

**PROJECT MANUAL**

**FOR**

**Additions and Renovations To:  
Brandywine School District Transportation Center  
Wilmington, Delaware**

**BRANDYWINE SCHOOL DISTRICT**  
1311 BRANDYWINE BOULEVARD  
WILMINGTON, DELAWARE 19809

**OWNER**

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**DATE: APRIL 15, 2013**



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**SECTION 001150**  
**ADVERTISEMENT FOR BIDS**

Brandywine School District -Transportation Center

Bid Offering - BSD Bid#: 1-13-09

Brandywine School District will receive bids for renovations and addition for the BSD Transportation Center on Thursday, May 30, 2013 until 2:00 PM, at the Brandywine Operations Center, 4 Mt. Lebanon Road Wilmington, DE 19803 (formerly Data Service Center). Bids will be opened publicly and read aloud. Bidder bears the risk of late delivery. Any bids received after the stated time will be returned unopened.

Project involves interior fit out and addition of maintenance bays at the proposed Transportation Center.

A mandatory pre-bid meeting will be held on Tuesday, May 7, 2013 at 1:00 P.M. at 1409 Eastlawn Ave Wilmington DE 19802. ATTENDANCE OF THIS MEETING IS A PREREQUISITE FOR BIDDING ON THIS CONTRACT. Following the meeting, attendees may walk through the project site.

Starting May 6th 2013 Bid Documents will be available from Reproduction Center Inc. 298 Churchman's Rd. New Castle DE 302-328-0519 or may be viewed online at <http://ftp.abha.com> Username: `bsd_transport_bid`

Username: `bsd_transport_bid`

Password: Bidding1228 (case-sensitive)

Sealed bids shall be addressed to Brandywine School District, Attn: Carol Riddle. The outer envelope should clearly indicate: "BSD Transportation Center", SEALED BID- DO NOT OPEN."

Questions should be directed to ABHA Architects. Attn: David Barisa in writing only by e-mail: [dbarisa@abha.com](mailto:dbarisa@abha.com) <<mailto:dbarisa@abha.com>> or fax number (302) 658-8431.

Time and place for opening of bids may be extended from that described above, with not less than two calendar days notice by certified delivery, facsimile machine, or other verifiable electronic means to those bidders who are known to the architect to have obtained bid documents.

**END OF SECTION**



**SECTION 002110**

**INSTRUCTIONS TO BIDDERS - STATE PROJECTS**

**TABLE OF ARTICLES**

1.01 ARTICLE 1:GENERAL

A. DEFINITIONS

1. Whenever the following terms are used, their intent and meaning shall be interpreted as follows:

STATE: The State of Delaware.

AGENCY: Contracting State Agency as noted on cover sheet.

DESIGNATED OFFICIAL: The agent authorized to act for the Agency.

ARCHITECT:

ABHA Architects, Inc.  
1621 N. Lincoln Street  
Wilmington, DE 19806

BIDDING DOCUMENTS: Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement for Bid, Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the Bid Form (including the Non-collusion Statement), and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, as well as the Drawings, Specifications (Project Manual) and all Addenda issued prior to execution of the Contract.

CONTRACT DOCUMENTS: The Contract Documents consist of the, Instructions to Bidders, Supplementary Instructions to Bidders (if any), General Conditions, Supplementary General Conditions, General Requirements, Special Provisions (if any), the form of agreement between the Owner and the Contractor, Drawings (if any), Specifications (Project Manual), and all addenda.

AGREEMENT: The form of the Agreement shall be AIA Document A101, Standard Form of Agreement between Owner and Contractor where the basis of payment is a STIPULATED SUM. In the case of conflict between the instructions contained therein and the General Requirements herein, these General Requirements shall prevail.

GENERAL REQUIREMENTS (or CONDITIONS): General Requirements (or conditions) are instructions pertaining to the Bidding Documents and to contracts in general. They contain, in summary, requirements of laws of the State; policies of the Agency and instructions to bidders.

SPECIAL PROVISIONS: Special Provisions are specific conditions or requirements peculiar to the bidding documents and to the contract under consideration and are supplemental to the General Requirements. Should the Special Provisions conflict with the General Requirements, the Special Provisions shall prevail.

ADDENDA: Written or graphic instruments issued by the Owner/Architect prior to the execution of the contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

**BIDDER OR VENDOR:** A person or entity who formally submits a Bid for the material or Work contemplated, acting directly or through a duly authorized representative who meets the requirements set forth in the Bidding Documents.

**SUB-BIDDER:** A person or entity who submits a Bid to a Bidder for materials or labor, or both for a portion of the Work.

**BID:** A complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

**BASE BID:** The sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids (if any are required to be stated in the bid).

**ALTERNATE BID (or ALTERNATE):** An amount stated in the Bid, where applicable, to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents is accepted.

**UNIT PRICE:** An amount stated in the Bid, where applicable, as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

**SURETY:** The corporate body which is bound with and for the Contract, or which is liable, and which engages to be responsible for the Contractor's payments of all debts pertaining to and for his acceptable performance of the Work for which he has contracted.

**BIDDER'S DEPOSIT:** The security designated in the Bid to be furnished by the Bidder as a guaranty of good faith to enter into a contract with the Agency if the Work to be performed or the material or equipment to be furnished is awarded to him.

**CONTRACT:** The written agreement covering the furnishing and delivery of material or work to be performed.

**CONTRACTOR:** Any individual, firm or corporation with whom a contract is made by the Agency.

**SUBCONTRACTOR:** An individual, partnership or corporation which has a direct contract with a contractor to furnish labor and materials at the job site, or to perform construction labor and furnish material in connection with such labor at the job site.

**CONTRACT BOND:** The approved form of security furnished by the contractor and his surety as a guaranty of good faith on the part of the contractor to execute the work in accordance with the terms of the contract.

## 1.02 ARTICLE 2: BIDDER'S REPRESENTATIONS

### A. PRE-BID MEETING

1. A pre-bid meeting for this project will be held at the time and place designated. Attendance at this meeting is a pre-requisite for submitting a Bid, unless this requirement is specifically waived elsewhere in the Bid Documents.
2. By submitting a Bid, the Bidder represents that:
  - a. The Bidder has read and understands the Bidding Documents and that the Bid is made in accordance therewith.

- b. The Bidder has visited the site, become familiar with existing conditions under which the Work is to be performed, and has correlated the Bidder's his personal observations with the requirements of the proposed Contract Documents.
- c. The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

**B. JOINT VENTURE REQUIREMENTS**

1. For Public Works Contracts, each Joint Venturer shall be qualified and capable to complete the Work with their own forces.
2. Included with the Bid submission, and as a requirement to bid, a copy of the executed Joint Venture Agreement shall be submitted and signed by all Joint Venturers involved.
3. All required Bid Bonds, Performance Bonds, Material and Labor Payment Bonds must be executed by both Joint Venturers and be placed in both of their names.
4. All required insurance certificates shall name both Joint Venturers.
5. Both Joint Venturers shall sign the Bid Form and shall submit a valid Delaware Business License Number with their Bid or shall state that the process of application for a Delaware Business License has been initiated.
6. Both Joint Venturers shall include their Federal E.I. Number with the Bid.
7. In the event of a mandatory Pre-bid Meeting, each Joint Venturer shall have a representative in attendance.
8. Due to exceptional circumstances and for good cause shown, one or more of these provisions may be waived at the discretion of the State.

**C. ASSIGNMENT OF ANTITRUST CLAIMS**

1. As consideration for the award and execution by the Owner of this contract, the Contractor hereby grants, conveys, sells, assigns and transfers to the State of Delaware all of its right, title and interests in and to all known or unknown causes of action it presently has or may now or hereafter acquire under the antitrust laws of the United States and the State of Delaware, relating to the particular goods or services purchased or acquired by the Owner pursuant to this contract.

**1.03 ARTICLE 3: BIDDING DOCUMENTS**

**A. COPIES OF BID DOCUMENTS**

1. Refer to Advertisement (or Invitation) for Bids for information concerning locations where Bidding Documents may be seen or obtained and under what conditions. Deposits for documents are non-refundable.
2. Bidders shall use complete sets of Bidding Documents for preparation of Bids. The issuing Agency nor the Architect assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
3. Any errors, inconsistencies or omissions discovered shall be reported to the Architect immediately.
4. The Agency and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

**B. INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS**

1. The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to

the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall report any errors, inconsistencies, or ambiguities discovered to the Architect.

2. Bidders or Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect at least seven days prior to the date for receipt of Bids. Interpretations, corrections and changes to the Bidding Documents will be made by written Addendum. Interpretations, corrections, or changes to the Bidding Documents made in any other manner shall not be binding.
3. The apparent silence of the specifications as to any detail, or the apparent omission from it of detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and only material and workmanship of the first quality are to be used. Proof of specification compliance will be the responsibility of the Bidder.
4. Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all permits, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.
5. The Owner will bear the costs for all impact and user fees associated with the project.

#### C. SUBSTITUTIONS

1. The materials, products and equipment described in the Bidding Documents establish a standard of quality, required function, dimension, and appearance to be met by any proposed substitution. The specification of a particular manufacturer or model number is not intended to be proprietary in any way. Substitutions of products for those named will be considered, providing that the Bidder certifies that the function, quality, and performance characteristics of the material offered is equal or superior to that specified. It shall be the Bidder's responsibility to assure that the proposed substitution will not affect the intent of the design, and to make any installation modifications required to accommodate the substitution.
2. Requests for substitutions shall be made in writing to the Architect at least ten (10) days prior to the date of the Bid Opening. Such requests shall include a complete description of the proposed substitution, drawings, performance and test data, explanation of required installation modifications due the substitution, and any other information necessary for an evaluation. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval shall be final. The Architect is to notify Owner prior to any approvals.
3. If the Architect approves a substitution prior to the receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding.
4. The Architect shall have no obligation to consider any substitutions after the Contract award.
5. Bidders shall conform to requirements in Section 01600 MATERIAL AND EQUIPMENT.

#### D. ADDENDA

1. Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of the Bidding Documents.

2. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.
3. No Addenda will be issued later than 4 days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which extends the time or changes the location for the opening of bids.
4. Each bidder shall ascertain prior to submitting his Bid that they have received all Addenda issued, and shall acknowledge their receipt in their Bid in the appropriate space. Not acknowledging an issued Addenda could be grounds for determining a bid to be non-responsive.

#### 1.04 ARTICLE 4: BIDDING PROCEDURES

##### A. PREPARATION OF BIDS

1. Submit the bids on the Bid Forms included with the Bidding Documents.
2. Submit the original Bid Form for each bid. Bid Forms may be removed from the project manual for this purpose.
3. Execute all blanks on the Bid Form in a non-erasable medium (typewriter or manually in ink).
4. Where so indicated by the makeup on the Bid Form, express sums in both words and figures, in case of discrepancy between the two, the written amount shall govern.
5. Interlineations, alterations or erasures must be initialed by the signer of the Bid.
6. **BID ALL REQUESTED ALTERNATES AND UNIT PRICES, IF ANY.** If there is no change in the Base Bid for an Alternate, enter "No Change". The Contractor is responsible for verifying that they have received all addenda issued during the bidding period. Work required by Addenda shall automatically become part of the Contract.
7. Make no additional stipulations on the Bid Form and do not qualify the Bid in any other manner.
8. Each copy of the Bid shall include the legal name of the Bidder and a statement whether the Bidder is a sole proprietor, a partnership, a corporation, or any legal entity, and each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current Power of Attorney attached, certifying agent's authority to bind the Bidder.
9. Bidder shall complete the Non-Collusion Statement form included with the Bid Forms and include it with their Bid.
10. In the construction of all Public Works projects for the State of Delaware or any agency thereof, preference in employment of laborers, workers or mechanics shall be given to bona fide legal citizens of the State who have established citizenship by residence of at least 90 days in the State.

##### B. BID SECURITY

1. All bids shall be accompanied by a deposit of either a good and sufficient bond to the agency for the benefit of the agency, with corporate surety authorized to do business in this State, the form of the bond and the surety to be approved by the agency, or a security of the bidder assigned to the agency, for a sum equal to at least 10% of the bid plus all add alternates, or in lieu of the bid bond a security deposit in the form of

a certified check, bank treasurer's check, cashier's check, money order, or other prior

approved secured deposit assigned to the State. The bid bond need not be for a specific sum, but may be stated to be for a sum equal to 10% of the bid plus all add alternates to which it relates and not to exceed a certain stated sum, if said sum is equal to at least 10% of the bid. The Bid Bond form used shall be the standard OMB form (attached).

2. The Agency has the right to retain the bid security of Bidders to whom an award is being considered until either a formal contract has been executed and bonds have been furnished or the specified time has elapsed so the Bids may be withdrawn or all Bids have been rejected.
3. In the event of any successful Bidder refusing or neglecting to execute a formal contract and bond within 20 days of the awarding of the contract, the bid bond or security deposited by the successful bidder shall be forfeited.

C. SUBCONTRACTOR LIST

1. As required by Delaware Code, Title 29, section 6962(d)(10)b, each Bidder shall submit with their Bid a completed List of Sub-Contractors included with the Bid Form. NAME ONLY ONE SUBCONTRACTOR FOR EACH TRADE. A Bid will be considered non-responsive unless the completed list is included.
2. Provide the Name and Address for each listed subcontractor. Addresses by City, Town or Locality, plus State, will be acceptable.
3. It is the responsibility of the Contractor to ensure that their Subcontractors are in compliance with the provisions of this law. Also, if a Contractor elects to list themselves as a Subcontractor for any category, they must specifically name themselves on the Bid Form and be able to document their capability to act as Subcontractor in that category in accordance with this law.

D. EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

1. During the performance of this contract, the contractor agrees as follows:
  - a. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex or national origin. The Contractor will take affirmative action to ensure the applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, sex or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.
  - b. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, sex or national origin."

E. PREVAILING WAGE REQUIREMENT

1. Wage Provisions: In accordance with Delaware Code, Title 29, Section 6960, renovation projects whose total cost shall exceed \$15,000, and \$100,000 for new construction, the minimum wage rates for various classes of laborers and mechanics

shall be as determined by the Department of Labor, Division of Industrial Affairs of the State of Delaware.

2. The prevailing wage shall be the wage paid to a majority of employees performing similar work as reported in the Department's annual prevailing wage survey or in the absence of a majority, the average paid to all employees reported.
3. The employer shall pay all mechanics and labors employed directly upon the site of work, unconditionally and not less often than once a week and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the specifications, regardless of any contractual relationship which may be alleged to exist between the employer and such laborers and mechanics.
4. The scale of the wages to be paid shall be posted by the employer in a prominent and easily accessible place at the site of the work.
5. Every contract based upon these specifications shall contain a stipulation that sworn payroll information, as required by the Department of Labor, be furnished weekly. The Department of Labor shall keep and maintain the sworn payroll information for a period of 6 months from the last day of the work week covered by the payroll.

F. SUBMISSION OF BIDS

1. Enclose the Bid, the Bid Security, and any other documents required to be submitted with the Bid in a sealed opaque envelope. Address the envelope to the party receiving the Bids. Identify with the project name, project number, and the Bidder's name and address. If the Bid is sent by mail, enclose the sealed envelope in a separate mailing envelope with the notation "BID ENCLOSED" on the face thereof. The State is not responsible for the opening of bids prior to bid opening date and time that are not properly marked.
2. Deposit Bids at the designated location prior to the time and date for receipt of bids indicated in the Advertisement for Bids. Bids received after the time and date for receipt of bids will be marked "LATE BID" and returned.
3. Bidder assumes full responsibility for timely delivery at location designated for receipt of bids.
4. Oral, telephonic or telegraphic bids are invalid and will not receive consideration.
5. Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids, provided that they are then fully in compliance with these Instructions to Bidders.

G. MODIFICATION OR WITHDRAW OF BIDS

1. Prior to the closing date for receipt of Bids, a Bidder may withdraw a Bid by personal request and by showing proper identification to the Architect. A request for withdraw by letter or fax, if the Architect is notified in writing prior to receipt of fax, is acceptable. A fax directing a modification in the bid price will render the Bid informal, causing it to be ineligible for consideration of award. Telephone directives for modification of the bid price shall not be permitted and will have no bearing on the submitted proposal in any manner.
2. Bidders submitting Bids that are late shall be notified as soon as practicable and the bid shall be returned.
3. A Bid may not be modified, withdrawn or canceled by the Bidder during a thirty (30) day period following the time and date designated for the receipt and opening of

Bids, and Bidder so agrees in submitting their Bid. Bids shall be binding for 30 days after the date of the Bid opening.

#### 1.05 ARTICLE 5: CONSIDERATION OF BIDS

##### A. OPENING/REJECTION OF BIDS

1. Unless otherwise stated, Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids will be made available to Bidders.
2. The Agency shall have the right to reject any and all Bids. A Bid not accompanied by a required Bid Security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.
3. If the Bids are rejected, it will be done within thirty (30) calendar day of the Bid opening.

##### B. COMPARISON OF BIDS

1. After the Bids have been opened and read, the bid prices will be compared and the result of such comparisons will be made available to the public. Comparisons of the Bids may be based on the Base Bid plus desired Alternates. The Agency shall have the right to accept Alternates in any order or combination.
2. The Agency reserves the right to waive technicalities, to reject any or all Bids, or any portion thereof, to advertise for new Bids, to proceed to do the Work otherwise, or to abandon the Work, if in the judgment of the Agency or its agent(s), it is in the best interest of the State.
3. An increase or decrease in the quantity for any item is not sufficient grounds for an increase or decrease in the Unit Price.
4. The prices quoted are to be those for which the material will be furnished F.O.B. Job Site and include all charges that may be imposed during the period of the Contract.
5. No qualifying letter or statements in or attached to the Bid, or separate discounts will be considered in determining the low Bid except as may be otherwise herein noted. Cash or separate discounts should be computed and incorporated into Unit Bid Price(s).

##### C. DISQUALIFICATION OF BIDDERS

1. An agency shall determine that each Bidder on any Public Works Contract is responsible before awarding the Contract. Factors to be considered in determining the responsibility of a Bidder include:
  - a. The Bidder's financial, physical, personnel or other resources including Subcontracts;
  - b. The Bidder's record of performance on past public or private construction projects, including, but not limited to, defaults and/or final adjudication or admission of violations of the Prevailing Wage Laws in Delaware or any other state;
  - c. The Bidder's written safety plan;
  - d. Whether the Bidder is qualified legally to contract with the State;
  - e. Whether the Bidder supplied all necessary information concerning its responsibility; and,
  - f. Any other specific criteria for a particular procurement, which an agency may establish; provided however, that, the criteria be set forth in the Invitation to Bid and is otherwise in conformity with State and/or Federal law.

2. If an agency determines that a Bidder is nonresponsive and/or nonresponsible, the determination shall be in writing and set forth the basis for the determination. A copy of the determination shall be sent to the affected Bidder within five (5) working days of said determination.
  3. In addition, any one or more of the following causes may be considered as sufficient for the disqualification of a Bidder and the rejection of their Bid or Bids.
    - a. More than one Bid for the same Contract from an individual, firm or corporation under the same or different names.
    - b. Evidence of collusion among Bidders.
    - c. Unsatisfactory performance record as evidenced by past experience.
    - d. If the Unit Prices are obviously unbalanced either in excess or below reasonable cost analysis values.
    - e. If there are any unauthorized additions, interlineation, conditional or alternate bids or irregularities of any kind which may tend to make the Bid incomplete, indefinite or ambiguous as to its meaning.
    - f. If the Bid is not accompanied by the required Bid Security and other data required by the Bidding Documents.
    - g. If any exceptions or qualifications of the Bid are noted on the Bid Form.
- D. ACCEPTANCE OF BID AND AWARD OF CONTRACT
1. A formal Contract shall be executed with the successful Bidder within twenty (20) calendar days after the award of the Contract.
  2. Per Section 6962(d)(13) a., Title 29, Delaware Code, "The contracting agency shall award any public works contract within thirty (30) days of the bid opening to the lowest responsive and responsible Bidder, unless the Agency elects to award on the basis of best value, in which case the election to award on the basis of best value shall be stated in the Invitation To Bid."
  3. Each Bid on any Public Works Contract must be deemed responsive by the Agency to be considered for award. A responsive Bid shall conform in all material respects to the requirements and criteria set forth in the Contract Documents and specifications.
  4. The Agency shall have the right to accept Alternates in any order or combination, and to determine the low Bidder on the basis of the sum of the Base Bid, plus accepted Alternates.
  5. The successful Bidder shall execute a formal contract, submit the required Insurance Certificate, and furnish good and sufficient bonds, unless specifically waived in the General Requirements, in accordance with the General Requirement, within twenty (20) days of official notice of contract award. Bonds shall be for the benefit of the Agency with surety in the amount of 100% of the total contract award. Said Bonds shall be conditioned upon the faithful performance of the contract. Bonds shall remain in affect for period of one year after the date of substantial completion.
  6. If the successful Bidder fails to execute the required Contract and Bond, as aforesaid, within twenty (20) calendar days after the date of official Notice of the Award of the Contract, their Bid guaranty shall immediately be taken and become the property of the State for the benefit of the Agency as liquidated damages, and not as a forfeiture or as a penalty. Award will then be made to the next lowest qualified Bidder of the Work or readvertised, as the Agency may decide.

7. Prior to receiving an award, the successful Bidder shall furnish to the Agency proof of State of Delaware Business Licensure. If the Bidder does not currently have a Business License, they may obtain an application by writing to: Division of Revenue, Carvel State Office Building, 820 French Street, Wilmington, DE 19899. A copy of the letter written to the Division of Revenue, sent with your Bid will be adequate proof for your firm to be considered for award until such time as you receive your license.
8. The Bid Security shall be returned to the successful Bidder upon the execution of the formal contract. The Bid Securities of unsuccessful bidders shall be returned within thirty (30) calendar days after the opening of the Bids.

1.06 ARTICLE 6: POST-BID INFORMATION

A. CONTRACTOR'S QUALIFICATION STATEMENT

1. Bidders to whom award of a Contract is under consideration shall, if requested by the Agency, submit a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a statement has been previously required and submitted.

B. BUSINESS DESIGNATION FORM

1. Successful bidder shall be required to accurately complete an Office of Management and Budget Business Designation Form for Subcontractors.

1.07 ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND

A. BOND REQUIREMENTS

1. The cost of furnishing the required Bonds, that are stipulated in the Bidding Documents, shall be included in the Bid.
2. If the Bidder is required by the Agency to secure a bond from other than the Bidder's usual sources, changes in cost will be adjusted as provide in the Contract Documents.
3. The Performance and Payment Bond forms used shall be the standard OMB forms (attached).

B. TIME OF DELIVERY AND FORM OF BONDS

1. The bonds shall be dated on or after the date of the Contract.
2. The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix a certified and current copy of the power of attorney.

1.08 ARTICLE 8: FORM OF AGREEMENT BETWEEN AGENCY AND CONTRACTOR

- A. Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment is a Stipulated Sum.

END OF INSTRUCTIONS TO BIDDERS

STATE OF DELAWARE  
DEPARTMENT OF LABOR  
DIVISION OF INDUSTRIAL AFFAIRS  
OFFICE OF LABOR LAW ENFORCEMENT  
PHONE: (302) 451-3423

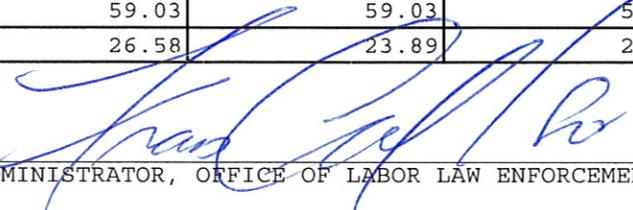
Mailing Address:  
225 CORPORATE BOULEVARD  
SUITE 104  
NEWARK, DE 19702

Located at:  
225 CORPORATE BOULEVARD  
SUITE 104  
NEWARK, DE 19702

PREVAILING WAGES FOR BUILDING CONSTRUCTION EFFECTIVE MARCH 15, 2013

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	21.87	26.94	39.20
BOILERMAKERS	65.47	33.22	48.83
BRICKLAYERS	46.83	46.83	46.83
CARPENTERS	50.06	50.06	39.82
CEMENT FINISHERS	27.61	29.11	21.20
ELECTRICAL LINE WORKERS	43.49	37.29	28.44
ELECTRICIANS	60.60	60.60	60.60
ELEVATOR CONSTRUCTORS	75.33	40.93	30.55
GLAZIERS	64.10	64.10	54.20
INSULATORS	51.48	51.48	51.48
IRON WORKERS	59.12	59.12	59.12
LABORERS	38.30	38.30	38.30
MILLWRIGHTS	62.18	62.18	48.75
PAINTERS	42.02	42.02	42.02
PILEDRIVERS	67.87	37.64	30.45
PLASTERERS	28.55	28.55	17.50
PLUMBERS/PIPEFITTERS/STEAMFITTERS	59.00	49.26	46.28
POWER EQUIPMENT OPERATORS	57.06	57.06	24.13
ROOFERS-COMPOSITION	21.77	17.96	19.34
ROOFERS-SHINGLE/SLATE/TILE	17.59	17.50	16.45
SHEET METAL WORKERS	62.74	62.74	62.74
SOFT FLOOR LAYERS	45.97	45.97	45.97
SPRINKLER FITTERS	51.75	51.75	51.75
TERRAZZO/MARBLE/TILE FNRS	51.41	51.41	45.45
TERRAZZO/MARBLE/TILE STRS	59.03	59.03	52.63
TRUCK DRIVERS	26.58	23.89	20.03

CERTIFIED: 3/19/13

BY:   
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

**NOTE:** THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 451-3423.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

**PROJECT:** Additions and Renovations to Brandywine School District Transportation Center , New Castle County

**SECTION 003100**  
**AVAILABLE PROJECT INFORMATION**

**PART 1 GENERAL**

1.01 EXISTING CONDITIONS

- A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents, as follows:
- B. Geotechnical Report: Prepared by Duffield Associates, entitled Geotechnical Evaluation, Brandywine School District, Transportation Center Addition, Wilmington, Delaware, dated February 25, 2013.
  - 1. A copy of this report is attached to this Section.
  - 2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.
  - 3. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.
  - 4. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations may be made, with resulting credits or expenditures to the Contract Sum accruing to Owner.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**





**DUFFIELD**  
**ASSOCIATES**

*Water/Civil*



*Geotechnical*



*Natural Resources*



*Environmental*



**Project No. 4939.GI**  
**Geotechnical Evaluation**  
**Brandywine School District**  
**Transportation Center Addition**  
**Wilmington, Delaware**

*Construction*



February 25, 2012

Mr. John Read  
District Construction Project Manager  
Brandywine School District  
1311 Brandywine Boulevard  
Wilmington, DE 19809

RE: Project No. 4939.GI  
Geotechnical Evaluation  
Proposed Addition to Brandywine School District  
Transportation Center  
Wilmington, Delaware

Dear Mr. Read:

Duffield Associates, Inc. (Duffield Associates) has completed our Geotechnical Evaluation for the proposed addition to the Brandywine School District Transportation Center located in Wilmington, Delaware. The following discussion summarizes our geotechnical evaluation for the site. The enclosed provides more detailed information regarding the field and laboratory testing programs, subsurface conditions encountered, and recommendations for the design and construction of the proposed foundations and slab-on-grade, as well as stormwater management facilities.

Based on the information provided, it is proposed to construct a 5,000-square-foot, single-story, addition onto the north side of the existing transportation center. The building addition will be constructed at grade (i.e., no basement level) with a proposed finished floor elevation of 21.0 feet (project datum), which will require fills on the order of 1 foot from the original grade to match the finished floor of the existing building. Based on the information provided by the project's structural engineer (Baker, Ingram & Associates), the proposed building addition will consist of structural steel framing with a maximum column load of 70 kips at the center of the structure and columns around the exterior of the structure with design column loads of lesser magnitude.

The project site is located at 3101 Edgemoor Avenue, Wilmington, Delaware. The location of the proposed addition is currently a soil and gravel covered area. The proposed addition is to be located to the north of the existing facility and the site slopes downward away from the existing building with existing elevations ranging from approximately 19 to 21 feet.

Three Standard Penetration Test (SPT) borings were performed on January 23, 2013. Beneath a surficial layer of stone base course and apparent fill material to a depth of approximately 5 to 6 feet below existing ground surface, the subsurface conditions observed can generally be described as a layer of medium stiff silty clay overlying loose to medium dense clayey sand, silty sand, and sand with variable amounts of rounded alluvial gravel.

Groundwater was observed in the test borings at depths ranging from approximately 11.4 to 18.5 feet below the existing ground surface.

Based on the observed subsurface conditions and estimated loading conditions, it is Duffield Associates' opinion that the proposed addition can be supported on a conventional shallow foundation system and slab-on-grade. Due to the variability and potential for post-construction settlement and differential settlement, the surficial fill materials are not considered suitable for support of the proposed building foundations. As a result, it is recommended that the fill materials be removed from beneath the proposed foundations, and the building footings be constructed directly on the natural site soils, or structural fill materials, placed and compacted as indicated in the report. A maximum allowable bearing pressure of 2,000 pounds per square foot is recommended for the design of foundations. Total foundation settlement is estimated to be on the order of 1 inch or less, with post construction differential settlements estimated to be ½ inch or less over a distance of 20 feet.

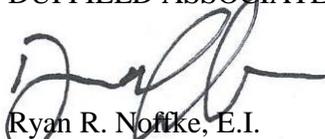
Two options are considered possible for the construction of the slab-on-grade for the proposed building addition. The alternative involving the least risk of post-construction settlement and differential settlement would be to remove the fill materials from beneath the slab and replace them with imported, compacted structural fill materials. While this option would reduce the risk of floor slab settlement, there are costs associated with the excavation and disposal of the fill materials, as well as the placement and compaction of structural fill material. The alternative would be to construct the floor slab over the existing fill materials and accept that some settlement and differential settlement of the slab-on-grade may occur. If this option is chosen, the initial construction costs will be reduced (compared to removal and replacement), but there may be long-term maintenance required with associated costs.

The recommendations of this report have been prepared according to generally accepted soil and foundation engineering practice and are based on the conditions encountered by the test borings performed at the site. It is noted that, although soil quality has been inferred from the interpolation of the sampling data, subsurface conditions beyond the test borings are, in fact, unknown. Should any conditions encountered during construction differ from those described in this report, this office should be notified immediately in order to review, and possibly modify, these recommendations. This report applies solely to the size, type, and location of the structure described herein. In the event that changes are proposed, this report will not be considered valid unless the changes have been reviewed and the recommendations of this report modified and re-approved in writing by Duffield Associates, Inc.

We appreciate this opportunity to be of service to you. Should you have any questions concerning this evaluation, please contact us.

Very truly yours,

DUFFIELD ASSOCIATES, INC.



Ryan R. Noffke, E.I.  
Geotechnical Engineer



Joseph Jakubowski, P.E., LEED AP  
Geotechnical Project Manager

**Project No. 4939.GI - Geotechnical Evaluation  
Brandywine School District Transportation Center  
Wilmington, Delaware**



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**Project No. 4939.GI - Geotechnical Evaluation  
Brandywine School District Transportation Center  
Wilmington, Delaware**



**A. PROJECT SUMMARY**

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**PROPOSED CONSTRUCTION**

- One 5,000-square-foot single-story building addition onto the north side of the existing Transportation Facility.
- Proposed finished floor elevation of 21.0 feet (project datum) with fills on the order of 1 foot.
- According to the project structural engineer (Baker, Ingram & Associates), structural steel framing construction with a maximum column load of 70 kips at a centrally located 6-foot by 6-foot square spread footing.

**REFERENCES UTILIZED FOR THIS EVALUATION**

- Drawing No. C-101 titled “Site Construction Plan, Brandywine School District – Transportation Center,” prepared by ABHA Architects, Inc., undated and marked “Progress Print.” Plan shows proposed and existing elevations with the proposed and existing structure.
- An untitled marked-up site plan indicating the footing locations and the loading at the columns, prepared by ABHA Architects, Inc.
- Drawing No. 22556.02-CONST-01 titled “Location Plan,” prepared by Vandemark & Lynch, Inc., dated December 20, 2012, and marked “DRAFT.” This drawing shows the location of the existing building at the site and the proposed addition.

**EXISTING SITE CONDITIONS**

- The Transportation Center is located at 3101 Edgemoor Avenue, Wilmington, Delaware 19802, which is located offsite from the Brandywine School District.
- The location of the proposed addition is currently with covered stone base course and soil. The proposed addition will attach to the north wall of the existing facility. Minimal existing slopes exist with the necessity of slight regarding on the order of approximately 1 foot of fill. The site slopes gradually away from the existing building with existing elevations ranging from 19 to 21 feet.
- Underground water lines, sanitary sewer, and storm sewer were reported to have been delineated in the field prior to the performance of the field work by Miss Utility, as shown on the referenced ABHA Architects Site Construction Plan.

**Project No. 4939.GI - Geotechnical Evaluation  
Brandywine School District Transportation Center  
Wilmington, Delaware**



**B. FIELD WORK AND LABORATORY TESTING RESULTS**

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**STANDARD PENETRATION TEST BORINGS**

- On December 30, 2011, five test borings were performed by CGC Geoservices, LLC of Hockessin, Delaware, as a subcontractor to Duffield Associates, Inc. (Duffield Associates), utilizing a truck-mounted, Deidrich D-50 drill rig with hollow-stem augers.
- The test borings were field located, and the elevations are estimated based on the drawings provided.
- At completion of the drilling, the boreholes were backfilled with the soil cuttings.

**GEOTECHNICAL LABORATORY TESTING**

Following the test boring program, the samples were returned to Duffield Associates' office and laboratory testing was performed on selected samples. The results of the laboratory testing are summarized in Table 1. No environmental testing or characterization was performed.

**Table 1: Geotechnical Laboratory Testing**

Location	Sample No.	Depth (Ft)	Moisture Content (%) ASTM D 2216	Percent Passing No. 200 Sieve (%) ASTM D 1140	Atterberg Limits ASTM D 4318
TB-1	S-5	13.5-15.0	19.1	27.5	--
TB-1	S-7	23.0-25.0	16.6	37.4	--
TB-2	S-3	6.0-7.5	23.1	85.3	--
TB-2	S-5	13.5-15.0	32.3	95.4	Liquid Limit = 35 Plasticity Index = 13
TB-3	S-6	18.5-20.0	18.9	32.1	--
TB-3	S-7	23.5-25.0	18.4	14.7	--

**C. SUBSURFACE CONDITIONS**

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**SITE GEOLOGY**

- This site is located approximately 700 feet northwest of the fall line between the Piedmont Physiographic province and the Atlantic Coastal Plain Physiographic Province, remaining within the Peidmont. Based on data from the Delaware Geological Survey (DGS), sediments in this area are generally of the upper Pleistocene Age, coastal plain – primary surface unit Delaware Bay Group. The Delaware Bay Group deposits consist of light reddish-brown to gray, medium to coarse sands with common beds of fine to medium sand and very fine to fine

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Wilmington, Delaware**



sand and very fine to fine sandy silt. Also present are beds of gray clayey silt and brown, organic-rich clayey silt that are commonly found in lensoid channel-fill bodies. Beds of gray, fine to very fine clayey sand to clayey silt with shell are found in its eastern extent near Rehoboth Beach. The sands are quartzose with varying amounts of feldspar, slightly less than quantities of feldspar found in the Columbia Formation. The deposits are heterogeneous both vertically and laterally. The general trend within the formations is a fining upwards of sediment textures. Geomorphology: The Delaware Bay Group deposits are found beneath terraces that have scarps roughly parallel to the Delaware River and Bay tributaries, and relatively flat treads that slope gently toward the modern Delaware Bay. Due to the proximity to the Piedmont fall line, the Brandywine Blue Gniess is expected to be encountered at greater depths.

**SITE STRATIGRAPHY**

Stratum A: FILL: Black and brown Silt, some sand, trace clay, some gravel. Organics, brick, and rubber present. Apparent petroleum odor noted in one sample, (Sample S-2, 3.5 to 5 feet in test boring TB-3). Stratum B: Gray silty Clay, trace sand, medium stiff. USCS: CL-ML

Stratum C: Clayey Sand, silty sand, and sand- all with some gravel, medium dense. USCS: SC and SM

**GROUNDWATER CONDITIONS**

- Groundwater was observed in the test borings at depths ranging from approximately 11.4 to 18.5 feet below the existing ground surface.
- Groundwater mapping by DGS and the current State of Delaware, Department of Natural Resources and Environmental Control (DNREC) well permit database indicates annual average groundwater levels in “normal” or “dry” conditions range from approximately 6 to 9 feet below the existing ground surface, while annual average groundwater depths bordering between 3 to 6 feet and 6 to 9 feet may be experienced during “wet” conditions. The borings for this evaluation appear consistent with the DNREC well database information.
- Groundwater levels at the site will be affected by seasonal and annual variations in precipitation. It is estimated that variations in groundwater levels several feet higher or lower than those observed during this evaluation could be experienced during extreme variations in precipitation.

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Brandywine School District Transportation Center  
Wilmington, Delaware**



**D. ANALYSIS AND DESIGN RECOMMENDATIONS**

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**DISCUSSION OF ANALYSIS**

**BUILDING FOUNDATIONS AND SLAB-ON-GRADE**

It is Duffield Associates' opinion that the medium stiff or stiffer "natural" site soils (Stratum B), encountered beneath the fill (Stratum A), are generally suitable for supporting the proposed addition on a shallow foundation system. The soils of Stratum A are not considered suitable for support of the proposed building foundations due to the variability of the composition and consistency of these materials and the relatively high potential for post construction differential settlements.

Two options are available for the construction of the floor slab for the structure. The first option would be to completely remove the miscellaneous fill materials within the proposed building area (and from beneath the proposed slab) and replace them with compacted structural fill material. This option would present the "least risk" in terms of long-term settlement of the floor slab. However, this alternative would involve additional cost to undercut and dispose of the fill materials and to replace them with suitable imported borrow materials. It is noted that an apparent petroleum odor was observed in one of the samples of the fill material. The source of this odor is unclear, but some further environmental analysis to characterize these materials may be required if the fill materials are to be excavated and disposed of offsite.

The second option would be to construct the floor slab over the fill materials, and accept that some post-construction settlement of the floor slab may occur over the long term and some future maintenance (with associated costs) may be required due to settlement and differential settlement.

Based on the existing and proposed grades, it appears that the proposed finish floor elevation is approximately 1 foot above the existing grades at the site and minimal fill will be required to reach the finished floor. One method of reducing the effects of differential settlement on the floor slab would be to construct a "stabilization layer" of aggregate and high strength geotextile reinforcing below the proposed slab. This would not eliminate differential settlement of the floor slab, but typically reduces the effects of large differential settlement over a short distance. However, due to the relatively small amount of fill required, it may not be possible to construct a "stabilization layer" without either raising the finish floor elevation or undercutting some of the fill material to permit construction of the layer beneath the floor slab.

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Brandywine School District Transportation Center  
Wilmington, Delaware**



**DESIGN RECOMMENDATIONS**

**1. FOUNDATION BEARING CAPACITY AND SETTLEMENT**

The fill materials at the site are not considered suitable for support of a shallow foundation system. These fill materials should be removed in the areas of proposed footings, until the natural silty clay materials of Stratum B are encountered. The footings should be constructed directly on the soils of Stratum B, or on structural fill, placed and compacted as recommended in this report. A maximum allowable bearing pressure of 2,000 pounds per square foot is recommended for the design of shallow foundations. Total settlement is estimated to be on the order of 1 inch or less, and post-construction differential settlement is estimated to be ½ inch or less over a distance of 20 feet.

**2. FOUNDATION BURIAL DEPTH AND SIZE**

The base of all exterior spread footings in areas exposed to frost should be placed at least 32 inches below final exterior grade. Interior foundations in insulated areas should be placed at least 18 inches below the proposed finished floor elevation. All isolated column footings should be sized and loaded, as specified on the referenced preliminary drawing provided by Baker, Ingram & Associates, and all continuous wall footings should be a minimum of 2 feet wide, regardless of bearing pressure. If a winter construction schedule is proposed for the foundations, provisions for the protection of shallow foundations from frost heave during construction should be included in the contract specifications.

**3. SLAB-ON-GRADE**

As indicated above, several options for supporting the proposed slab-on-grade are possible. Regardless of the option selected, ground-supported floor slabs should be designed as “free floating” and should not be connected to the structural elements (e.g., walls, framing, etc.) of the buildings. Isolation joints should be utilized at the interface of proposed ground-supported floor slab and structural elements to accommodate potential differential settlement. A minimum 10-mil polyethylene vapor barrier and free-draining subbase, consisting of at least 4 inches of poorly graded, crushed stone aggregate, such as AASHTO SP-57 stone, should be provided beneath all floor slabs.

If it is decided to construct the proposed floor slab over the fill materials, some type of vent system should be constructed in the crushed stone directly below the slab to reduce the potential for vapors from the fill material entering the building after construction is complete. In addition, the expansion and control joints constructed in the slab-on-grade should utilize a vapor resistance flexible joint sealant.

**4. SEISMIC DESIGN PARAMETERS**

Based on subsurface conditions encountered during the field exploration at the site and review of regional geologic maps, an “E” soil profile type, as defined by Table 1615.1.1 of the 2003 International Building Code, is recommended for design.

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Brandywine School District Transportation Center  
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**5. INFLUENCE OF NEW BUILDINGS ON THE EXISTING STRUCTURES**

It is understood that the new foundations for the proposed additions will be independent of the existing foundations (i.e., the new structures will not be supported directly on the existing footings or foundation walls). The burial depth of the foundations for the proposed new additions should be selected such that additional loads will not be imparted to the existing footings. The proposed foundations immediately adjacent to the existing structures should be founded at an elevation equal to, or below, the existing foundations.

The connection between the proposed and existing structures should be designed to tolerate up to 1 inch of differential settlement, as the existing structures have likely already experienced their full load-induced settlement.

**6. EXISTING UTILITIES**

The presence of utilities beneath new foundations could result in crushing of the pipes and/or undermining of the proposed foundations and slab-on-grade. Therefore, it is recommended that any existing utilities be relocated outside the limits of the proposed construction. The resulting excavations should be backfilled with structural fill, placed, and compacted as recommended in this report. If the utilities cannot be relocated outside of the proposed building area, foundations should be designed to bear at or below the invert elevations of the pipe. If these options are not considered economical, or are otherwise impractical to accomplish, a potentially less expensive method of construction, with resultant greater potential for future undermining is to expose, sleeve, and fully encapsulate the existing utilities in concrete beneath the proposed building area. The latter alternative should only be considered if the former alternatives cannot be accomplished.

**7. CONTROL JOINTS**

Masonry walls, if required, should be provided with frequent control joints placed at architecturally convenient locations, such as windows and doorways, to provide a “preferred” location for cracking due to differential settlement to occur.

**8. SITE GRADING**

Site grading should be designed to provide positive drainage away from the proposed building areas. Positive site drainage should be maintained throughout the construction activities.

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Brandywine School District Transportation Center  
Wilmington, Delaware**



**E. CONSTRUCTION RECOMMENDATIONS**

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**SUBGRADE PREPARATION**

1. At the start of construction, the site should be stripped of all topsoil, portland cement concrete, and vegetation, and rough excavated to the proposed grades. Following rough grading, but prior to footing excavation or placement of fill, it is recommended that the exposed subgrade be proofrolled with a minimum 10-ton static roller or fully-loaded tandem dump truck in the presence of a qualified soils technician working under the supervision of a geotechnical engineer familiar with this report. The building area should be proofrolled at least 10 feet beyond the building perimeter. The purpose of this proofrolling is to identify potentially yielding surficial subgrade conditions. Yielding subgrade conditions encountered within the proposed building areas should be undercut to firm, subgrade conditions, and backfilled with compacted structural fill placed in accordance with the recommendations of this report. Regardless of the option utilized for support of the floor slab, proofrolling of the exposed subgrade should be performed as part of the subgrade preparation. If the fill materials are to be removed, the exposed natural soils of Stratum B should be proofrolled. If the fill materials are to remain in place, the surface of these materials should be proofrolled prior to construction of the stabilization layer (if one is to be utilized) or construction of the floor slab. The subgrade review should also confirm the consistency and texture of the exposed soils with the conditions encountered by this evaluation, as described in this report.

**FOUNDATION SUBGRADE REVIEW**

2. All foundations should be placed on natural, firm, dry, non-frozen compacted structural fill. Foundation excavations should be reviewed by a qualified technician working under the supervision of a geotechnical engineer who is familiar with the recommendations of this report. Subgrade review should be performed prior to the placement of structural fill, and should verify the presence of the medium stiff or stiffer clay. If these conditions are not encountered at the proposed foundation depth, additional undercutting may be required, as evaluated and recommended by a qualified geotechnical engineer. If acceptable to the project's geotechnical engineer, granular soils may be densified in place. Foundation undercut areas should be backfilled with structural fill (as recommended herein) or, if acceptable to the project's structural engineer, some type of "flowable fill" or lean concrete.
3. An apparent petroleum odor was reported to be present in a sample of the fill material obtained in test boring TB-3. The source of this odor is not known, nor is the extent. If evidence of a release of petroleum, such as odors, are encountered during construction, the owner or operator of the facility must notify the State of Delaware's Release Hotline within 24 hours (State of Delaware, 2012, [Delaware Regulations Governing Hazardous Substance Cleanup](#)). Alternately, the odors could be reported to the State of Delaware in advance of construction in order to reduce the impact of possible delays. If a release is to be reported, Duffield Associates recommends contacting an environmental professional to assist with regulatory requirements stemming from discussions with agents of the State of Delaware.

**Project No. 4939.GI - Geotechnical Evaluation  
Brandywine School District Transportation Center  
Wilmington, Delaware**



**RE-USE OF ON-SITE SOILS AS STRUCTURAL FILL**

4. On-site soils are not considered suitable for use as structural fill.
5. Imported borrow consisting of predominately granular soils conforming to the requirements of Delaware Department of Transportation Standard Specifications Borrow Type G (Backfill) should be utilized. AASHTO SP-57 stone could also be utilized as structural fill at locations, as recommended by the project engineer, and should be considered for localized, relatively deep fills such as foundation undercuts or utility trenches and as a base beneath the slabs.

**COMPACTION REQUIREMENTS**

6. Structural fill utilized within the proposed building area should be placed in loose lifts with a maximum thickness of 8 inches.
7. The following compaction requirement should be utilized for each lift of fill placed at the site:
  - Structural fill placed within the building area should be compacted to at least 95% of the maximum dry density, as determined by the Modified Proctor test (ASTM D 1557).
8. The placement and compaction of structural fill should be monitored on a full-time basis by a qualified technician under the supervision of a geotechnical engineer.

**PROTECTION OF SUBGRADE SOILS**

9. Subgrade soils disturbed by precipitation and construction traffic should be either scarified and re-compacted, or undercut and replaced with structural fill as previously discussed. Subgrade disturbance could be reduced by maintaining positive surface drainage, by establishing and maintaining a sump throughout the construction period, and by limiting construction traffic on the exposed subgrade soils.

**GROUNDWATER CONTROL**

10. Based on the subsurface conditions encountered, it is anticipated that groundwater conditions will be below the depth of typical shallow foundation excavation. However, it is considered possible that “perched” groundwater conditions may be encountered at the base of the fill materials and above the natural soils of Stratum B. If “perched” groundwater is encountered, localized sumping may be required to control groundwater encountered in excavations during construction. It is recommended that wherever groundwater is encountered during shallow foundation or utility excavations, the resulting excavation should be over excavated by at least 4 inches and replaced with AASHTO SP-57 stone to protect the exposed subgrade soils and facilitate sumping.

**Project No. 4939.GI - Geotechnical Evaluation  
Brandywine School District Transportation Center  
Wilmington, Delaware**



**EXCAVATION SAFETY**

11. All foundation and utility excavation should be performed in accordance with OSHA guidelines. Typically, sand soils can be characterized by OSHA CFR Part 1926 Excavation Standards as Type C soils. Should it be required, all temporary sheeting and shoring should be designed by a qualified engineer registered in the State of Delaware.

**CONSTRUCTION REVIEW**

12. It is recommended that the project budget include provisions for the cost for independent construction monitoring of the earthwork and foundation construction by a qualified engineering firm retained by the owner to review conformance of construction with the recommendations of the project geotechnical evaluation and the project plans and specifications.

**Project No. 4939.GI - Geotechnical Evaluation  
Brandywine School District Transportation Center  
Wilmington, Delaware**



**F. LEED 2009 RECOMMENDATIONS**

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Duffield Associates is a participating member of the U.S. Green Building Council, and has been a leader in innovative and sustainable site design, storm and wastewater management, and conservation since our inception more than 30 years ago. As part of our continued efforts to be environmentally responsible, Duffield Associates provides this list of New Construction & Major Renovations recommendations for the design team to consider. If requested, we can assist in developing these items.

Energy and Atmosphere



Credit 2 – On-site Renewable Energy

- Assist in the evaluation and design of geothermal heating/cooling systems.

Materials and Resources



Credit 3 – Materials Reuse

- Provide recommendations for the use of recycled concrete and bituminous concrete millings rather than disposal off-site.



Credit 5 – Regional Materials

- Identify local borrow pits within 500 miles of the project site to reduce environmental effects and reduce construction costs.

Innovation and Design Process



Credit 2 – LEED Accredited Professional

- Provide LEED Accredited Professionals with project experience and knowledge of the LEED rating system.

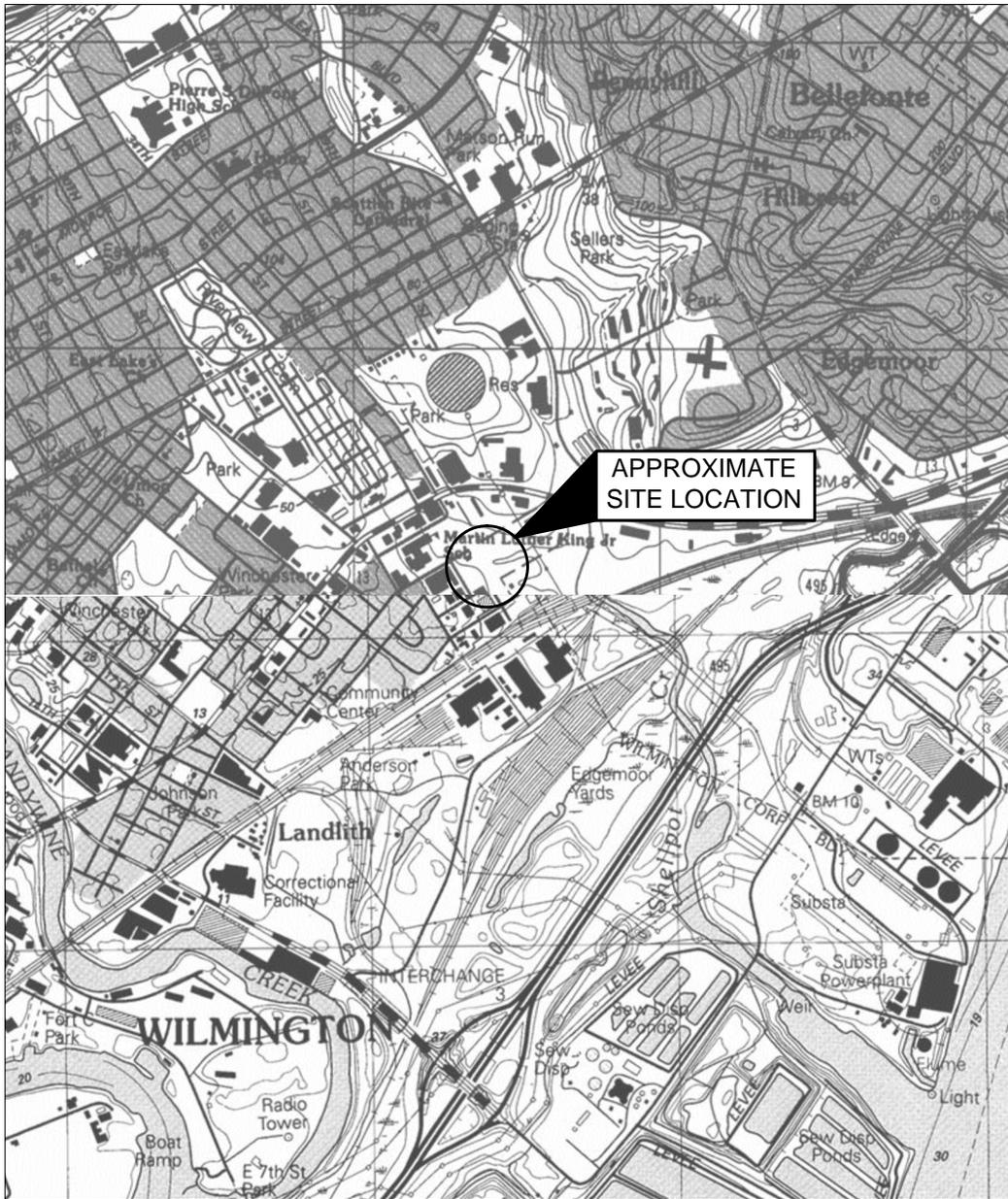
**Project No. 4939.GI - Geotechnical Evaluation  
Brandywine School District Transportation Center  
Wilmington, Delaware**



**G. SKETCHES AND LOGS**

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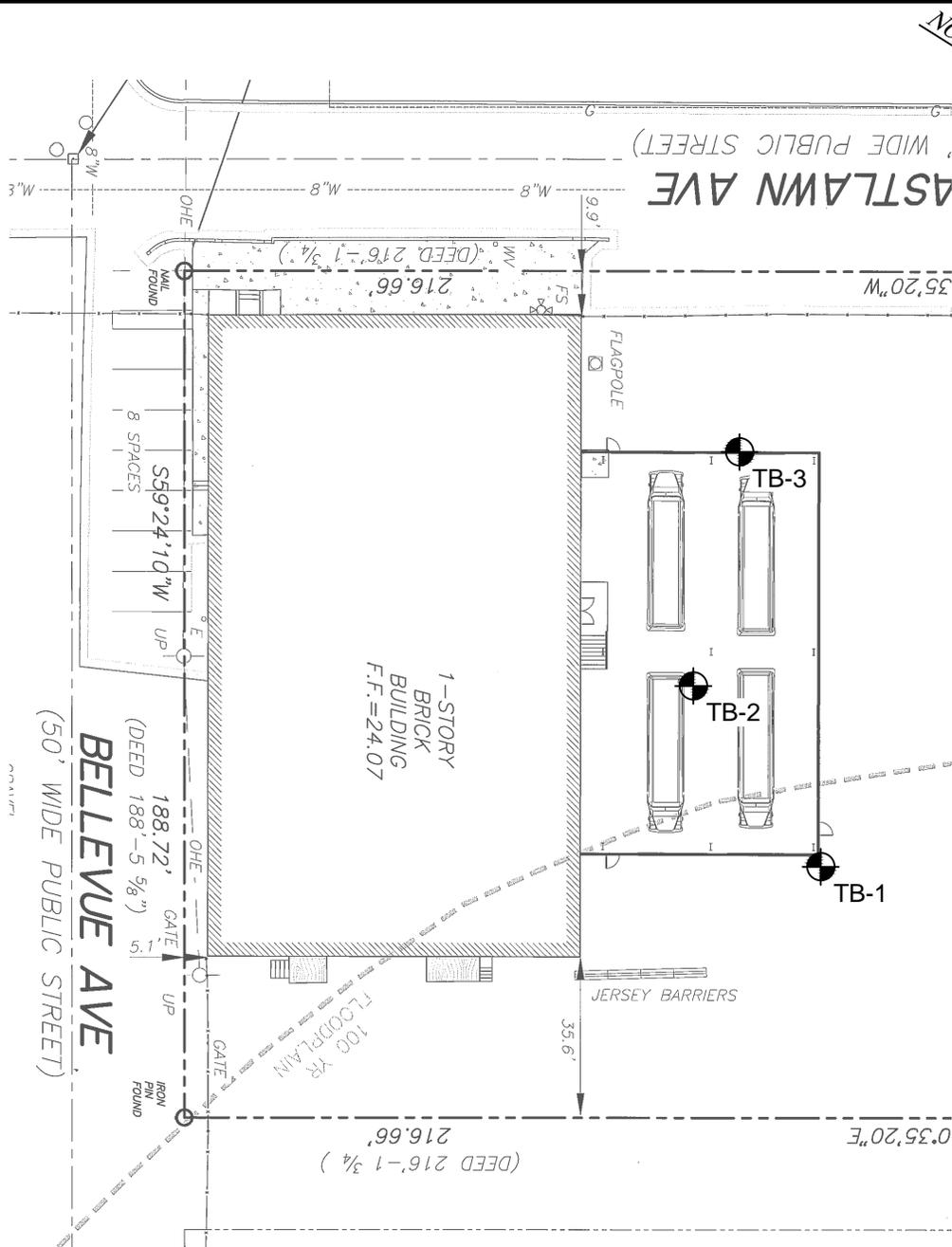
- **SITE LOCATION SKETCH**
- **TEST BORING LOCATION SKETCH**
- **TEST BORING LOGS (3)**
- **GENERAL NOTES**



**NOTE:**

THIS SITE LOCATION SKETCH IS ADAPTED FROM THE U.S.G.S. TOPOGRAPHIC MAP, 7.5 MINUTE SERIES, FOR WILMINGTON, DELAWARE 1993.

<b>DATE:</b> 25 FEBRUARY 2013	<b>SITE LOCATION SKETCH</b>  <b>TRANSPORTATION CENTER ADD.</b> <b>BRANDYWINE SCHOOL DISTRICT</b>  <b>WILMINGTON-NEW CASTLE COUNTY-DELAWARE</b>	<b>DESIGNED BY:</b> JJ	 <small>5400 LIMESTONE ROAD WILMINGTON, DE 19808-1232 TEL. (302)239-6634 FAX (302)239-8485</small> <small>OFFICES IN PHILADELPHIA, PA GEORGETOWN, DE AND STONE HARBOR, NJ</small> <small>E-MAIL: DUFFIELD@DUFFNET.COM</small>
<b>SCALE:</b> 1"=2000'		<b>DRAWN BY:</b> BCD	
<b>PROJECT NO.</b> 4939.GI		<b>CHECKED BY:</b> JJ	
<b>SHEET:</b> FIGURE 1		<b>FILE:</b> A-4939GI-01	



**KEY:**



TB-1 - APPROXIMATE LOCATION OF TEST BORING

**NOTE:**

THIS SKETCH IS ADAPTED FROM A DRAWING TITLED, "SITE CONSTRUCTION PLAN, LOCATION PLAN," PREPARED BY VANDEMARK & LYNCH, INC. AND DATED DECEMBER 20, 2012.

<b>DATE:</b> 25 FEBRUARY 2013
<b>SCALE:</b> 1"=40'
<b>PROJECT NO.</b> 4939.GI
<b>SHEET:</b> FIGURE 2

TEST BORING LOCATION SKETCH

**TRANSPORTATION CENTER ADD.**

**BRANDYWINE SCHOOL DISTRICT**

WILMINGTON-NEW CASTLE COUNTY-DELAWARE

<b>DESIGNED BY:</b> JJ
<b>DRAWN BY:</b> BCD
<b>CHECKED BY:</b> JJ
<b>FILE:</b> A-4939GI-02

**DUFFIELD ASSOCIATES**

5400 LIMESTONE ROAD  
WILMINGTON, DE 19808-1232  
TEL. (302)239-6634  
FAX (302)239-8485

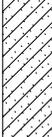
OFFICES IN PHILADELPHIA, PA  
GEORGETOWN, DE AND  
STONE HARBOR, NJ

E-MAIL: DUFFIELD@DUFFNET.COM

Geotechnical Evaluation  
 Transportation Center Addition  
 Brandywine School District  
 Wilmington, Delaware  
 Project No. 4939.GI

Date Started : January 23, 2013  
 Date Completed : January 23, 2013  
 Logged by : D. Wilson  
 Weather : Sunny 20°  
 Driller/Agency : D. Wilson/CGCG

Drilling Equipment : Truck-Mounted Diedrich D-50  
 Drilling Methods : SPT (ASTM D1586, HSA/MR)  
 Surface Elevation : 19 feet

Depth in feet	Surf. Elev. 19 ft	GRAPHIC	USCS	Sample Condition	Water Levels	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
				 Remolded	 During Drilling  At completion							
				DESCRIPTION								
0				Stone Base (approximately 5 inches)								
5				FILL: Black and brown silt, some medium to fine sand, some gravel, trace organics (moist)			S-1	5-6-9	0.4			
15				FILL: Black and brown silt, some medium to fine sand, some gravel, trace organics (moist)			S-2	5-9-3	0.4			
10			ML	Gray and tan clayey SILT, trace medium to fine sand (moist)			S-3	2-2-2	0.3			
10			ML	Gray and tan SILT, trace fine sand (moist)			S-4	3-4-6	1.1			
15			SC	Gray and brownish medium to fine SAND, some clay, little silt, little gravel (moist)			S-5	1-6-3	0.8	19.1	27.5	 
20			SC	Gray medium to coarse SAND, some gravel, little clay (moist to wet)			S-6	5-4-4	0.4			
25			SC	Gray and brownish medium SAND and CLAY, some gravel, little fine sand (moist to wet)			S-7	8-6-4-3	0.5	16.6	37.4	

- NOTES:
- Test boring terminated at ± 25.0 feet below existing ground surface (b.e.g.s.).
  - Wet-on-spoon conditions observed at ± 18.5 feet b.e.g.s.
  - Upon removal of the auger, the borehole was observed to be caved at 16.4 feet, with the water level at 14.7 feet b.e.g.s.
  - Soil descriptions performed in general accordance with ASTM D 2488, the Practice for Description and Identification of Soils (Visual-Manual Procedure).

Geotechnical Evaluation  
 Transportation Center Addition  
 Brandywine School District  
 Wilmington, Delaware  
 Project No. 4939.GI

Date Started : January 23, 2013  
 Date Completed : January 23, 2013  
 Logged by : D. Wilson  
 Weather : Sunny 20°  
 Driller/Agency : D. Wilson/CGCG

Drilling Equipment : Truck-Mounted Diedrich D-50  
 Drilling Methods : SPT (ASTM D1586, HSA/MR)  
 Surface Elevation : 20 feet

Depth in feet	Surf. Elev. 20 ft	GRAPHIC	USCS	Sample Condition	DESCRIPTION	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
				<input type="checkbox"/> Remolded								
0	20				Stone Base (approximately 7 inches)							
					FILL: Black and brown clayey silt, some medium to fine sand, little gravel (moist)	<input checked="" type="checkbox"/>	S-1	4-4-7	0.6			
					FILL: Brown silt, trace fine to medium sand (moist)	<input checked="" type="checkbox"/>	S-2	1-1-1	0.2			
5	15				Gray and brown silty CLAY, little fine sand (moist)	<input checked="" type="checkbox"/>	S-3	1-1-4	0.9	23.1	85.3	
			CL		Gray and tan silty CLAY, little fine sand (moist)	<input checked="" type="checkbox"/>	S-4	5-4-5	1.5			
10	10				Gray and tan CLAY, trace fine sand (moist); Atterberg Limits: LL=35, PI=13	<input checked="" type="checkbox"/>	S-5	2-2-2	1.5	32.3	95.4	
15	5											
20	0											
25	-5											
30	-10											
35	-15											

NOTES:

1. Test boring terminated at ± 15.0 feet below existing ground surface (b.e.g.s.).
2. Groundwater not encountered during performance of the test boring
3. Upon removal of the augers, the borehole was observed to be dry and caved at 8.2 feet.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice

for Description and Identification of Soils (Visual-Manual Procedure).

Geotechnical Evaluation  
 Transportation Center Addition  
 Brandywine School District  
 Wilmington, Delaware  
 Project No. 4939.GI

Date Started : January 23, 2013  
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 Weather : Sunny 20°  
 Driller/Agency : D. Wilson/CGCG

Drilling Equipment : Truck-Mounted Diedrich D-50  
 Drilling Methods : SPT (ASTM D1586, HSA/MR)  
 Surface Elevation : 20 feet

Depth in feet	Surf. Elev. 20 ft	GRAPHIC	USCS	Sample Condition	Water Levels	SAMPLES	Sample Number	Blows per 6 inches	Recovery (ft)	Moisture Content (%)	Percent Passing 200 Sieve	WATER LEVEL
				 Remolded	 During Drilling  At completion							
				DESCRIPTION								
0	20			Stone Base (approximately 7 inches)								
				FILL: Brown silt, little fine micaceous sand, trace organics (moist)			S-1	14-9-11	0.7			
				FILL: Brown sil, little debris (e.g., rubber and brick), little fine micaceous sand (moist); apparent petroleum odor observed			S-2	2-1-2	0.2			
5	15		ML	Brownish gray clayey SILT, trace fine sand, trace organics (moist)			S-3	2-5-6	0.9			
				Brownish tan clayey SILT, trace fine sand (moist)			S-4	6-4-4	1.5			
10	10			Gray clayey SILT, trace gravel, trace fine sand (moist)			S-5	2-2-1	1.5			
15	5											
20	0		SC	Gray and tan medium to fine SAND, some clay, some gravel(moist to wet)			S-6	2-4-3	0.7	18.9	32.1	
				Gray fine to coarse SAND and GRAVEL, little silt, trace clay (wet)			S-7	5-2-1-5	0.6	18.4	14.7	
25	-5		SM	Gray coarse to fine SAND, some gravel, little silt (wet)			S-8	41-21-9	0.5			
30	-10											
35	-15											

NOTES:

1. Test boring terminated at ± 30.0 feet below existing ground surface (b.e.g.s.).
2. Wet-on-spoon conditions observed at ± 18.5 feet b.e.g.s.
3. Upon removal of the auger, the borehole was observed to be caved at 13.2 feet, with the water level at 11.4 feet b.e.g.s.
4. Soil descriptions performed in general accordance with ASTM D 2488, the Practice

for Description and Identification of Soils (Visual-Manual Procedure).

## GENERAL NOTES

DUFFIELD ASSOCIATES uses the following definitions and terminology to classify and correlate the field and laboratory samples.

**VISUAL UNIFIED CLASSIFICATIONS:** The soil samples are described by color, major constituent, modifiers (by percentage), and density (or consistency). Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a No. 200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a No. 200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are noncohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency and their plasticity.

The Unified Soil Classification symbols are:

### COARSE GRAINED SOILS

GW - Well graded gravels  
 GP - Poorly graded gravels  
 GM - Silty gravels  
 GC - Clayey gravels  
 SW - Well graded sands  
 SP - Poorly graded sands  
 SM - Silty sands  
 SC - Clayey sands

### FINE GRAINED SOILS

ML - Silts of low plasticity  
 CL - Clays of low to medium plasticity  
 OL - Organic silt clays of low plasticity  
 MH - Silts of high plasticity  
 CH - Clays of high plasticity  
 OH - Organic silt clays of high plasticity  
 PT - Peat and highly organic soils

### SIZE DESCRIPTION

F - Fine  
 M - Medium  
 C - Coarse  
 G - Gravel

### MODIFIERS (PERCENTAGE)

Tr - Trace      1 - 10%  
 Lt - Little      11 - 20%  
 Some      21 - 35%  
 & - And      36 - 50%

### COLOR

Or - Orange	Blk - Black	Vc - Varicolored
Yel - Yellow	Gr - Gray	Dk - Dark
Br - Brown	R - Red	Lt - Light

### DENSITY: COARSE GRAINED SOILS

Very loose      4 blows/ft or less  
 Loose      5 to 10 blows/ft  
 Medium      11 to 30 blows/ft  
 Dense      31 to 50 blows/ft  
 Very Dense      51 blows/ft or more

### CONSISTENCY: FINE GRAINED SOILS

Very soft      2 blows/ft or less  
 Soft      3 to 4 blows/ft  
 Medium      5 to 8 blows/ft  
 Stiff      9 to 15 blows/ft  
 Very stiff      16 to 30 blows/ft  
 Hard      31 blows/ft or more

**NOTE:** The Standard Penetration Test "N" value is the number of blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon sampler, except where otherwise noted.

**SECTION 004150**  
**BID FORM**

FOR BIDS DUE: \_\_\_\_\_

TO:

BRANDYWINE SCHOOL DISTRICT

FOR: ADDITIONS &  
RENOVATIONS TO THE  
BRANDYWINE SCHOOL  
DISTRICT  
TRANSPORTATION CENTER  
4 MT. LEBANON ROAD

1409 EASTLAWN AVENUE

WILMINGTON, DE. 19803

WILMINGTON, DE. 19802

FOR CONTRACT: GENERAL CONSTRUCTION

NAME OF BIDDER: \_\_\_\_\_

DELAWARE BUSINESS LICENSE NO.: \_\_\_\_\_

TAXPAYER ID NO.: \_\_\_\_\_

(OTHER LICENSE NOS.): \_\_\_\_\_

PHONE NO.: (     ) \_\_\_\_\_ FAX NO.: (     ) \_\_\_\_\_

EMAIL ADDRESS: \_\_\_\_\_

The undersigned, representing that he has read and understands the Bidding Documents, including the complete Project Manual and the Drawings as listed in the Table of Contents, all dated \_\_\_\_\_, 20\_\_\_\_\_, and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

BASE BID:

\_\_\_\_\_  
(expressed in words)

(\$ \_\_\_\_\_)  
(expressed in figures)

**BID FORM**

ALTERNATES

Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

ALTERNATE NO. 1: FOUR-BAY GARAGE ADDITION

Add/Deduct: \_\_\_\_\_  
(expressed in words)  
(\$ \_\_\_\_\_ )  
(expressed in figures)

UNIT PRICES

Unit prices conform to applicable project specification project. The difference between Add or Deduct Unit Prices of the same item may not exceed 15%. Refer to the specifications for a complete description of the following Unit Prices:

UNIT PRICE NO. 1: STRUCTURAL FILL

Price per cubic yard  
Add: \_\_\_\_\_  
Deduct: \_\_\_\_\_

UNIT PRICE NO. 2: DRAINAGE FILL

Price per cubic yard  
Add: \_\_\_\_\_  
Deduct: \_\_\_\_\_

**BID FORM**

SIGNATURE FORM

I / We acknowledge Addendas Numbered \_\_\_\_\_ .

The price(s) submitted include any cost / schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for 60 days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received. This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid. Should I/We be awarded this contract, I/We pledge to achieve Substantial Completion of the work in conformance with the project schedule.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall

be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By: \_\_\_\_\_

Trading as: \_\_\_\_\_

( Individual's / General Partner's / Corporate Name )

\_\_\_\_\_  
(State of Corporation)

Business Address: \_\_\_\_\_

\_\_\_\_\_  
Witness: \_\_\_\_\_ By: \_\_\_\_\_

(Authorized Signature )

( SEAL) \_\_\_\_\_

(Title)

\_\_\_\_\_  
(Date)

I/We have: Completed the Sub-Contractor List.

Completed the Non-Collusion Statement.

Attached the Bid Security.

**BID FORM**

**SUBCONTRACTOR LIST**

In accordance with Title 29, Chapter 6962 (d)(10)G Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

**SUBCONTRACTOR**

**CATEGORYSUBCONTRACTORADDRESS (CITY & STATE)**

Sitework \_\_\_\_\_

Demolition \_\_\_\_\_

Concrete \_\_\_\_\_

Gypsum Board/Steel Studs \_\_\_\_\_

Carpentry \_\_\_\_\_

Pre-Engineered Metal Building \_\_\_\_\_

Metal Panels \_\_\_\_\_

Plumbing \_\_\_\_\_

Fire Protection \_\_\_\_\_

Mechanical \_\_\_\_\_

Electrical \_\_\_\_\_

**BID FORM**

**NON-COLLUSION STATEMENT**

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date.

All the terms and conditions of this Contract have been thoroughly examined and are understood.

NAME OF BIDDER: \_\_\_\_\_

AUTHORIZED REPRESENTATIVE

(TYPED): \_\_\_\_\_

AUTHORIZED REPRESENTATIVE

(SIGNATURE): \_\_\_\_\_

TITLE: \_\_\_\_\_

ADDRESS OF BIDDER: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

PHONE NUMBER: \_\_\_\_\_

Sworn to and Subscribed before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_

My Commission expires : \_\_\_\_\_ NOTARY PUBLIC \_\_\_\_\_

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE  
CONSIDERED.

END OF DOCUMENT



**SECTION 005000**  
**CONTRACTING FORMS AND SUPPLEMENTS**

**PART 1 GENERAL**

1.01 LICENSES

- A. Contractor is responsible for obtaining a valid license to use all copyrighted documents specified but not included in the Project Manual.

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

- A. See Section 007250 for the State of Delaware General Requirements.
- B. See Section 007350 for the Supplementary Conditions.
- C. The Agreement form is AIA A101.
- D. The General Conditions are AIA A201.

1.03 FORMS

- A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.
- B. Bond Forms:
  - 1. Performance and Payment Bond Form: Conform to those approved by the State of Delaware Office of Management and Budget (attached to this Section).
- C. Post-Award Certificates and Other Forms:
  - 1. Schedule of Values Form: AIA G703.
  - 2. Application for Payment Form: AIA G702 and G703.
- D. Clarification and Modification Forms:
  - 1. Change Order Form: AIA G701.
- E. Closeout Forms:
  - 1. Certificate of Substantial Completion Form: AIA G704.
  - 2. Affidavit of Payment of Debts and Claims Form: AIA G706.
  - 3. Affidavit of Release of Liens Form: AIA G706a.
  - 4. Consent of Surety to Final Payment Form: AIA G707.

1.04 REFERENCE STANDARDS

- A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum; 2007.
- B. AIA A201 - General Conditions of the Contract for Construction; 2007.
- C. AIA G701 - Change Order; 2001.
- D. AIA G702 - Application and Certificate for Payment; 1992.
- E. AIA G703 - Continuation Sheet; 1992.
- F. AIA G704 - Certificate of Substantial Completion; 2000.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**



**SECTION 007200**  
**GENERAL CONDITIONS**

**GENERAL**

1.01 FORM OF GENERAL CONDITIONS

- A. The General Conditions applicable to this contract shall be AIA A201 - General Conditions of the Contract for Construction; 2007.

1.02 RELATED REQUIREMENTS

- A. Document 009000 - State of Delaware General Conditions
- B. Section 007300 - Supplementary Conditions.

1.03 SUPPLEMENTARY CONDITIONS

- A. Refer to Document 007310 for amendments to these General Conditions.

**END OF DOCUMENT**



**SECTION 007310**  
**SUPPLEMENTARY GENERAL CONDITIONS A201-2007**

THE FOLLOWING SUPPLEMENTS MODIFY THE AIA DOCUMENT A201-2007, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION. WHERE A PORTION OF THE GENERAL CONDITIONS IS MODIFIED OR DELETED BY THE SUPPLEMENTARY CONDITIONS, THE UNALTERED PORTIONS OF THE GENERAL CONDITIONS SHALL REMAIN IN EFFECT.

**ARTICLE 1: GENERAL PROVISIONS**

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Delete the last sentence in its entirety and replace with the following:

"The Contract Documents also include Advertisement for Bid, Instructions to Bidder, sample forms, the Bid Form, the Contractor's completed Bid and the Award Letter."

Add the following Paragraph:

1.1.2 In the event of conflict or discrepancies among the Contract Documents, the Documents prepared by the State of Delaware, Division of Facilities Management shall take precedence over all other documents.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Paragraphs:

1.2.4 In the case of an inconsistency between the Drawings and the Specifications, or within either document not clarified by addendum, the better quality or greater quantity of work shall be provided in accordance with the Architect's interpretation.

1.2.5 The word "PROVIDE" as used in the Contract Documents shall mean "FURNISH AND INSTALL" and shall include, without limitation, all labor, materials, equipment, transportation, services and other items required to complete the Work.

1.2.6 The word "PRODUCT" as used in the Contract Documents means all materials, systems and equipment.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

Delete Paragraph 1.5.1 in its entirety and replace with the following:

"All pre-design studies, drawings, specifications and other documents, including those in electronic form, prepared by the Architect under this Agreement are, and shall remain, the property of the Owner whether the Project for which they are made is executed or not. Such documents may be used by the Owner to construct one or more like Projects without the approval of, or additional compensation to, the Architect. The Contractor, Subcontractors, Sub-subcontractors and Material or Equipment Suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in the execution of their Work

under the Contract Documents. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or Material and Equipment Supplier on other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and Architect's consultants. The Architect shall not be liable for injury or damage resulting from the re-use of drawings and specifications if the Architect is not involved in the re-use Project. Prior to re-use of construction documents for a Project in which the Architect is not also involved, the Owner will remove from such documents all identification of the original Architect, including name, address and professional seal or stamp."

Delete Paragraph 1.5.2 in its entirety.

## **ARTICLE 2: OWNER**

### **2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER**

To Subparagraph 2.2.3 - Add the following sentence:

"The Contractor, at their expense shall bear the costs to accurately identify the location of all underground utilities in the area of their excavation and shall bear all cost for any repairs required, out of failure to accurately identify said utilities."

Delete Subparagraph 2.2.5 in its entirety and substitute the following:

2.2.5 The Contractor shall be furnished free of charge up to five (5) sets of the Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling.

## **ARTICLE 3: CONTRACTOR**

### **3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR**

Amend Paragraph 3.2.2 to state that any errors, inconsistencies or omissions discovered shall be reported to the Architect and Owner immediately.

Delete the third sentence in Paragraph 3.2.4.

### **3.3 SUPERVISION AND CONSTRUCTION PROCEDURES**

Add the following Paragraphs:

3.3.2.1 The Contractor shall immediately remove from the Work, whenever requested to do so by the Owner, any person who is considered by the Owner or Architect to be incompetent or disposed to be so disorderly, or who for any reason is not satisfactory to the Owner, and that person shall not again be employed on the Work without the consent of the Owner or the Architect.

3.3.4 The Contractor must provide suitable storage facilities at the Site for the proper protection and safe storage of their materials. Consult the Owner and the Architect before storing any materials.

3.3.5 When any room is used as a shop, storeroom, office, etc., by the Contractor or Subcontractor(s) during the construction of the Work, the Contractor making use of these areas will be held responsible for any repairs, patching or cleaning arising from such use.

### **3.4 LABOR AND MATERIALS**

Add the Following Paragraphs:

3.4.4 Before starting the Work, each Contractor shall carefully examine all preparatory Work that has been executed to receive their Work. Check carefully, by whatever means are required, to insure that its Work and adjacent, related Work, will finish to proper contours, planes and levels. Promptly notify the General Contractor/Construction Manager of any defects or imperfections in preparatory Work which will in any way affect satisfactory completion of its Work. Absence of such notification will be construed as an acceptance of preparatory Work and later claims of defects will not be recognized.

3.4.5 Under no circumstances shall the Contractor's Work proceed prior to preparatory Work proceed prior to preparatory Work having been completely cured, dried and/or otherwise made satisfactory to receive this Work. Responsibility for timely installation of all materials rests solely with the Contractor responsible for that Work, who shall maintain coordination at all times.

### 3.5 WARRANTY

Add the following Paragraphs:

3.5.1 The Contractor will guarantee all materials and workmanship against original defects, except injury from proper and usual wear when used for the purpose intended, for two years after Acceptance by the Owner, and will maintain all items in perfect condition during the period of guarantee.

3.5.2 Defects appearing during the period of guarantee will be made good by the Contractor at his expense upon demand of the Owner, it being required that all work will be in perfect condition when the period of guarantee will have elapsed.

3.5.3 In addition to the General Guarantee there are other guarantees required for certain items for different periods of time than the two years as above, and are particularly so stated in that part of the specifications referring to same. The said guarantees will commence at the same time as the General Guarantee.

3.5.4 If the Contractor fails to remedy any failure, defect or damage within a reasonable time after receipt of notice, the Owner will have the right to replace, repair, or otherwise remedy the failure, defect or damage at the Contractor's expense.

### 3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following Paragraphs:

3.11.1 During the course of the Work, the Contractor shall maintain a record set of drawings on which the Contractor shall mark the actual physical location of all piping, valves, equipment, conduit, outlets, access panels, controls, actuators, including all appurtenances that will be concealed once construction is complete, etc., including all invert elevations.

3.11.2 At the completion of the project, the Contractor shall obtain a set of reproducible drawings from the Architect, and neatly transfer all information outlined in 3.11.1 to provide a complete record of the as-built conditions.

3.11.3 The Contractor shall provide two (2) prints of the as-built conditions, along with the reproducible drawings themselves, to the Owner and one (1) set to the Architect. In addition, attach one complete set to each of the Operating and Maintenance Instructions/Manuals.

3.17 In the second sentence of the paragraph, insert "indemnify and" between "shall" and "hold".

**ARTICLE 4: ADMINISTRATION OF THE CONTRACT**

**4.2 ADMINISTRATION OF THE CONTRACT**

Delete the first sentence of Paragraph 4.2.7 and replace with the following:

The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples for the purpose of checking for conformance with the Contract Documents.

Delete the second sentence of Paragraph 4.2.7 and replace with the following:

The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work in the activities of the Owner, Contractor or separate Contractors, while allowing sufficient time in the Owner's professional judgment to permit adequate review.

Add the following Subparagraph:

4.2.10.1 There will be no full-time project representative provided by the Owner or Architect on this project.

Add the following to the end of Paragraph 4.2.13:

“and in compliance with all local requirements.”

**ARTICLE 5: SUBCONTRACTORS**

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

Delete Paragraph 5.2.3 in its entirety and replace with the following:

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection, subject to the statutory requirements of 29 Delaware Code § 6962(d)(10)b.3 and 4.

**ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

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

Delete Paragraph 6.1.4 in its entirety.

**6.2 MUTUAL RESPONSIBILITY**

6.2.3 In the second sentence, strike the word “shall” and insert the word “may”.

**ARTICLE 7: CHANGES IN THE WORK**

(SEE ARTICLE 7: CHANGES IN WORK IN THE GENERAL REQUIREMENTS)

**ARTICLE 8: TIME**

**8.2 PROGRESS AND COMPLETION**

Add the following Paragraphs:

8.2.1.1 Refer to Specification Section SUMMARY OF WORK for Contract time requirements.

8.2.4 If the Work falls behind the Progress Schedule as submitted by the Contractor, the Contractor shall employ additional labor and/or equipment necessary to bring the Work into compliance with the Progress Schedule at no additional cost to the Owner.

### 8.3 DELAYS AND EXTENSION OF TIME

8.3.1 Strike "arbitration" and insert "remedies at law or in equity".

Add the following Paragraph:

8.3.2.1 The Contractor shall update the status of the suspension, delay, or interruption of the Work with each Application for Payment. (The Contractor shall report the termination of such cause immediately upon the termination thereof.) Failure to comply with this procedure shall constitute a waiver for any claim for adjustment of time or price based upon said cause.

Delete Paragraph 8.3.3 in its entirety and replace with the following:

8.3.3 Except in the case of a suspension of the Work directed by the Owner, an extension of time under the provisions of Paragraph 8.3.1 shall be the Contractor's sole remedy in the progress of the Work and there shall be no payment or compensation to the Contractor for any expense or damage resulting from the delay.

Add the following Paragraph:

8.3.4 By permitting the Contractor to work after the expired time for completion of the project, the Owner does not waive their rights under the Contract.

## **ARTICLE 9: PAYMENTS AND COMPLETION**

### 9.2 SCHEDULE OF VALUES

Add the following Paragraphs:

9.2.1 The Schedule of Values shall be submitted using AIA Document G702, Continuation Sheet to G703.

9.2.2 The Schedule of Values is to include a line item for Project Closeout Document Submittal. The value of this item is to be no less than 1% of the initial contract amount.

### 9.3 APPLICATIONS FOR PAYMENT

Add the following Paragraph:

9.3.1.3 Application for Payment shall be submitted on AIA Document G702 "Application and Certificate for Payment", supported by AIA Document G703 "Continuation Sheet". Said Applications shall be fully executed and notarized.

Add the following Paragraphs:

9.3.4 Until Closeout Documents have been received and outstanding items completed the Owner will pay 95% (ninety-five percent) of the amount due the Contractor on account of progress payments.

9.3.5 The Contractor shall provide a current and updated Progress Schedule to the Architect with each Application for Payment. Failure to provide Schedule will be just cause for rejection of Application for Payment.

### 9.5 DECISIONS TO WITHHOLD CERTIFICATION

Add the following to 9.5.1:

.8 failure to provide a current Progress Schedule;

.9a lien or attachment is filed;

.10 failure to comply with mandatory requirements for maintaining Record Documents.

#### 9.6 PROGRESS PAYMENTS

Delete Paragraph 9.6.1 in its entirety and replace with the following:

9.6.1 After the Architect has approved and issued a Certificate for Payment, payment shall be made by the Owner within 30 days after Owner's receipt of the Certificate for Payment.

#### 9.7 FAILURE OF PAYMENT

F. In first sentence, strike "seven" and insert "thirty (30)".

Also strike "binding dispute resolution" and insert "remedies at law or in equity".

#### 9.8 SUBSTANTIAL COMPLETION

To Subparagraph 9.8.3- Add the following sentence:

"If the Architect is required to make more than 2 inspections of the same portion of work, the Contractor shall be responsible for all costs associated with subsequent inspections, including but not limited to any Architect's fees."

9.8.5 In the second sentence, strike "shall" and insert "may".

### **ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY**

#### 10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following Paragraphs:

10.1.1 Each Contractor shall develop a safety program in accordance with the Occupational Safety and Health Act of 1970. A copy of said plan shall be furnished to the Owner and Architect prior to the commencement of that Contractor's Work.

10.1.2 Each Contractor shall appoint a Safety Representative. Safety Representatives shall be someone who is on site on a full time basis. If deemed necessary by the Owner or Architect, Contractor Safety meetings will be scheduled. The attendance of all Safety Representatives will be required. Minutes will be recorded of said meetings by the Contractor and will be distributed to all parties as well as posted in all job offices/trailers etc.

#### 10.2 SAFETY OF PERSONS AND PROPERTY

Add the following Paragraph:

10.2.4.1 As required in the Hazardous Chemical Act of June 1984, all vendors supplying any material that may be defined as hazardous must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a caution warning on the label relating to a potential physical or health hazard, if it is known to be present in the work place, and if employees may be exposed under normal conditions or in foreseeable emergency situations. Material Safety Data Sheets shall be provided directly to the Owner, along with the shipping slips that include those products.

#### 10.3 HAZARDOUS MATERIALS

Delete Paragraph 10.3.3 in its entirety.

Delete Paragraphs 10.3.6 in its entirety.

### **ARTICLE 11: INSURANCE AND BONDS**

#### 11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.4 Strike "the Owner" immediately following "(1)"

and strike "and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations."

11.2 OWNER'S LIABILITY INSURANCE

Delete Paragraph 11.2 in its entirety.

11.3 PROPERTY INSURANCE

Delete Paragraph 11.3 in its entirety and replace with the following:

11.3 The State will not provide Builder's All Risk Insurance for the Project. The Contractor and all Subcontractors shall provide property coverage for their tools and equipment, as necessary. Any mandatory deductible required by the Contractor's Insurance shall be the responsibility of the Contractor.

11.4 PERFORMANCE BOND AND PAYMENT BOND

Add the following sentence: "The bonds will conform to those forms approved by the Office of Management and Budget."

**ARTICLE 12: UNCOVERING AND CORRECTION OF WORK**

12.2.2 AFTER SUBSTANTIAL COMPLETION

Add the following Paragraph:

12.2.2.1.1 At any time during the progress of the Work, or in any case where the nature of the defects will be such that it is not expedient to have corrected, the Owner, at its option, will have the right to deduct such sum, or sums, of money from the amount of the Contract as it considers justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

12.2.2.1 Strike "one" and insert "two".

12.2.2.2 Strike "one" and insert "two".

12.2.2.3 Strike "one" and insert "two".

12.2.5 In second sentence, strike "one" and insert "two".

**ARTICLE 13: MISCELLANEOUS PROVISIONS**

13.1 GOVERNING LAW

Strike "except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4".

13.6 INTEREST

Strike "the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located." Insert "30 days of presentment of the authorized Certificate of Payment at the annual rate of 12% or 1% per month.

13.7 TIME LIMITS ON CLAIMS

Strike the last sentence.

ADD THE FOLLOWING PARAGRAPH:

13.8 CONFLICTS WITH FEDERAL STATUTES OR REGULATIONS

13.8.1 If any provision, specifications or requirement of the Contract Documents conflict or is inconsistent with any statute, law or regulation of the government of the United State of America, the Contractor shall notify the Architect and Owner immediately upon discovery.

**ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT**

14.1 TERMINATION BY THE OWNER FOR CONVENIENCE

Delete Paragraph 14.4.3 in its entirety and replace with the following:

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and cost incurred by reason of such termination along with reasonable overhead.

**ARTICLE 15: CLAIMS AND DISPUTES**

15.1.2 THROUGHOUT THE PARAGRAPH STRIKE "21" AND INSERT "45."

15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete Paragraph 15.1.6 in its entirety.

15.2 INITIAL DECISION

Delete Paragraph 15.2.5 in its entirety and replace with the following:

15.2.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefore and shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be subject to mediation and other remedies at law or in equity.

Delete Paragraph 15.2.6 and its subparagraphs in their entirety.

15.3 MEDIATION

15.3.1 Strike "binding dispute resolution" and insert "any or all remedies at law or in equity."

15.3.2 In the first sentence, delete "administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedure in effect on the date of the Agreement," Strike "binding dispute resolution" and insert "remedies at law and in equity".

15.4 ARBITRATION

Delete Paragraph 15.4 and its sub-sections in its entirety.

**END OF SUPPLEMENTARY GENERAL CONDITIONS**

**SECTION 009000**

**STATE OF DELAWARE GENERAL REQUIREMENTS**

**ARTICLE 1: GENERAL**

**1.01 CONTRACT DOCUMENTS**

- A. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required to an extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.
- B. Work including material purchases shall not begin until the Contractor is in receipt of a bonafide State of Delaware Purchase Order. Any work performed or material purchases prior to the issuance of the Purchase Order is done at the Contractor's own risk and cost.

**1.02 EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS**

- A. For Public Works Projects financed in whole or in part by state appropriation the Contractor agrees that during the performance of this contract:
  - 1. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex or national origin. The Contractor will take positive steps to ensure that applicants are employed and that employees are treated during employment without regard to their race, creed, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.
  - 2. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, sex or national origin.”

**ARTICLE 2: OWNER**

(NO ADDITIONAL GENERAL REQUIREMENTS - SEE SUPPLEMENTARY GENERAL CONDITIONS)

**ARTICLE 3: CONTRACTOR**

**3.01 SCHEDULE OF VALUES**

- A. The successful Bidder shall within twenty (20) days after receiving notice to proceed with the work, furnish to the Owner a complete schedule of values on the various items comprising the work.

**3.02 SUBCONTRACTS**

- A. Upon approval of Subcontractors, the Contractor shall award their Subcontracts as soon as possible after the signing of their own contract and see that all material, their own and those of their Subcontractors, are promptly ordered so that the work will not be delayed by failure of materials to arrive on time.

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- B. Before commencing any work or construction, the General Contractor is to consult with the Owner as to matters in connection with access to the site and the allocation of Ground Areas for the various features of hauling, storage, etc.
- C. The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions.
- D. The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.
- E. The Contractor warrants to the Owner that materials and equipment furnished will be new and of good quality, unless otherwise permitted, and that the work will be free from defects and in conformance with the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved, may be considered defective. If required by the Owner, the Contractor shall furnish evidence as to the kind and quality of materials and equipment provided.
- F. Unless otherwise provided, the Contractor shall pay all sales, consumer, use and other similar taxes, and shall secure and pay for required permits, fees, licenses, and inspections necessary for proper execution of the Work.
- G. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on performance of the Work. The Contractor shall promptly notify the Owner if the Drawings and Specifications are observed to be at variance therewith.
- H. The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under contract with the Contractor.
- I. The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project all waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. The Contractor shall be responsible for returning all damaged areas to their original conditions.

### 3.03 STATE LICENSE AND TAX REQUIREMENTS

- A. Each Contractor and Subcontractor shall be licensed to do business in the State of Delaware and shall pay all fees and taxes due under State laws. In conformance with Section 2503, Chapter 25, Title 30, Delaware Code, "the Contractor shall furnish the State Tax Department within ten (10) days after award of the Contract, a statement of the total values of each contract and Subcontract, together with the names and addresses of the contracting parties .... "
- A. The Contractor shall comply with all requirements set forth in Section 6962, Chapter 69, Title 29 of the Delaware Code.

## **ARTICLE 4: ADMINISTRATION OF THE CONTRACT**

### **4.01 CONTRACT SURETY**

#### **A. Performance Bond And Labor And Material Payment Bond**

1. All bonds will be required as follows unless specifically waived elsewhere in the Bidding Documents.
2. Contents of Performance Bonds - The bond shall be conditioned upon the faithful compliance and performance by the successful bidder of each and every term and condition of the contract and the proposal, plans, specifications, and bid documents thereof. Each term and condition shall be met at the time and in the manner prescribed by the Contract, Bid documents and the specifications, including the payment in full to every person furnishing materiel or performing labor in the performance of the Contract, of all sums of money due the person for such labor and materiel. (The bond shall also contain the successful bidder's guarantee to indemnify and save harmless the State and the agency from all costs, damages and expenses growing out of or by reason of the Contract in accordance with the Contract.)
3. Invoking a Performance Bond - The agency may, when it considers that the interest of the State so require, cause judgement to be confessed upon the bond.
4. Within twenty (20) days after the date of notice of award of contract, the Bidder to whom the award is made shall furnish a Performance Bond and Labor and Material Payment Bond, each equal to the full amount of the Contract price to guarantee the faithful performance of all terms, covenants and conditions of the same. The bonds are to be issued by an acceptable Bonding Company licensed to do business in the State of Delaware and shall be issued in duplicate.
5. Performance and Payment Bonds shall be maintained in full force (warranty bond) for a period of two (2) years after the date of the Certificate for Final Payment. The Performance Bond shall guarantee the satisfactory completion of the Project and that the Contractor will make good any faults or defects in his work which may develop during the period of said guarantees as a result of improper or defective workmanship, material or apparatus, whether furnished by themselves or their Sub-Contractors. The Payment Bond shall guarantee that the Contractor shall pay in full all persons, firms or corporations who furnish labor or material or both labor and material for, or on account of, the work included herein. The bonds shall be paid for by this Contractor. The Owner shall have the right to demand that the proof parties signing the bonds are duly authorized to do so.

### **4.02 FAILURE TO COMPLY WITH CONTRACT**

- A. If any firm entering into a contract with the State, or Agency that neglects or refuses to perform or fails to comply with the terms thereof, the Agency which signed the Contract may terminate the Contract and proceed to award a new contract in accordance with this Chapter 69, Title 29 of the Delaware Code or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the Performance Bond. Nothing herein shall preclude the Agency from pursuing additional remedies as otherwise provided by law.

### **4.03 CONTRACT INSURANCE AND CONTRACT LIABILITY**

- A. In addition to the bond requirements stated in the Bid Documents, each successful Bidder shall purchase adequate insurance for the performance of the Contract and, by submission

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of a Bid, agrees to indemnify and save harmless and to defend all legal or equitable actions brought against the State, any Agency, officer and/or employee of the State, for and from all claims of liability which is or may be the result of the successful Bidder's actions during the performance of the Contract.

B. The purchase or nonpurchase of such insurance or the involvement of the successful Bidder in any legal or equitable defense of any action brought against the successful Bidder based upon work performed pursuant to the Contract will not waive any defense which the State, its agencies and their respective officers, employees and agents might otherwise have against such claims, specifically including the defense of sovereign immunity, where applicable, and by the terms of this section, the State and all agencies, officers and employees thereof shall not be financially responsible for the consequences of work performed, pursuant to said contract.

#### 4.04 RIGHT TO AUDIT RECORDS

A. The Owner shall have the right to audit the books and records of a Contractor or any Subcontractor under any Contract or Subcontract to the extent that the books and records relate to the performance of the Contract or Subcontract.

B. Said books and records shall be maintained by the Contractor for a period of seven (7) years from the date of final payment under the Prime Contract and by the Subcontractor for a period of seven (7) years from the date of final payment under the Subcontract.

### **ARTICLE 5: SUBCONTRACTORS**

#### 5.01 SUBCONTRACTING REQUIREMENTS

- A. All contracts for the construction, reconstruction, alteration or repair of any public building (not a road, street or highway) shall be subject to the following provisions:
1. A contract shall be awarded only to a Bidder whose Bid is accompanied by a statement containing, for each Subcontractor category, the name and address (city or town and State only - street number and P.O. Box addresses not required) of the subcontractor whose services the Bidder intends to use in performing the Work and providing the material for such Subcontractor category.
  2. A Bid will not be accepted nor will an award of any Contract be made to any Bidder which, as the Prime Contractor, has listed itself as the Subcontractor for any Subcontractor unless:
    - a. It has been established to the satisfaction of the awarding Agency that the Bidder has customarily performed the specialty work of such Subcontractor category by artisans regularly employed by the Bidder's firm;
    - b. That the Bidder is duly licensed by the State to engage in such specialty work, if the State requires licenses; and
    - c. That the Bidder is recognized in the industry as a bona fide Subcontractor or Contractor in such specialty work and Subcontractor category.
- B. The decision of the awarding Agency as to whether a Bidder who list itself as the Subcontractor for a Subcontractor category shall be final and binding upon all Bidders, and no action of any nature shall lie against any awarding agency or its employees or officers because of its decision in this regard.

- C. After such a Contract has been awarded, the successful Bidder shall not substitute another Subcontractor for any Subcontractor whose name was set forth in the statement which accompanied the Bid without the written consent of the awarding Agency.
- D. No Agency shall consent to any substitution of Subcontractors unless the Agency is satisfied that the Subcontractor whose name is on the Bidders accompanying statement:
  - 1. Is unqualified to perform the work required;
  - 2. Has failed to execute a timely reasonable Subcontract;
  - 3. Has defaulted in the performance on the portion of the work covered by the Subcontract; or
  - 4. Is no longer engaged in such business.

#### 5.02 PENALTY FOR SUBSTITUTION OF SUBCONTRACTORS

- A. Should the Contractor fail to utilize any or all of the Subcontractors in the Contractor's Bid statement in the performance of the Work on the public bidding, the Contractor shall be penalized in the amount of one (1) percent of Contract amount not to exceed \$10,000. The Agency may determine to deduct payments of the penalty from the Contractor or have the amount paid directly to the Agency. Any penalty amount assessed against the Contractor may be remitted or refunded, in whole or in part, by the Agency awarding the Contract, only if it is established to the satisfaction of the Agency that the Subcontractor in question has defaulted or is no longer engaged in such business. No claim for the remission or refund of any penalty shall be granted unless an application is filed within one year after the liability of the successful Bidder accrues. All penalty amounts assessed and not refunded or remitted to the contractor shall be reverted to the State.

#### 5.03 ASBESTOS ABATEMENT

- A. The selection of any Contractor to perform asbestos abatement for State-funded projects shall be approved by the Office of Management and Budget/Division of Facilities Management pursuant to Chapter 78 of Title 16.

#### 5.04 STANDARDS OF CONSTRUCTION FOR THE PROTECTION OF THE PHYSICALLY HANDICAPPED

- A. All Contracts shall conform with the standard established by the Delaware Architectural Accessibility Board unless otherwise exempted by the Board.

#### 5.05 CONTRACT PERFORMANCE

- A. Any firm entering into a Public Works Contract that neglects or refuses to perform or fails to comply with its terms, the Agency may terminate the Contract and proceed to award a new Contract or may require the Surety on the Performance Bond to complete the Contract in accordance with the terms of the performance Bond.

### **ARTICLE 6: CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS**

#### 6.01 CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS

- A. The Owner reserves the right to simultaneously perform other construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other Projects at the same site.
- B. The Contractor shall afford the Owner and other Contractors reasonable opportunity for access and storage of materials and equipment, and for the performance of their activities,

and shall connect and coordinate their activities with other forces as required by the Contract Documents.

## **ARTICLE 7: CHANGES IN THE WORK**

### **7.01 CHANGES IN THE WORK**

- A. The Owner, without invalidating the Contract, may order changes in the Work consisting of Additions, Deletions, Modifications or Substitutions, with the Contract Sum and Contract completion date being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Professional, as the duly authorized agent, the Contractor and the Owner.
- B. The Contract Sum and Contract Completion Date shall be adjusted only by a fully executed Change Order.
- C. The additional cost, or credit to the Owner resulting from a change in the Work shall be by mutual agreement of the Owner, Contractor and the Architect. In all cases, this cost or credit shall be based on the 'DPE' wages required and the "invoice price" of the materials/equipment needed.
  - 1. "DPE" shall be defined to mean "direct personnel expense". Direct payroll expense includes direct salary plus customary fringe benefits (prevailing wage rates) and documented statutory costs such as workman's compensation insurance, Social Security/Medicare, and unemployment insurance (a maximum multiplier of 1.35 times DPE).
  - 2. "Invoice price" of materials/equipment shall be defined to mean the actual cost of materials and/or equipment that is paid by the Contractor, (or subcontractor), to a material distributor, direct factory vendor, store, material provider, or equipment leasing entity. Rates for equipment that is leased and/or owned by the Contractor or subcontractor(s) shall not exceed those listed in the latest version of the "Means Building Construction Cost Data" publication.
  - 3. In addition to the above, the General Contractor is allowed a fifteen percent (15%) markup for overhead and profit for additional work performed by the General Contractor's own forces. For additional subcontractor work, the Subcontractor is allowed a fifteen percent overhead and profit on change order work above and beyond the direct costs stated previously. To this amount, the General Contractor will be allowed a mark-up not exceeding seven point five percent (7.5%) on the subcontractors work. These mark-ups shall include all costs including, but not limited to: overhead, profit, bonds, insurance, supervision, etc. No markup is permitted on the work of a Sub-subcontractor. No additional costs shall be allowed for changes related to the Contractor's onsite superintendent/staff, or project manager, unless a change in the work changes the project duration and is identified by the CPM schedule. There will be no other costs associated with the change order.

## **ARTICLE 8: TIME**

### **8.01 TIME**

- A. Time limits, if any, are as stated in the Project Manual. By executing the Agreement, the Contractor confirms that the stipulated limits are reasonable, and that the Work will be completed within the anticipated time frame.

- B. If progress of the Work is delayed at any time by changes ordered by the Owner, by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions, unavoidable casualties or other causes beyond the Contractor's control, the Contract Time shall be extended for such reasonable time as the Owner may determine.
- C. Any extension of time beyond the date fixed for completion of the construction and acceptance of any part of the Work called for by the Contract, or the occupancy of the building by the Owner, in whole or in part, previous to the completion shall not be deemed a waiver by the Owner of his right to annul or terminate the Contract for abandonment or delay in the matter provided for, nor relieve the Contractor of full responsibility.

#### 8.02 SUSPENSION AND DEBARMENT

- A. Per Section 6962(d)(14), Title 29, Delaware Code, "Any Contractor who fails to perform a public works contract or complete a public works project within the time schedule established by the Agency in the Invitation To Bid, may be subject to Suspension or Debarment for one or more of the following reasons: 1) failure to supply the adequate labor supply ratio for the project; 2) inadequate financial resources; or, 3) poor performance on the Project."
- B. "Upon such failure for any of the above stated reasons, the Agency that contracted for the public works project may petition the Director of the Office of Management and Budget for Suspension or Debarment of the Contractor. The Agency shall send a copy of the petition to the Contractor within three (3) working days of filing with the Director. If the Director concludes that the petition has merit, the Director shall schedule and hold a hearing to determine whether to suspend the Contractor, debar the Contractor or deny the petition. The Agency shall have the burden of proving, by a preponderance of the evidence, that the Contractor failed to perform or complete the public works project within the time schedule established by the Agency and failed to do so for one or more of the following reasons: 1) failure to supply the adequate labor supply ratio for the project; 2) inadequate financial resources; or, 3) poor performance on the project. Upon a finding in favor of the Agency, the Director may suspend a Contractor from Bidding on any project funded, in whole or in part, with public funds for up to 1 year for a first offense, up to 3 years for a second offense and permanently debar the Contractor for a third offense. The Director shall issue a written decision and shall send a copy to the Contractor and the Agency. Such decision may be appealed to the Superior Court within thirty (30) days for a review on the record."

#### 8.03 RETAINAGE

- A. Per Section 6962(d)(5) a., Title 29, Delaware Code: The Agency may at the beginning of each public works project establish a time schedule for the completion of the project. If the project is delayed beyond the completion date due to the Contractor's failure to meet their responsibilities, the Agency may hold permanently, at its discretion, all or part of the Contractor's retainage.
- B. This forfeiture of retainage also applies to the timely completion of the punchlist. A punchlist will only be prepared upon the mutual agreement of the Owner, Architect and Contractor. Once the punchlist is prepared, all three parties will by mutual agreement, establish a schedule for its completion. Should completion of the punchlist be delayed beyond the established date due to the Contractor's failure to meet their responsibilities,

the Agency may hold permanently, at its discretion, all or part of the Contractor's retainage.

## **ARTICLE 9: PAYMENTS AND COMPLETION**

### **9.01 APPLICATION FOR PAYMENT**

- A. Applications for payment shall be made upon AIA Document G702. There will be a five percent (5%) retainage on all Contractor's monthly invoices until completion of the project. This retainage will become payable upon receipt of all required closeout documentation, provided all other requirements of the Contract Documents have been met.
- B. A date will be fixed for the taking of the monthly account of work done. Upon receipt of Contractor's itemized application for payment, such application will be audited, modified, if found necessary, and approved for the amount. Statement shall be submitted to the Owner.
- C. Article 6516, Chapter 65, Title 29 of the Delaware Code stipulates annualized interest not to exceed 12% per annum beginning thirty (30) days after the "presentment" (as opposed to the date) of the invoice."

### **9.02 PARTIAL PAYMENTS**

- A. Any public works Contract executed by any Agency may provide for partial payments at the option of the Owner with respect to materials placed along or upon the sites or stored at secured locations, which are suitable for use in the performance of the contract.
- B. When approved by the agency, partial payment may include the values of tested and acceptable materials of a nonperishable or noncontaminative nature which have been produced or furnished for incorporation as a permanent part of the work yet to be completed, provided acceptable provisions have been made for storage.
  - 1. Any allowance made for materials on hand will not exceed the delivered cost of the materials as verified by invoices furnished by the Contractor, nor will it exceed the contract bid price for the material complete in place.
- C. If requested by the Agency, receipted bills from all Contractors, Subcontractors, and material, men, etc., for the previous payment must accompany each application for payment. Following such a request, no payment will be made until these receipted bills have been received by the Owner.

### **9.03 SUBSTANTIAL COMPLETION**

- A. When the building has been made suitable for occupancy, but still requires small items of miscellaneous work, the Owner will determine the date when the project has been substantially completed.
- B. If, after the Work has been substantially completed, full completion thereof is materially delayed through no fault of the Contractor, and without terminating the Contract, the Owner may make payment of the balance due for the portion of the Work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment that it shall not constitute a waiver of claims.
- C. On projects where commissioning is included, the commissioning work as defined in the specifications must be complete prior to the issuance of substantial completion.

9.04 FINAL PAYMENT

- A. Final payment, including the five percent (5%) retainage, shall be made within thirty (30) days after the Work is fully completed and the Contract fully performed and provided that the Contractor has submitted the following closeout documentation (in addition to any other documentation required elsewhere in the Contract Documents):
1. Evidence satisfactory to the Owner that all payrolls, material bills, and other indebtedness connected with the work have been paid,
  2. An acceptable RELEASE OF LIENS,
  3. Copies of all applicable warranties,
  4. As-built drawings,
  5. Operations and Maintenance Manuals,
  6. Instruction Manuals,
  7. Consent of Surety to final payment.
  8. The Owner reserves the right to retain payments, or parts thereof, for its protection until the foregoing conditions have been complied with, defective work corrected and all unsatisfactory conditions remedied.

**ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY**

10.01 PROTECTION OF PERSONS AND PROPERTY

- A. The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take all reasonable precautions to prevent damage, injury or loss to: workers, persons nearby who may be affected, the Work, materials and equipment to be incorporated, and existing property at the site or adjacent thereto. The Contractor shall give notices and comply with applicable laws ordinances, rules regulations, and lawful orders of public authorities bearing on the safety of persons and property and their protection from injury, damage, or loss. The Contractor shall promptly remedy damage and loss to property at the site caused in whole or in part by the Contractor, a Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable.
- B. The Contractor shall notify the Owner in the event any existing hazardous material such as lead, PCBs, asbestos, etc. is encountered on the project. The Owner will arrange with a qualified specialist for the identification, testing, removal, handling and protection against exposure or environmental pollution, to comply with applicable regulation laws and ordinances. The Contractor and Architect will not be required to participate in or to perform this operation. Upon completion of this work, the Owner will notify the Contractor and Architect in writing the area has been cleared and approved by the authorities in order for the work to proceed. The Contractor shall attach documentation from the authorities of said approval.
- C. As required in the Hazardous Chemical Information Act of June 1984, all vendors supplying any materials that may be defined as hazardous, must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a warning caution on the label relating to a potential physical or health hazard, if it is known to be present in the work place, and if employees may be exposed under normal conditions or in any foreseeable emergency situation. Material Safety Data Sheets must

be provided directly to the Owner along with the shipping slips that include those products.

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- D. The Contractor shall certify to the Owner that materials incorporated into the Work are free of all asbestos. This certification may be in the form of Material Safety Data Sheet (MSDS) provided by the product manufacturer for the materials used in construction, as specified or as provided by the Contractor.

**ARTICLE 11: INSURANCE AND BONDS**

**11.01 INSURANCE AND BONDS**

- A. The Contractor shall carry all insurance required by law, such as Unemployment Insurance, etc. The Contractor shall carry such insurance coverage as they desire on their own property such as a field office, storage sheds or other structures erected upon the project site that belong to them and for their own use. The Subcontractors involved with this project shall carry whatever insurance protection they consider necessary to cover the loss of any of their personal property, etc.
- B. Upon being awarded the Contract, the Contractor shall obtain a minimum of two (2) copies of all required insurance certificates called for herein, and submit one (1) copy of each certificate, to the Owner, within 20 days of contract award.
- C. Bodily Injury Liability and Property Damage Liability Insurance shall, in addition to the coverage included herein, include coverage for injury to or destruction of any property arising out of the collapse of or structural injury to any building or structure due to demolition work and evidence of these coverages shall be filed with and approved by the Owner.
- D. The Contractor's Property Damage Liability Insurance shall, in addition to the coverage noted herein, include coverage on all real and personal property in their care, custody and control damaged in any way by the Contractor or their Subcontractors during the entire construction period on this project.
- E. Builders Risk (including Standard Extended Coverage Insurance) on the existing building during the entire construction period, shall not be provided by the Contractor under this contract. The Owner shall insure the existing building and all of its contents and all this new alteration work under this contract during entire construction period for the full insurable value of the entire work at the site. Note, however, that the Contractor and their Subcontractors shall be responsible for insuring building materials (installed and stored) and their tools and equipment whenever in use on the project, against fire damage, theft, vandalism, etc.
- F. Certificates of the insurance company or companies stating the amount and type of coverage, terms of policies, etc., shall be furnished to the Owner, within 20 days of contract award.
- G. The Contractor shall, at their own expense, (in addition to the above) carry the following forms of insurance:
  - 1. Contractor's Contractual Liability Insurance  
Minimum coverage to be:
    - Bodily Injury\$ 500,000for each person
    - \$1,000,000for each occurrence
    - \$1,000,000aggregate
    - Property Damage\$ 500,000for each occurrence
    - \$1,000,000aggregate

2. Contractor's Protective Liability Insurance  
Minimum coverage to be:
  - Bodily Injury\$ 500,000for each person
  - \$1,000,000for each occurrence
  - \$1,000,000aggregate
  - Property Damage\$ 500,000for each occurrence
  - \$ 500,000aggregate
3. Automobile Liability Insurance  
Minimum coverage to be:
  - Bodily Injury\$ 1,000,000for each person
  - \$ 1,000,000for each occurrence
  - Property Damage\$ 500,000per accident
4. Prime Contractor's and Subcontractors' policies shall include contingent and contractual liability coverage in the same minimum amounts as 11.7.1 above.
5. Workmen's Compensation (including Employer's Liability):
  - a. Minimum Limit on employer's liability to be as required by law.
  - b. Minimum Limit for all employees working at one site.
6. Certificates of Insurance must be filed with the Owner guaranteeing fifteen (15) days prior notice of cancellation, non-renewal, or any change in coverages and limits of liability shown as included on certificates.
7. Social Security Liability
  - a. With respect to all persons at any time employed by or on the payroll of the Contractor or performing any work for or on their behalf, or in connection with or arising out of the Contractor's business, the Contractor shall accept full and exclusive liability for the payment of any and all contributions or taxes or unemployment insurance, or old age retirement benefits, pensions or annuities now or hereafter imposed by the Government of the United States and the State or political subdivision thereof, whether the same be measured by wages, salaries or other remuneration paid to such persons or otherwise.
  - b. Upon request, the Contractor shall furnish Owner such information on payrolls or employment records as may be necessary to enable it to fully comply with the law imposing the aforesaid contributions or taxes.
  - c. If the Owner is required by law to and does pay any and/or all of the aforesaid contributions or taxes, the Contractor shall forthwith reimburse the Owner for the entire amount so paid by the Owner.

**ARTICLE 12: UNCOVERING AND CORRECTION OF WORK**

**12.01 UNCOVERING AND CORRECTION OF WORK**

- A. The Contractor shall promptly correct Work rejected by the Owner or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed, and shall correct any Work found to be not in accordance with the requirements of the Contract Documents within a period of two years from the date of Substantial Completion, or by terms of an applicable special warranty required by the Contract Documents. The provisions of this Article apply to work done by Subcontractors as well as to Work done by direct employees of the Contractor.

- B. At any time during the progress of the work, or in any case where the nature of the defects shall be such that it is not expedient to have them corrected, the Owner, at their option, shall have the right to deduct such sum, or sums, of money from the amount of the contract as they consider justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

### **ARTICLE 13: MISCELLANEOUS PROVISIONS**

#### **13.01 CUTTING AND PATCHING**

- A. The Contractor shall be responsible for all cutting and patching. The Contractor shall coordinate the work of the various trades involved.

#### **13.02 DIMENSIONS**

- A. All dimensions shown shall be verified by the Contractor by actual measurements at the project site. Any discrepancies between the drawings and specifications and the existing conditions shall be referred to the Owner for adjustment before any work affected thereby has been performed.

#### **13.03 LABORATORY TESTS**

- A. Any specified laboratory tests of material and finished articles to be incorporated in the work shall be made by bureaus, laboratories or agencies approved by the Owner and reports of such tests shall be submitted to the Owner. The cost of the testing shall be paid for by the Contractor.
- B. The Contractor shall furnish all sample materials required for these tests and shall deliver same without charge to the testing laboratory or other designated agency when and where directed by the Owner.

#### **13.04 ARCHAEOLOGICAL EVIDENCE**

- A. Whenever, in the course of construction, any archaeological evidence is encountered on the surface or below the surface of the ground, the Contractor shall notify the authorities of the Delaware Archaeological Board and suspend work in the immediate area for a reasonable time to permit those authorities, or persons designated by them, to examine the area and ensure the proper removal of the archaeological evidence for suitable preservation in the State Museum.

#### **13.05 GLASS REPLACEMENT AND CLEANING**

- A. The General Contractor shall replace without expense to the Owner all glass broken during the construction of the project. If job conditions warrant, at completion of the job the General Contractor shall have all glass cleaned and polished.

#### **13.06 WARRANTY**

- A. For a period of two (2) years from the date of Substantial Completion, as evidenced by the date of final acceptance of the work, the contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect of equipment, material or workmanship performed by the contractor or any of his subcontractors or suppliers. However, manufacturer's warranties and guarantees, if for a period longer than two (2) years, shall take precedence over the above warranties. The contractor shall remedy, at his own expense, any such failure to conform or any such defect. The protection of this warranty shall be included in the Contractor's Performance Bond.

**ARTICLE 14: TERMINATION OF CONTRACT**

**14.01 TERMINATION OF CONTRACT**

- A. If the Contractor defaults or persistently fails or neglects to carry out the Work in accordance with the Contract Documents or fails to perform a provision of the Contract, the Owner, after seven days written notice to the Contractor, may make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor. Alternatively, at the Owner's option, and the Owner may terminate the Contract and take possession of the site and of all materials, equipment, tools, and machinery thereon owned by the Contractor and may finish the Work by whatever method the Owner may deem expedient. If the costs of finishing the Work exceed any unpaid compensation due the Contractor, the Contractor shall pay the difference to the Owner.
- B. "If the continuation of this Agreement is contingent upon the appropriation of adequate state, or federal funds, this Agreement may be terminated on the date beginning on the first fiscal year for which funds are not appropriated or at the exhaustion of the appropriation. The Owner may terminate this Agreement by providing written notice to the parties of such non-appropriation. All payment obligations of the Owner will cease upon the date of termination. Notwithstanding the foregoing, the Owner agrees that it will use its best efforts to obtain approval of necessary funds to continue the Agreement by taking appropriate action to request adequate funds to continue the Agreement."

**END OF GENERAL REQUIREMENTS**



**SECTION 011000**

**SUMMARY**

**PART 1 GENERAL**

**1.01 PROJECT**

- A. Project Name: Additions and Renovations to Brandywine School District Transportation Center.
- B. Owner's Name: Brandywine School District.
- C. Architect's Name: ABHA Architects, Inc..
- D. The Project consists of the construction of an approximately 5,000 s.f. maintenance garage addition, and renovations to an existing 11,800 s.f. maintenance garage and office building..

**1.02 CONTRACT DESCRIPTION**

- A. Contract Type: A single prime contract based on a Stipulated Price.

**1.03 DESCRIPTION OF ALTERATIONS WORK**

- A. Scope of demolition and removal work is shown on the Drawings.
- B. Scope of alterations work is shown on drawings.
- C. Plumbing: Alter existing and add new construction.
- D. HVAC: Alter existing and add new construction.
- E. Electrical Power and Lighting: Alter existing and add new construction.
- F. Fire Suppression Sprinklers: Alter existing system and add new construction, keeping existing in operation.
- G. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.
- H. Lightning Protection: Alter existing and add new construction.
- I. Owner will remove the following items before start of work:
  - 1. \_\_\_\_\_.
- J. Contractor shall remove and deliver the following to Owner prior to start of work:
  - 1. \_\_\_\_\_.
- K. Contractor shall remove and store the following prior to start of work, for later reinstallation by Contractor:
  - 1. \_\_\_\_\_.

**1.04 WORK BY OWNER (NOT APPLICABLE)**

- A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion. Some items include:
  - 1. Furnishings.
  - 2. Small equipment.
  - 3. Signage.
- B. Owner will supply and install the following:
  - 1. \_\_\_\_\_.
  - 2. \_\_\_\_\_.

C. Owner will supply the following for installation by Contractor:

1. \_\_\_\_\_.
2. \_\_\_\_\_.

1.05 OWNER OCCUPANCY

- A. Owner intends to continue to occupy the existing building during the entire construction period.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

- A. Contractor shall have complete and exclusive use of the premises for execution of the Work, except as otherwise specified.
- B. Construction Operations: Limited to areas of construction and designated staging area(s) to be coordinated with the Owner.
- C. Arrange use of site and premises to allow:
  1. Owner occupancy.
  2. Work by Others.
  3. Work by Owner.
  4. Use of site by the public.
- D. Provide access to and from site as required by law and by Owner:
  1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
  2. Do not obstruct roadways, sidewalks, or other public ways without permit.
- E. Existing building spaces may not be used for storage.
- F. Obtain and pay for the use of additional storage or work areas needed for operations.
- G. Assume full responsibility for the protection and safekeeping of Products under this Contract, stored on the site.
- H. Move any stored Products, under Contractor's control, which interfere with operations of the Owner or separate contractor.
- I. Utility Outages and Shutdown:
  1. Limit disruption of utility services to hours the building is unoccupied.
  2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
  3. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

- A. Coordinate construction schedule and operations with Owner.

1.08 TIME OF COMPLETION

- A. The Work shall be Substantially Complete within 270 calendar days after issuance of Notice to Proceed (if any) or Date of Contract, whichever is earlier.

1.09 LIQUIDATED DAMAGES

- A. There are no Liquidated Damages applying to this Work.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**



**SECTION 012000**  
**PRICE AND PAYMENT PROCEDURES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

- A. Section 005000 - Contracting Forms and Supplements: Forms to be used.
- B. Document 007300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.
- C. Section 012100 - Allowances: Payment procedures relating to allowances.
- D. Section 012200 - Unit Prices: Monetary values of unit prices, payment and modification procedures relating to unit prices.

1.03 SCHEDULE OF VALUES

- A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- B. Forms filled out by hand will not be accepted.
- C. Submit Schedule of Values in duplicate within 20 days after date of Owner-Contractor Agreement.
- D. Include in each line item, the amount of Allowances specified in Section 01210. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Execute certification by signature of authorized officer.
- E. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
- F. List each executed Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.
- G. Submit three copies of each Application for Payment.
- H. Include the following with the application:
  - 1. Insurance certificates for off-site stored products.

#### 1.05 MODIFICATION PROCEDURES

- A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.
- B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- C. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
  1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
  2. Promptly execute the change.
- D. For changes for which advance pricing is desired, Architect will issue a Contract Modification Request (CMR) that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change, with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation, including changes in Contract Time, if necessary, .
  1. Such request is for information only, and is not an instruction to execute the changes, nor to stop work in progress.
  2. Format for Contract Modification Requests shall be as issued by the Architect at the Pre-Construction meeting.
- E. Contractor may propose a change by submitting a change order request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors.
- F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
- G. Substantiation of Costs: Provide full information required for evaluation.
  1. Provide following data:
    - a. Quantities of products, labor, and equipment.
    - b. Taxes, insurance, and bonds.
    - c. Overhead and profit.
    - d. Justification for any change in Contract Time.
    - e. Credit for deletions from Contract, similarly documented.
  2. Support each claim for additional costs, including time and material work, with additional information:
    - a. Origin and date of claim.
    - b. Dates and times work was performed, and by whom.
    - c. Time records and wage rates paid.
    - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
  3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

- H. When the information in the Contract Modification Request and Change Order Request is complete, it will be submitted to the Architect for review and forwarded to the Owner. If the change is agreed to by the Owner, the Architect will prepare a Change Order and forward it to the Contractor for signature.
- I. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- J. After execution of Change Order by all parties, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- K. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- L. Promptly enter changes in Project Record Documents.

**1.06 APPLICATION FOR FINAL PAYMENT**

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
  - 1. All closeout procedures specified in Section 017000.
  - 2. All Closeout submittals as specified in Section 017800.
  - 3. Submit Affidavit of Payment of Indebtedness: See General Conditions.
  - 4. Submit Consent of Surety to Final Payment: See General Conditions.
  - 5. Submit Releases of Liens: See General Conditions. Release forms shall conform to State law governing mechanics Liens and shall be transmitted with AIA Document G706A. Note that Document G706A is not a release of liens and must be accompanied by actual releases.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**



**SECTION 012200**

**UNIT PRICES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. List of unit prices, for use in preparing Bids.
- B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 COSTS INCLUDED

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.
- D. Measurement Devices:
  - 1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
  - 2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
  - 3. Metering Devices: Inspected, tested and certified by the applicable State department within the past year.
- E. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
- F. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.
- G. Measurement by Area: Measured by square dimension using mean length and width or radius.
- H. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

1.04 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.
- B. Payment will not be made for any of the following:
  - 1. Products wasted or disposed of in a manner that is not acceptable.
  - 2. Products determined as unacceptable before or after placement.

3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.05 SCHEDULE OF UNIT PRICES

- A. The description of Unit Prices contained in this Section is in summary form. Detailed requirements for materials and execution are shown on the drawings and specified in the Section indicated.
- B. Item: UNIT PRICE NO. 1 - STRUCTURAL FILL; Section 312000.
  1. Description: Provide a price per ton for excavation, removal and on-site disposal of unsuitable soils, and delivery, placement and compaction of select borrow (Borrow Type "G") over geotextile fabric. Unit Price may be used for either site or building elements.
- C. Item: UNIT PRICE NO. 2 - DRAINAGE FILL; Section 312000.
  1. Description: Provide a price per cubic yard for excavation, removal and on-site disposal of unsuitable soils, and delivery and placement of drainage fill (AASHTO No. 57 stone) over geotextile fabric. Unit Price may be used for either site or building elements.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 012300  
ALTERNATES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Description of alternates.
- B. Procedures for pricing alternates.
- C. Documentation of changes to Contract Sum and Contract Time.

1.02 RELATED REQUIREMENTS

- A. Document 002113 - Instructions to Bidders: Instructions for preparation of pricing for alternatives.

1.03 BASE BID

- A. The Base Bid shall consist of all work shown or specified in the Contract Documents, exclusive of any Additive Alternates specified herein.
- B. The Base Bid shall include all work in any Subtractive Alternates specified herein.

1.04 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each alternate.

1.05 SCHEDULE OF ALTERNATES

- A. The description of Alternates contained herein is in summary form. Detailed requirements for materials and execution shall be as specified in other Sections and as shown on Drawings.
- B. Alternate No. 1 - FOUR-BAY GARAGE ADDITION:
  - 1. State in the Bid Form the amount to be added to the Base Bid amount for providing a four-bay pre-engineered metal building garage addition to the existing building.
  - 2. Description: Provide an approximately 5,725 square foot pre-engineered metal building addition with four working bays. Include foundations, superstructure, mechanical, plumbing, fire protection, and electrical systems. Refer to Drawings for additional information..
  - 3. Note that the four-bay 5,725 square foot addition is in lieu of the two-bay 3,720 square foot addition that is indicated as the Base Bid.
  - 4. \_\_\_\_\_. Refer to drawings for more information.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**



**SECTION 013000**  
**ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Preconstruction meeting.
- B. Progress meetings.
- C. Special meetings
- D. Submittals for review, information, and project closeout.
- E. Number of copies of submittals.
- F. Submittal procedures.

1.02 RELATED REQUIREMENTS

- A. Section 013216 - Construction Progress Schedule: Form, content, and administration of schedules.
- B. Section 017000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 017800 - Closeout Submittals: Project record documents.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

3.01 PRECONSTRUCTION MEETING

- A. Architect will schedule a meeting after Notice of Award.
- B. Attendance Required:
  - 1. Owner.
  - 2. Architect.
  - 3. Contractor.
  - 4. Contractor to have in attendance representatives of his subcontractors and the person who will be the Contractor's superintendent on the project.
  - 5. The Architect will have in attendance representatives of his consultants.
- C. Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of schedule of values, and progress schedule.
  - 5. Designation of personnel representing the parties to Contract, \_\_\_\_\_ and Architect.
  - 6. Designation of personnel representing the parties to Contract, \_\_\_\_\_, and Architect.
  - 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 8. Scheduling.
  - 9. Schedule for construction progress meetings.
- D. Architect will record minutes and distribute copies to participants.

### 3.02 PROGRESS MEETINGS

- A. Meetings throughout progress of the Work will be held at maximum monthly intervals.
- B. Architect will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
- D. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems that impede, or will impede, planned progress.
  - 5. Review of submittals schedule and status of submittals.
  - 6. Maintenance of progress schedule.
  - 7. Corrective measures to regain projected schedules.
  - 8. Planned progress during succeeding work period.
  - 9. Maintenance of quality and work standards.
  - 10. Effect of proposed changes on progress schedule and coordination.
  - 11. Other business relating to Work.
- E. Architect will record minutes and distribute copies to participants.

### 3.03 SPECIAL MEETINGS

- A. Refer to other Sections of the Project Manual for requirements for other meetings, such as pre-roofing meeting and pre-caulking meeting.
- B. It is the responsibility of the Contractor to organize and call these meetings as specified.

### 3.04 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
  - 1. Product data.
  - 2. Shop drawings.
  - 3. Samples for selection.
  - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - CLOSEOUT SUBMITTALS.

### 3.05 SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
  - 1. Design data.
  - 2. Certificates.
  - 3. Test reports.
  - 4. Inspection reports.
  - 5. Manufacturer's instructions.

6. Manufacturer's field reports.
7. MSDS sheets.
8. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

### 3.06 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:

1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

### 3.07 NUMBER OF COPIES OF SUBMITTALS

A. Submittals for Review and Information:

1. Submittals will be reviewed and distributed electronically.
2. Architect will provide access to FTP site for distribution of submittals.
3. File format for electronic submittals shall be Adobe .PDF, unless otherwise agreed upon. Coordinate electronic submittal distribution protocol at pre-construction meeting.

B. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. \_\_\_\_

C. Samples: Submit two (2) each; one of which will be retained by Architect.

1. After review, retain one at the job site for reference.
2. Retained samples will not be returned to Contractor unless specifically stated.

### 3.08 SUBMITTAL PROCEDURES

A. Transmit each submittal with approved form or transmittal.

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

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

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

1. Submittals not reviewed and approved by Contractor will be returned without review.

E. Schedule submittals to expedite the Project, and coordinate submission of related items.

F. Identify product(s) to be used. Clearly mark submittal to specifically identify products or models pertinent to project.

G. Modify drawings and diagrams to delete information which is not applicable to the Work. Supplement standard information to provide information specifically applicable to the Work.

- H. Indicate field dimensions, clearly identified as such.
- I. Show relationship to adjacent or critical features of the Work. Show dimensions and clearances required.
- J. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- K. Provide space for Contractor and Architect review stamps.
- L. When revised for resubmission, identify all changes made since previous submission.
- M. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- N. Submittals not requested will not be recognized or processed.

**END OF SECTION**

**SECTION 013216**  
**CONSTRUCTION PROGRESS SCHEDULE**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Preliminary schedule.
- B. Construction progress schedule, with network analysis diagrams and reports.

1.02 RELATED SECTIONS

- A. Section 011000 - Summary: Work sequence.

1.03 SUBMITTALS

- A. Within 21 days after date of Agreement, submit preliminary schedule defining planned operations for the first 90 days of Work, with a general outline for remainder of Work.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
- D. Within 10 days after joint review, submit complete schedule.
- E. Submit updated schedule with each Application for Payment.

1.04 SCHEDULE FORMAT

- A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
- B. Diagram Sheet Size: Maximum 22 x 17 inches (560 x 432 mm) or width required.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

3.01 PRELIMINARY SCHEDULE

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate phases and other logically grouped activities.
- D. Provide sub-schedules for each stage of Work identified in Section 011000.
- E. Provide sub-schedules to define critical portions of the entire schedule.
- F. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
- G. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
- H. Indicate delivery dates for owner-furnished products.

- I. Provide legend for symbols and abbreviations used.

### 3.03 BAR CHARTS

- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

### 3.04 NETWORK ANALYSIS

- A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
- B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
- C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
  - 1. Preceding and following event numbers.
  - 2. Activity description.
  - 3. Estimated duration of activity, in maximum 15 day intervals.
  - 4. Earliest start date.
  - 5. Earliest finish date.
  - 6. Actual start date.
  - 7. Actual finish date.
  - 8. Latest start date.
  - 9. Latest finish date.
  - 10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
  - 11. Responsibility.
- D. Analysis Program: Capable of accepting revised completion dates, and recomputation of all dates and float.
- E. Required Reports: List activities in sorts or groups:
  - 1. By preceding work item or event number from lowest to highest.
  - 2. Listing of activities on the critical path.

### 3.05 REVIEW AND EVALUATION OF SCHEDULE

- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

### 3.06 UPDATING SCHEDULE

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit reports required to support recommended changes.

3.07 DISTRIBUTION OF SCHEDULE

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

**END OF SECTION**



**SECTION 014000**  
**QUALITY REQUIREMENTS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. References and standards.
- B. Quality assurance submittals.
- C. Mock-ups.
- D. Control of installation.
- E. Tolerances.
- F. Testing and inspection services.
- G. Manufacturers' field services.

1.02 RELATED REQUIREMENTS

- A. Document 003100 - Available Project Information: Soil investigation data.
- B. Section 013000 - Administrative Requirements: Submittal procedures.
- C. Section 016000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008.
- B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2011c.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2012.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- E. ASTM E329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2011.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2009.

1.04 SUBMITTALS

- A. Testing Agency Qualifications:
  - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.

1. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
  1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
  1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- G. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
  1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

#### 1.05 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference 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 of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### 1.06 TESTING AND INSPECTION AGENCIES

- A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

- C. Contractor shall employ and pay for the services of independent testing laboratories to test and certify certain materials which the contractor proposes to use on the project, where such tests and certification are prerequisites to approval of materials by the Architect.

## **PART 2 PRODUCTS - NOT USED**

## **PART 3 EXECUTION**

### 3.01 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 Architect 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. Have Work performed 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, and disfigurement.

### 3.02 MOCK-UPS

- A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- 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 Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

### 3.03 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 Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### 3.04 TESTING AND INSPECTION

- A. Testing Agency Duties:
  - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
  - 2. Perform specified sampling and testing of products in accordance with specified standards.
  - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.

4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
  5. Perform additional tests and inspections required by Architect.
  6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  2. Agency may not approve or accept any portion of the Work.
  3. Agency may not assume any duties of Contractor.
  4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

### 3.05 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

### 3.06 DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

### END OF SECTION

**SECTION 015000**  
**TEMPORARY FACILITIES AND CONTROLS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Temporary telecommunications services.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Construction Aids
- E. Security requirements.
- F. Vehicular access and parking.
- G. Traffic Regulation
- H. Tree and Plan Protection
- I. Waste removal facilities and services.
- J. Field offices.

1.02 RELATED REQUIREMENTS

- A. Section 015100 - Temporary Utilities.

1.03 TEMPORARY UTILITIES - SEE SECTION 015100

1.04 TELECOMMUNICATIONS SERVICES

- A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
- B. Telecommunications services shall include:
  - 1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
  - 2. Telephone Land Lines: One line, minimum; one handset per line.
  - 3. Internet Connections: Minimum of one; DSL modem or faster.
  - 4. Facsimile Service: Minimum of one dedicated fax machine/printer.

1.05 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Use of existing facilities is not permitted.
- C. New permanent facilities may not be used during construction operations.
- D. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

#### 1.07 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.
- C. Location:
  - 1. Enclose and secure all construction areas. Use as necessary to supplement existing fencing.
  - 2. Locate vehicular entrance gates in suitable relation to construction facilities; and to avoid interference with traffic on public thoroughfares.
  - 3. Locate pedestrian entrance gates as required to provide controlled personnel entry, in suitable relation to construction parking facilities.

#### 1.08 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

#### 1.09 INTERIOR ENCLOSURES

- A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
- B. Construction: Framing and gypsum board sheet materials with closed joints and sealed edges at intersections with existing surfaces:
  - 1. Maximum flame spread rating of 25 in accordance with ASTM E84.

#### 1.10 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required to facilitate execution of the Work. Examples are scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.
- B. Mutual use may be arranged by the Contractor where applicable.

#### 1.11 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Security of persons and property in areas under control of the Contractor shall be the Contractor's exclusive responsibility.
- C. The Contractor, at his own expense, shall initiate whatever programs necessary to execute his responsibility.
- D. Control of access to the areas under control of the Contractor shall be maintained. Visitors shall be required to report immediately to the Field Office and to produce full identification to be recorded in the Contractor's Daily Log, along with the purpose of the visit.

- E. Coordinate with Owner's security program.

#### 1.12 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Maintain traffic areas free as possible of excavated materials, construction equipment, products, snow, ice and debris.
- F. Existing parking areas may be used for construction parking.

#### 1.13 TRAFFIC REGULATION

- A. Obtain all temporary permits for access to and use of public roads and streets for construction and hauling purposes. Comply with traffic control regulations applying to permit issuance.
- B. Provide all markers, signs, lights and barriers on and near the site to safely control construction traffic and public access.

#### 1.14 WASTE REMOVAL

- A. See Section 017419 - Waste Management, for additional requirements.
- B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- C. Provide containers with lids. Remove trash from site periodically.
- D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

#### 1.15 FIELD OFFICES

- A. Office may be located inside existing structure at location approved by Owner.

#### 1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
  - 1. Remove stone from temporary access roads, unless it is to be incorporated into new work.
  - 2. Grade damaged areas of site to required elevations, spread topsoil, and re-seed.
- D. Restore existing facilities used during construction to original condition.
- E. Restore new permanent facilities used during construction to specified condition.

Additions and Renovations to  
BSD Transportation Center  
Project No. 1228

Brandywine School District

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 015100**  
**TEMPORARY UTILITIES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

- A. Section 015000 - Temporary Facilities and Controls:

1.03 TEMPORARY ELECTRICITY

- A. Cost: By Owner.
- B. Connect to Owner's existing power service.
  - 1. Do not disrupt Owner's need for continuous service.
  - 2. Exercise measures to conserve energy.
- C. Complement existing power service capacity and characteristics as required.
- D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- E. Provide main service disconnect and over-current protection at convenient location and meter.
- F. Permanent convenience receptacles may be utilized during construction.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 2 watt/sq ft (21 watt/sq m).
- B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- C. Maintain lighting and provide routine repairs.
- D. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY HEATING

- A. Cost of Energy: By Contractor.
- B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.
- C. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.
- D. Owner's existing heat equipment may be used.
  - 1. Exercise measures to conserve energy.
  - 2. Enclose building prior to activating temporary heat.
- E. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.06 TEMPORARY VENTILATION

- A. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases.

1.07 TEMPORARY WATER SERVICE

- A. Cost of Water Used: By Owner.
- B. Connect to existing water source.
  - 1. Exercise measures to conserve water.
  - 2. Provide vacuum breakers at connections to existing water supply.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION - NOT USED**

**END OF SECTION**

**SECTION 016000**  
**PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Re-use of existing products.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations and procedures.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

- A. Document 002113 - Instructions to Bidders: Product options and substitution procedures prior to bid date.
- B. Section 011000 - Summary: Lists of products to be removed from existing building.
- C. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

1.03 REFERENCE STANDARDS

- A. GreenSeal GS-36 - Commercial Adhesives; Green Seal, Inc.; 2000.
- B. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; [www.aqmd.gov](http://www.aqmd.gov).

1.04 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit within 21 days after date of Agreement.
  - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

**PART 2 PRODUCTS**

2.01 EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

## 2.02 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by the Contract Documents.
- B. Urea-Formaldehyde Prohibition:
  - 1. Overall Project Requirement: Provide composite wood and agrifiber products having no added urea-formaldehyde resins.
    - a. Require each installer to certify compliance and submit product data showing product content.
  - 2. Specific Product Categories: Comply with limitations specified elsewhere.
- C. Adhesives and Joint Sealants:
  - 1. Definition: This provision applies to gunnable, trowelable, and liquid-applied adhesives, sealants, and sealant primers used anywhere on the interior of the building inside the weather barrier, including duct sealers.
  - 2. Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
    - a. Require each installer to certify compliance and submit product data showing product content.
  - 3. Specific Product Categories: Comply with limitations specified elsewhere.
- D. Aerosol Adhesives:
  - 1. Provide only products having lower volatile organic compound (VOC) content than required by GreenSeal GS-36.
    - a. Require each installer to certify compliance and submit product data showing product content.
  - 2. Specific Product Categories: Comply with limitations specified elsewhere.
- E. Manufactured and Fabricated Products shall conform to the following requirements:
  - 1. Design, fabricate and assemble in accord with the best engineering and shop practices.
  - 2. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
  - 3. Two or more items of the same kind shall be identical, by the same manufacturer.
  - 4. Products shall be suitable for service conditions.
  - 5. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
- F. Do not use material or equipment for any purpose other than that for which it is designated or is specified.

## 2.03 MANUFACTURER'S INSTRUCTIONS

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including the Architect.

1. Maintain one set of complete instructions at the job site during installation and until completion.
- B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.
  1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect for further instructions.
  2. Do not proceed with work without clear instructions.
- C. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

#### 2.04 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the 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.
- D. For Products specified by listing a product or manufacturer as the Basis of Design or standard of construction, select the primary product, or, if approved equivalent manufacturers are listed, an approved equivalent manufacturer.
  1. Selection of an approved equivalent manufacturer shall constitute that the Contractor has verified that the equivalent product meets all performance, quality and dimensional requirements and tolerances of the primary product.
  2. Where changes are required in other elements of the Work, the Contractor shall be responsible for coordinating such changes and shall waive claims for additional costs that may arise from the substitution of the approved equivalent manufacturer's product.

#### 2.05 MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver Owner; obtain receipt prior to final payment.

### **PART 3 EXECUTION**

#### 3.01 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request for substitution constitutes a representation that the submitter:
  1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  2. Will provide the same warranty for the substitution as for the specified product.
  3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.

D. Substitution Submittal Procedure:

1. Submit one copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer. Include:
  - a. Comparison of the qualities of the proposed substitution with that specified.
  - b. Changes required in other elements of the work because of the substitution.
  - c. Effect on the construction schedule.
  - d. Cost data comparing the proposed substitution with the Product specified.
  - e. Any required license fees or royalties.
  - f. Availability of maintenance service, and source of replacement materials.
3. Architect will review requests and will notify Bidders in an Addendum if the requested substitution is acceptable.

3.02 OWNER-SUPPLIED PRODUCTS

- A. See Section 011000 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:

1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

- A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- B. Transport and handle products in accordance with manufacturer's instructions.
- C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- D. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.
- F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

### 3.04 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- 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. Prevent contact with material that may cause corrosion, discoloration, or staining.
- I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- J. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- K. Store flammable materials so as to prevent contact with flames and fire. Conform with manufacturer's recommendations and local laws. Pay particular attention to storage of:
  - 1. Roof insulation
  - 2. Roofing materials, including solvents
  - 3. Paint materials
  - 4. Cleaning and other solvents
  - 5. Fuels

**END OF SECTION**



**SECTION 017000**

**EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, except payment procedures.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 013000 - Administrative Requirements: Submittals procedures.
- C. Section 014000 - Quality Requirements: Testing and inspection procedures.
- D. Section 015000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 015000 - Temporary Facilities and Controls: Temporary interior partitions.
- F. Section 015100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.
- G. Section 017419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.
- H. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
  - 1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather exposed or moisture resistant element.

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3. Efficiency, maintenance, or safety of any operational element.
  4. Visual qualities of sight exposed elements.
  5. Work of Owner or separate Contractor.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

#### 1.05 QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
- B. For survey work, employ a land surveyor registered in the State of Delaware and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.
- C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State of Delaware.

#### 1.06 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
  1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
  1. Minimize amount of bare soil exposed at one time.
  2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
  3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
  4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

## **PART 2 PRODUCTS**

### **2.01 PATCHING MATERIALS**

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 016000.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of 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. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### **3.02 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.

### **3.03 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect seven days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.

### **3.04 LAYING OUT THE WORK**

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.

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- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that indicated on Drawings.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
  - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
  - 2. Grid or axis for structures.
  - 3. Building foundation, column locations, ground floor elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.
- L. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction .

### 3.05 GENERAL INSTALLATION REQUIREMENTS

- A. In addition to compliance with regulatory requirements, conduct construction operations in compliance with NFPA 241, including applicable recommendations in Appendix A.
- B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- F. Make neat transitions between different surfaces, maintaining texture and appearance.

### 3.06 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as shown.
  - 2. Report discrepancies to Architect before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.
  - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 .

- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
  - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
  - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
  - 2. Remove items indicated on drawings.
  - 3. Relocate items indicated on drawings.
  - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
  - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
  - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
  - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
  - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
    - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
    - b. See Section 011000 for other limitations on outages and required notifications.
    - c. Provide temporary connections as required to maintain existing systems in service.
  - 4. Verify that abandoned services serve only abandoned facilities.
  - 5. Remove abandoned pipe, ducts, conduits, wiring, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

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- H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- I. Refinish existing surfaces as indicated:
  - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
  - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- J. Clean existing systems and equipment.
- K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- L. Do not begin new construction in alterations areas before demolition is complete.
- M. Comply with all other applicable requirements of this section.

### 3.07 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
  - 1. Complete the work.
  - 2. Fit products together to integrate with other work.
  - 3. Provide openings for penetration of mechanical, electrical, and other services.
  - 4. Match work that has been cut to adjacent work.
  - 5. Repair areas adjacent to cuts to required condition.
  - 6. Repair new work damaged by subsequent work.
  - 7. Remove samples of installed work for testing when requested.
  - 8. Remove and replace defective and non-conforming work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.
- J. Patching:
  - 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  - 2. Match color, texture, and appearance.

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

### 3.08 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### 3.09 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

### 3.10 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

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- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

### 3.11 DEMONSTRATION AND INSTRUCTION

- A. See Section 017900 - Demonstration and Training.

### 3.12 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### 3.13 FINAL CLEANING

- A. Execute final cleaning .
  - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Replace filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### 3.14 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Architect and Owner.
- B. Notify Architect when work is considered ready for Substantial Completion.
- C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
- D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- E. Notify Architect when work is considered finally complete.
- F. Complete items of work determined by Architect's final inspection.

**END OF SECTION**

**SECTION 017419**

**CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL**

**PART 1 GENERAL**

**1.01 WASTE MANAGEMENT REQUIREMENTS**

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
  - 1. Aluminum and plastic beverage containers.
  - 2. Corrugated cardboard.
  - 3. Wood pallets.
  - 4. Asphalt paving: May be recycled into paving for project.
  - 5. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
- E. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- F. Methods of trash/waste disposal that are not acceptable are:
  - 1. Burning on the project site.
  - 2. Burying on the project site.
  - 3. Dumping or burying on other property, public or private.
  - 4. Other illegal dumping or burying.
- G. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

**1.02 RELATED REQUIREMENTS**

- A. Section 011000 - Summary: List of items to be salvaged from the existing building for relocation in project or for Owner.
- B. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- D. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- E. Section 017000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

### 1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Waste Management Plan: Include the following information:
  - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
  - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
  - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.

4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

**PART 2 PRODUCTS: NOT USED**

**PART 3 EXECUTION**

**3.01 WASTE MANAGEMENT PROCEDURES**

- A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

**3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION**

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.
- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
  1. Pre-bid meeting.
  2. Pre-construction meeting.
  3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
  1. As a minimum, provide:
    - a. Separate area for storage of materials to be reused on-site.
    - b. Separate dumpsters for each category of recyclable.
    - c. Recycling bins at worker lunch area.
  2. Provide containers as required.
  3. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  4. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

**END OF SECTION**

**SECTION 017800**  
**CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

- A. Section 007200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
  - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned , with Architect comments. Revise content of all document sets as required prior to final submission.
  - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
  - 1. Changes made by Addenda and modifications.
- F. Record Drawings : Legibly mark each item to record actual construction including:
  - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 3. Field changes of dimension and detail.
  - 4. Details not on original Contract drawings.

**3.02 OPERATION AND MAINTENANCE DATA**

- A. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

**3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

- A. For Each Product, Applied Material, and Finish:
  - 1. Product data, with catalog number, size, composition, and color and texture designations.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

### 3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:

1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

C. Include color coded wiring diagrams as installed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

M. Additional Requirements: As specified in individual product specification sections.

### 3.05 OPERATION AND MAINTENANCE MANUALS

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

B. Prepare data in the form of an instructional manual.

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 3 inch (\_\_\_\_ mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

F. Arrange content by products and systems under section numbers and sequence of Table of Contents of this Project Manual.

- G. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

### 3.06 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

**END OF SECTION**

**SECTION 017900**  
**DEMONSTRATION AND TRAINING**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
  - 1. All software-operated systems.
  - 2. HVAC systems and equipment.
  - 3. Plumbing equipment.
  - 4. Electrical systems and equipment.
  - 5. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
  - 1. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

- A. Section 017800 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
  - 1. Submit to Architect for transmittal to Owner.
  - 2. Submit not less than two weeks prior to start of training.
  - 3. Revise and resubmit until acceptable.
  - 4. Provide an overall schedule showing all training sessions.
  - 5. Include at least the following for each training session:
    - a. Identification, date, time, and duration.
    - b. Description of products and/or systems to be covered.
    - c. Name of firm and person conducting training; include qualifications.
    - d. Intended audience, such as job description.
    - e. Objectives of training and suggested methods of ensuring adequate training.
    - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
    - g. Media to be used, such as slides, hand-outs, etc.
    - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
  - 1. Include applicable portion of O&M manuals.
  - 2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
  - 3. Provide one extra copy of each training manual to be included with operation and maintenance data.

- D. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
  - 1. Format: DVD Disc.
  - 2. Label each disc and container with session identification and date.

#### 1.04 QUALITY ASSURANCE

- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
  - 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
  - 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### 3.01 DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstration may be combined with Owner personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
  - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
  - 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
  - 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

#### 3.02 TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.
- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
  - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
  - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
  - 3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:
  - 1. Review the applicable O&M manuals.

2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
  3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
  4. Provide hands-on training on all operational modes possible and preventive maintenance.
  5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
  6. Discuss common troubleshooting problems and solutions.
  7. Discuss any peculiarities of equipment installation or operation.
  8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
  9. Review recommended tools and spare parts inventory suggestions of manufacturers.
  10. Review spare parts and tools required to be furnished by Contractor.
  11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

**END OF SECTION**



**SECTION 033000**  
**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete foundations and anchor bolts for pre-engineered building.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads, light pole bases, and thrust blocks.
- G. Concrete curing.

1.02 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2010.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- C. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010.
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- F. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
- G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
- H. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International; 2004.
- I. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.
- J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Billet-Steel Bars for Concrete Reinforcement; 2012.
- K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2011a.
- L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012a.
- M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2012.
- N. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2011b.
- O. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.

- P. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2012.
- Q. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2012.
- S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.
- T. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2010.
- U. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999 (Reapproved 2008).
- V. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2011.
- W. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).

### 1.03 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.

## **PART 2 PRODUCTS**

### 2.01 FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347 to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
  - 1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
  - 2. Earth Cuts: Natural rock formations that maintain a stable vertical edge may be used as side forms.
  - 3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
  - 4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

### 2.02 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
  - 1. Type: Deformed billet-steel bars.
  - 2. Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
  - 1. Form: Flat Sheets.
  - 2. Mesh Size and Wire Gage: As indicated on drawings.
- C. Reinforcement Accessories:
  - 1. Tie Wire: Annealed, minimum 16 gage (1.5 mm).
  - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

#### 2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C 33.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Water: Clean and not detrimental to concrete.
- E. Fiber Reinforcement: Alkali-resistant polypropylene complying with ASTM C1116/C1116M.

#### 2.04 CHEMICAL ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Accelerating Admixture: ASTM C494/C494M Type C.
- H. Retarding Admixture: ASTM C494/C494M Type B.
- I. Water Reducing Admixture: ASTM C494/C494M Type A.

#### 2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: See Section 072616.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
  1. ASTM C1107/C1107M; Grade A, B, or C.
  2. Minimum Compressive Strength at 48 Hours: 2,400 psi (17 MPa).
  3. Minimum Compressive Strength at 28 Days: 7,000 psi (48 MPa).

#### 2.06 BONDING AND JOINTING PRODUCTS

- A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059 Type II.
- B. Epoxy Bonding System: Complying with ASTM C881/C881M and of Type required for specific application.
- C. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
- D. Slab Isolation Joint Filler: 1/2 inch (13 mm) thick, height equal to slab thickness, with removable top section that will form 1/2 inch (13 mm) deep sealant pocket after removal.
- E. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch (25 mm) diameter holes for conduit or rebars to pass through at 6 inches (150 mm) on center; ribbed steel stakes for setting.

## 2.07 CURING MATERIALS

- A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound, that dissipates within 3 to 5 weeks; complying with ASTM C309.
  - 1. Application: Use at interior floor slabs to receive floor finishes..
  - 2. Products:
    - a. W.R. Meadows, Inc.; 1100-Clear: [www.wrmeadows.com](http://www.wrmeadows.com).
    - b. Substitutions: See Section 016000 - Product Requirements.
- B. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
  - 1. Application: Use at interior and exterior exposed locations..
  - 2. Solids by Mass: 25 percent, minimum.
  - 3. VOC Content: OTC compliant.
  - 4. Products:
    - a. SpecChem, LLC; Cure and Seal WB: [www.specchemllc.com](http://www.specchemllc.com).
    - b. SpecChem, LLC; Cure and Seal WB 25: [www.specchemllc.com](http://www.specchemllc.com).
    - c. W.R. Meadows, Inc.; CS-309 OTC: [www.wrmeadows.com](http://www.wrmeadows.com).
    - d. W.R. Meadows, Inc.; CS-309-25: [www.wrmeadows.com](http://www.wrmeadows.com).
    - e. W.R. Meadows, Inc.; CS-309-30 OTC: [www.wrmeadows.com](http://www.wrmeadows.com).
    - f. W.R. Meadows, Inc.; TIAH OTC: [www.wrmeadows.com](http://www.wrmeadows.com).
- C. Moisture-Retaining Sheet: ASTM C171.
  - 1. Curing paper, regular.
  - 2. Polyethylene film, clear, minimum nominal thickness of 0.0040 in. (0.10 mm).
- D. Polyethylene Film: ASTM D2103, 4 mil (0.1 mm) thick, clear.
- E. Water: Potable, not detrimental to concrete.

## 2.08 CONCRETE MIX DESIGN

- A. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- B. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard (0.89 kg per cubic meter), or as recommended by manufacturer for specific project conditions.
- C. Normal Weight Concrete:
  - 1. Location: Foundations and Piers
    - a. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch (20.7 MPa).
    - b. Cement Content: Minimum \_\_\_ lb per cubic yard (\_\_\_ kg per cubic meter).
    - c. Water-Cement Ratio: Maximum 40 percent by weight.
    - d. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
    - e. Maximum Slump: 3 inches (75 mm).
    - f. Maximum Aggregate Size: 3/4 inch (19 mm).
  - 2. Location: Floor slabs
    - a. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch (27.6 MPa).
    - b. Cement Content: Minimum \_\_\_ lb per cubic yard (\_\_\_ kg per cubic meter).

- c. Water-Cement Ratio: Maximum 45 percent by weight.
  - d. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
  - e. Maximum Slump: 4 inches (100 mm).
  - f. Maximum Aggregate Size: 3/4 inch (19 mm).
3. Location: Exterior Stairs and Ramps
- a. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch (27.6 MPa).
  - b. Cement Content: Minimum \_\_\_ lb per cubic yard (\_\_\_ kg per cubic meter).
  - c. Water-Cement Ratio: Maximum 45 percent by weight.
  - d. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
  - e. Maximum Slump: 4 inches (100 mm).
  - f. Maximum Aggregate Size: 3/4 inch (19 mm).

## 2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

### 3.02 PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
  - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
  - 2. Use latex bonding agent only for non-load-bearing applications.
- E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

### 3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

#### 3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Ensure reinforcement, inserts, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- D. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

#### 3.05 SLAB JOINTING

- A. Locate joints as indicated on the drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.

#### 3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
  - 1. Exposed to View and Foot Traffic: F(F) of 25; F(L) of 20, on-grade only.
- B. Measure F(F) and F(L) in accordance with ASTM E1155, within 48 hours after slab installation; report both composite overall values and local values for each measured section.
- C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
- D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

#### 3.07 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch (6 mm) or more in height. Provide finish as follows:
  - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
  - 1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 301.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.

2. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
  - a. Chemical Hardener: After slab has cured, apply water-diluted hardener in three coats per manufacturer's instructions, allowing 24 hours between coats.

### 3.08 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Surfaces Not in Contact with Forms:
  1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
  2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
  3. Final Curing: Begin after initial curing but before surface is dry.

### 3.09 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.

### 3.10 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

### 3.11 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

**END OF SECTION**



**SECTION 042000**

**UNIT MASONRY**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Concrete Block.
- B. Clay Facing Brick.
- C. Mortar and Grout.
- D. Reinforcement and Anchorage.
- E. Lintels.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications: Loose steel lintels.
- B. Section 071113 - Bituminous Dampproofing: Dampproofing parged masonry surfaces.
- C. Section 076200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.
- D. Section 079005 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2011.
- B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2012.
- E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2012.
- F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- G. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- H. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- I. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2012.
- J. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2012.
- K. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- L. ASTM C476 - Standard Specification for Grout for Masonry; 2010.
- M. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.
- N. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit \_\_\_\_ samples of facing brick units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- E. Mix Designs: For each type of mortar and grout.
  - 1. Include description of type and proportions of ingredients.

#### 1.06 QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

#### 1.07 MOCK-UP

- A. Construct a masonry wall as a mock-up panel sized 8 feet (2.4 m) long by 6 feet (1.8 m) high; include mortar and accessories and structural backup in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

### **PART 2 PRODUCTS**

#### 2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
  - 1. Size: Standard units with nominal face dimensions of 16 x 8 inches (400 x 200 mm) and nominal depths as indicated on the drawings for specific locations.
  - 2. Load-Bearing Units: ASTM C90, normal weight.
    - a. Both hollow and solid block.
    - b. Exposed faces: Manufacturer's standard color and texture where indicated.

#### 2.02 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBS, Grade SW.
  - 1. Color and texture: to match existing.
  - 2. Nominal size: As indicated on drawings.

#### 2.03 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: not permitted.
- B. Portland Cement: ASTM C150, Type I.
- C. Hydrated Lime: ASTM C207, Type S.

- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979.
  - 1. Color(s): to match existing brick veneer mortar.
- G. Water: Clean and potable.

#### 2.04 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers of Joint Reinforcement and Anchors:
  - 1. Blok-Lok Limited: [www.blok-lok.com](http://www.blok-lok.com).
  - 2. Hohmann & Barnard, Inc (including Dur-O-Wal brand): [www.h-b.com](http://www.h-b.com).
  - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M Grade 60 (420) deformed billet bars; uncoated.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: Truss type; ASTM A82/A82M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B; 0.1875 inch (4.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage on each exposure.
- E. Adjustable Multiple Wythe Joint Reinforcement: Truss type with adjustable ties spaced at 16 in (406 mm) on center and fabricated with moisture drip; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1875 inch (4.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods and adjustable components of 0.1875 inch (4.8 mm) wire; width of components as required to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage from each masonry face.
  - 1. Vertical adjustment: Not less than 2 inches (50 mm).
- F. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage from masonry face.
  - 1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch (6.3 mm) thick, with trapezoidal wire ties 0.1875 inch (4.75 mm) thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
- G. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
  - 1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
  - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
  - 3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).

#### 2.05 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

1. Manufacturers:
    - a. Blok-Lok Limited: [www.blok-lok.com](http://www.blok-lok.com).
    - b. Hohmann & Barnard, Inc (including Dur-O-Wal brand); Product \_\_\_\_:  
[www.h-b.com](http://www.h-b.com).
    - c. Substitutions: See Section 016000 - Product Requirements.
  - B. Weeps: Polyester mesh.
    1. Manufacturers:
      - a. Blok-Lok Limited: [www.blok-lok.com](http://www.blok-lok.com).
      - b. CavClear/Archovations, Inc: [www.cavclear.com](http://www.cavclear.com).
      - c. Mortar Net USA, Ltd; Mortar Net Weep Vents: [www.mortarnet.com](http://www.mortarnet.com).
      - d. Substitutions: See Section 016000 - Product Requirements.
  - C. Drainage Fabric: Polyester mesh.
    1. Manufacturers:
      - a. Mortar Net USA, Ltd; Mortar Net WallNet: [www.mortarnet.com](http://www.mortarnet.com).
      - b. Substitutions: See Section 016000 - Product Requirements.
  - D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
- 2.06 MORTAR AND GROUT MIXES
- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
    1. Masonry below grade and in contact with earth: Type S.
    2. Exterior, loadbearing masonry: Type S.
    3. Exterior, non-loadbearing masonry: Type S.
    4. Exterior, brick veneer: Type N.
    5. Interior, loadbearing masonry: Type S.
    6. Interior, non-loadbearing masonry: Type N.
  - B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
  - C. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
  - D. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
  - E. Mixing: Use mechanical batch mixer and comply with referenced standards.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

#### 3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

### 3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

### 3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
  - 1. Bond: Running.
  - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
  - 3. Mortar Joints: Concave.
- D. Brick Units:
  - 1. Bond: Running.
  - 2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
  - 3. Mortar Joints: Concave.

### 3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate masonry partitions from vertical structural framing members with a control joint .
- K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

### 3.06 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 16 inches (400 mm) on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

### 3.07 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

- B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

### 3.08 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches (150 mm).
- E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.

### 3.09 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches (400 mm) on center vertically and 16 inches (400 mm) on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches (200 mm) on center.

### 3.10 LINTELS

- A. Install loose steel lintels over openings.
- B. Maintain minimum 8 inch (200 mm) bearing on each side of opening.

### 3.11 CONTROL JOINTS

- A. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

### 3.12 BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.

### 3.13 CUTTING AND FITTING

- A. Cut and fit for pipes, conduit, and sleeves. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### 3.14 PARGING

- A. Dampen masonry walls prior to parging.
- B. Scarify each parging coat to ensure full bond to subsequent coat.

- C. Parge masonry walls in two uniform coats of mortar to a total thickness of 3/4 inch (19 mm).
- D. Strike top edge of parging at 45 degrees.

3.15 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 014000.
- B. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.16 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Clean soiled surfaces with cleaning solution.
- C. Use non-metallic tools in cleaning operations.

**END OF SECTION**



**SECTION 055000**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 042000 - Unit Masonry: Placement of metal fabrications in masonry.

1.03 REFERENCE STANDARDS

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2012.
- G. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
- H. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.
- I. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- K. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).
- L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

**PART 2 PRODUCTS**

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.

- B. Steel Tubing: ASTM A500, Grade B cold-formed structural tubing.
- C. Plates: ASTM A283.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black and hot-dip galvanized finish, as indicated.
- E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

## 2.02 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## 2.03 FABRICATED ITEMS

- A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
  - 1. Side Rails: 3/8 x 2 inches (9 x 50 mm) members spaced at 20 inches (500 mm).
  - 2. Rungs: one inch (25 mm) diameter solid round bar spaced 12 inches (300 mm) on center.
  - 3. Space rungs 7 inches (175 mm) from wall surface.
  - 4. Provide brackets at top and bottom, and at maximum spacing of 5'-0" o.c.; welded to rails and bolted to building structure.
- B. Bollards: 6 inch steel pipe, 3,000 psi concrete filled, crowned cap, as detailed; galvanized finish.
- C. Lintels: As scheduled on Drawings; galvanized finish.

## 2.04 MANUFACTURED PRODUCTS

- A. Cast Iron Downspout Boot: Provide boots where shown on drawings.
  - 1. B25A manufactured by Barry Pattern and Foundry, Inc.
  - 2. 1786 Series manufactured by Jay R. Smith Mfg. Co.
  - 3. Type DS4 manufactured by McKinley Iron Works.

## 2.05 FINISHES - STEEL

- A. Prime paint steel items unless otherwise noted.
- B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- C. Prime Painting: One coat.

- D. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

**END OF SECTION**



**SECTION 055100**  
**METAL STAIRS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Stairs with grating treads.
- B. Structural steel stair framing and supports.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.
- B. Section 042000 - Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 055000 - Metal Fabrications.
- D. Section 055213 - Pipe and Tube Railings: Metal handrails and guards for the stairs specified in this section.
- E. Section 099000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- D. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
- E. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- H. NAAMM AMP 510 - Metal Stairs Manual; The National Association of Architectural Metal Manufacturers; 1992, Fifth Edition.
- I. NAAMM MBG 531 - Metal Bar Grating Manual; The National Association of Architectural Metal Manufacturers; 2009.
- J. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; 2009 (ANSI/NAAMM MBG 532).
- K. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).
- L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).
- M. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

## **PART 2 PRODUCTS**

### **2.01 METAL STAIRS - GENERAL**

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
  - 1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
  - 2. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code.
  - 3. Dimensions: As indicated on drawings.
  - 4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
  - 5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
  - 6. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
  - 1. Service: Exposed joints tight with face surfaces aligned; underside of stair not covered by soffit is not considered exposed to view.
    - a. Welded Joints: Welded on back side wherever possible.
    - b. Welds Exposed to View: Ground smooth; not required to be flush.
    - c. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts or screw threads.
    - d. Metal Surfaces to be Painted: Sanded smooth, suitable for satin or matte finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

### **2.02 METAL STAIRS WITH GRATING TREADS**

- A. Jointing and Finish Quality Level: Service, as defined above.
- B. Risers: Closed.
- C. Treads: Steel bar grating.
  - 1. Grating Type: Welded.
  - 2. Bearing Bar Depth: 3/4 inch (19 mm), minimum.
  - 3. Top Surface: Standard.
  - 4. Nosing: Checkered plate.
  - 5. Nosing Width: 1-1/4 inch (31 mm), minimum.
  - 6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.
- D. Stringers: Rolled steel channels.

1. Stringer Depth: As indicated on drawings.
  2. End Closure: Sheet steel of same thickness as risers welded across ends.
- E. Railings: As indicated on drawings.
- F. Finish for interior stairs: Shop- or factory-prime painted.
- G. Finish for exterior stairs: Galvanized after fabrication.
- 2.03 HANDRAILS AND GUARDS
- A. Handrails and Guards: As specified in Section 055213.
- 2.04 MATERIALS
- A. Steel Sections: ASTM A 36/A 36M.
- B. Gratings: Bar gratings complying with NAAMM MBG 531 or NAAMM MBG 532, whichever applies based on bar sizes.
- C. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- D. Welding Materials: AWS D1.1; type required for materials being welded.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- 2.05 SHOP FINISHING
- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
  2. Number of Coats: One.
- D. Galvanizing: Hot-dip galvanize to minimum requirements of ASTM A123/A123M.
1. Touch up abraded areas after fabrication using specified touch-up primer for galvanized surfaces.
- PART 3 EXECUTION**
- 3.01 EXAMINATION
- A. Verify that field conditions are acceptable and are ready to receive work.
- 3.02 PREPARATION
- A. When field welding is required, clean and strip primed steel items to bare metal.
- B. Supply items required to be cast into concrete and embedded in masonry with setting templates.
- 3.03 INSTALLATION
- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on shop drawings. Perform field welding in accordance with AWS D1.1.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

**END OF SECTION**

**SECTION 055213**  
**PIPE AND TUBE RAILINGS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Wall mounted handrails.
- B. Stair railings and guardrails.
- C. Free-standing railings at steps and ramps.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 042000 - Unit Masonry: Placement of anchors in masonry.
- C. Section 055100 - Metal Stairs
- D. Section 099000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- D. ASTM A 167 - Specification for Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- E. A 312 - Specification for Seamless and Welded Austenitic Stainless Steel Pipe.
- F. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.
- G. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
- H. SSPC-Paint 15 - Steel Joist Shop Paint; The Society for Protective Coatings; 1999 (Ed. 2004).
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); The Society for Protective Coatings; 2002 (Ed. 2004).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

**PART 2 PRODUCTS**

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot (730 N/m) applied to the top of the assembly and in any direction, without damage or permanent set.

- B. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set.
- C. Design railing assembly, wall rails, and attachments to resist lateral force of 50 lbs (730 N) at any point without damage or permanent set.
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.
  - 1. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
  - 2. Intermediate Rails: 1-1/2 inches (38 mm) square.
  - 3. Posts: 1-1/2 inches (38 mm) square.
  - 4. Balusters: 1/2 inch (12 mm) square solid bar.
- F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- G. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

## 2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A501 hot-formed structural tubing.
- B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black and galvanized finish, as indicated.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: No exposed bolts or screws.
- E. Straight Splice Connectors: Steel welding collars.
- F. Galvanizing: Galvanize exterior railings in accordance with requirements of ASTM A 123/A 123M.
  - 1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

## 2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
  - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

2.04 ALUMINUM FINISHES (ALTERNATE)

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

**PART 3 EXECUTION**

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.
- D. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.
- E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

**END OF SECTION**



**SECTION 061000**  
**ROUGH CARPENTRY**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Rough opening framing for doors, windows, and roof openings.
- B. Sheathing.
- C. Subflooring.
- D. Preservative treated wood materials.
- E. Fire retardant treated wood materials.
- F. Communications and electrical room mounting boards.
- G. Concealed wood blocking, nailers, and supports.
- H. Miscellaneous wood nailers, furring, and grounds.

1.02 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2012.
- D. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2010.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

**PART 2 PRODUCTS**

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
  - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee ([www.alsc.org](http://www.alsc.org)) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

- B. Lumber fabricated from old growth timber is not permitted.

## 2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

## 2.03 CONSTRUCTION PANELS

- A. Subflooring: APA PRP-108: Rated Sheathing.
  - 1. Exposure Class: Exposure 1.
  - 2. Span Rating: 32/16 inches (812/406 mm).
- B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

## 2.04 ACCESSORIES

- A. Fasteners and Anchors:
  - 1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
  - 2. Anchors: Toggle bolt type for anchorage to hollow masonry.
- B. Subfloor Glue: Waterproof, water base, air cure type, cartridge dispensed.

## 2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
  - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
  - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.
- B. Fire Retardant Treatment:
  - 1. Manufacturers:
    - a. Arch Wood Protection, Inc: [www.wolmanizedwood.com](http://www.wolmanizedwood.com).
    - b. Hoover Treated Wood Products, Inc: [www.frtw.com](http://www.frtw.com).
    - c. Osmose, Inc: [www.osmose.com](http://www.osmose.com).
    - d. Substitutions: See Section 016000 - Product Requirements.
  - 2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
    - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
    - b. All interior rough carpentry items are to be fire retardant treated.

- c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
1. Manufacturers:
    - a. Arch Wood Protection, Inc: [www.wolmanizedwood.com](http://www.wolmanizedwood.com).
    - b. Viance, LLC: [www.treatedwood.com](http://www.treatedwood.com).
    - c. Osmose, Inc: [www.osmose.com](http://www.osmose.com).
    - d. Substitutions: See Section 016000 - Product Requirements.
  2. Preservative Pressure Treatment of Lumber Above Grade: AWWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft (4.0 kg/cu m) retention.
    - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    - b. Treat lumber exposed to weather.
    - c. Treat lumber in contact with masonry or concrete.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION - GENERAL**

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

#### **3.02 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Specifically, provide the following non-structural framing and blocking:
  1. Cabinets, casework, and shelf supports.
  2. Wall brackets.
  3. Handrails.
  4. Grab bars.
  5. Towel and bath accessories.
  6. Wall-mounted door stops.
  7. Chalkboards and marker boards.

#### **3.03 INSTALLATION OF CONSTRUCTION PANELS**

- A. Subflooring: Screw to framing; staples are not permitted.

- B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
  - 1. Install adjacent boards without gaps.

#### 3.04 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

#### 3.05 CLEANING

- A. Waste Disposal: Comply with the requirements of Section 017419.
  - 1. Comply with applicable regulations.
  - 2. Do not burn scrap on project site.
  - 3. Do not burn scraps that have been pressure treated.
  - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

**END OF SECTION**

**SECTION 071113**  
**BITUMINOUS DAMPPROOFING**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Bituminous dampproofing.

1.02 REFERENCE STANDARDS

- A. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012)e1.
- B. NRCA ML104 - The NRCA Roofing and Waterproofing; National Roofing Contractors Association; Fifth Edition, with interim updates.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Roofing and Waterproofing Manual.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years experience.
- C. Source Limitations: Obtain primary damp proofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials

1.05 FIELD CONDITIONS

- A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.
- B. Ventilation: Provide adequate ventilation during application of damp proofing in enclosed spaces. Maintain ventilation until damp proofing has thoroughly cured

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Cold-Applied, Cut-Back (Solvent-Based) Asphalt Dampproofing .
- B. Acceptable Manufacturers:
  - 1. Karnak Corporation: [www.karnakcorp.com](http://www.karnakcorp.com).
  - 2. Mar-Flex Systems, Inc: [www.mar-flex.com](http://www.mar-flex.com).
  - 3. W.R. Meadows, Inc: [www.wrmeadows.com](http://www.wrmeadows.com).
  - 4. Henry Company. [www.henry.com](http://www.henry.com)
  - 5. Koppers Industries, Inc. [www.koppers.com/](http://www.koppers.com/)

## 2.02 DAMPPROOFING PRODUCTS

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
- C. Verify that items that penetrate surfaces to receive dampproofing are securely installed.

#### 3.02 PREPARATION

- A. Protect adjacent surfaces not designated to receive dampproofing.
- B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
- C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

#### 3.03 ODOR ELIMINATION

- A. Odor Elimination: For interior and concealed-in-wall uses [other than exterior face of inner wythe of cavity walls], provide damp proofing material warranted by manufacturer to be substantially odor free after drying for 24 hours under normal conditions

#### 3.04 APPLICATION

- A. Foundation Walls: Apply two coats of asphalt dampproofing.
- B. Perform work in accordance with NRCA Roofing and Waterproofing Manual.
- C. Prime surfaces in accordance with manufacturer's instructions.
- D. Apply bitumen by trowel.
- E. Apply bitumen in two coats, continuous and uniform, at a rate of 4 gal/100 sq ft (\_\_\_\_ L/sq m) per coat.
- F. Apply from 2 inches (50 mm) below finish grade elevation down to top of footings.
- G. Seal items projecting through dampproofing surface with mastic. Seal watertight.
- H. Immediately backfill against dampproofing to protect from damage.
- I. Remove damp proofing materials from surfaces not intended to receive damp proofing

#### 3.05 SCHEDULE

- A. Foundation Wall: Two coatings of asphalt dampproofing.
- B. Locations:
  - 1. Exterior, below-grade surfaces of new concrete and masonry foundation walls.
  - 2. Existing foundation walls disturbed by new construction.

### **END OF SECTION**

**SECTION 072105**  
**THERMAL INSULATION**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Board insulation at perimeter foundation wall.
- B. Batt insulation and vapor retarder in exterior wall construction, and elsewhere as noted.
- C. Batt insulation for filling perimeter window and door shim spaces and elsewhere as noted.

1.02 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2010a.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.

1.03 QUALITY ASSURANCE

- A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperature indicated.
- B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Surface Burning Characteristics: ASTM E 84.
  - 2. Fire Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.
- C. Protect plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, product limitations, and other relevant data.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation, installation techniques, and other relevant data.

- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

#### 1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Approved Manufacturers of Extruded Polystyrene Board Insulation:
1. Amoco Foam Products Co.
  2. Dow Chemical U.S.A.
  3. Owens Corning
  4. Minnesota Diversified Products, Inc.
  5. UC Industries.
- B. Approved Manufacturers of Glass Fiber Insulation:
1. CertainTeed Corp.
  2. Knauf Fiber Glass
  3. Johns Manville Corp.
  4. Owens-Corning Fiberglas Corp.
- C. Approved Manufacturer of Industrial Insulation Board:
1. Owens-Corning Fiberglas Corp.
- D. Approved Manufacturers of Semi-Refractory (Slag Wool/Rock Wool) Fiber Insulation:
1. Johns Manville Corp.
  2. United States Gypsum Co.
  3. Fibrex Insulations Inc.
  4. Owens Corning.
  5. Thermafiber.
- E. Substitutions: See Section 01600 - Product Requirements

#### 2.02 APPLICATIONS

- A. Insulation at Perimeter of Foundation: Extruded polystyrene board. (Type 3)
- B. Insulation in Metal and Wood Framed Walls: Batt insulation with integral vapor retarder. (Type 2)
- C. Fire Safing Insulation: Mineral Fiber Batt Insulation (Type 6)
- D. Other locations as noted on Drawings. Insulation type designations are:
1. Type 1 - NOT USED
  2. Type 2 - Batt/blanket insulation with vapor barrier.
  3. Type 3 - Perimeter insulation - rigid.
  4. Type 4 - NOT USED
  5. Type 5 - NOT USED
  6. Type 6 - Fire safing insulation.

#### 2.03 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene Board Insulation (Type 3): ASTM C 578, Type IV; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Board Size: 24 x 96 inch (610 x 2440 mm).
4. Board Thickness: 2 inches (50 mm).
5. Board Edges: Square.
6. Thermal Conductivity (k factor) at 25 degrees F (-3.9 degrees C): 0.18 (0.31).
7. Compressive Resistance: 25 psi (173 kPa).
8. Board Density: 1.6 lb/cu ft (26 kg/cu m).
9. Water Absorption, maximum: 0.3 percent, volume.
10. Manufacturers:
  - a. Dow Chemical Co: [www.dow.com](http://www.dow.com).
  - b. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
11. Substitutions: See Section 016000 - Product Requirements.

#### 2.04 BATT INSULATION MATERIALS

- A. Batt Insulation (Type 2): ASTM C 665; preformed batt; friction fit, conforming to the following:
  1. Material: Glass or mineral fiber.
  2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.
  3. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E 84.
  4. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
  5. Formaldehyde Content: Zero.
  6. Thermal Resistance: R of 3.14 ( ).
  7. Thickness: as noted on drawings.
  8. Facing: Aluminum foil, flame spread 25 rated; one side.
  9. Manufacturers:
    - a. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
    - b. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
    - c. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  10. Substitutions: See Section 016000 - Product Requirements.
- B. Mineral Fiber Batt Insulation (Type 6): Flexible preformed batt or blanket, complying with ASTM C 665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E 84.
  1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
  2. Manufacturers:
    - a. Thermafiber, Inc: [www.thermafiber.com](http://www.thermafiber.com).
    - b. Substitutions: See Section 016000 - Product Requirements.

#### 2.05 ACCESSORIES

- A. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with requirements for fire performance characteristics.
- B. Mechanical Anchors: Type and size indicated or, if not indicated, as recommended by insulation manufacturer for type of application and condition of substrate.
- C. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.
- D. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch (50 mm) wide.

- E. Crack Sealer for Board Insulation: Provide polymeric insulating foam in aerosol dispenser designed for filling voids in board insulation as recommended by manufacturer
- F. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- G. Adhesive: Type recommended by insulation manufacturer for application.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.
- C. Crack Sealer for Board Insulation: Provide polymeric insulating foam in aerosol dispenser designed for filling voids in board insulation as recommended by manufacturer

#### **3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER**

- A. Adhere a 6 inch (150 mm) wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
  - 1. Tape seal joints.
  - 2. Extend sheet full height of joint.
- B. Apply adhesive to back of boards:
  - 1. Three continuous beads per board length.
  - 2. Full bed 1/8 inch (3 mm) thick.
- C. Install boards horizontally on foundation perimeter.
  - 1. Place boards to maximize adhesive contact.
  - 2. Install in running bond pattern.
  - 3. Butt edges and ends tightly to adjacent boards and to protrusions.
- D. Extend boards over expansion joints, unbonded to foundation on one side of joint.
- E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

#### **3.03 BATT INSTALLATION**

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
- F. Staple or nail facing flanges in place at maximum 6 inches (150 mm) on center.
- G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- H. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

- I. Tape seal tears or cuts in vapor retarder.
- J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.04 FIRE - SAFING INSULATION

- A. Install safing insulation of proper size on safing clips spaced as needed. Seal opening and insulation joints completely with Thermafiber Smoke Seal Compound.

3.05 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION**



**SECTION 072616**

**UNDER-SLAB VAPOR BARRIER/RETARDER**

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

1.02 RELATED SECTIONS

- A. Section 033000 Cast-in-place Structural Concrete

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM E 1745-97(2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
  - 2. ASTM E 154-99(2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
  - 3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials
  - 4. ASTM E 1643-98(2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

1.04 SUBMITTALS

- A. Quality Control / Assurance
  - 1. Independent laboratory test results showing compliance with ASTM & ACI Standards.
  - 2. Manufacturer's samples, literature
  - 3. Manufacturer's installation instructions for placement, seaming and pipe boot installation

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Vapor Barrier
  - 1. Vapor Barrier must have the following qualities
    - a. Perm rating less than or equal to 0.01 perms (grains/(ft<sup>2</sup> \*hr \* in. Hg)) after conditioning as tested by:
      - 1) ASTM E 96
- B. Vapor Barrier Products
  - 1. Stego Wrap (15 mil) Vapor Barrier by STEGO INDUSTRIES LLC, San Clemente, CA (877) 464-7834 [www.stegoindustries.com](http://www.stegoindustries.com)
  - 2. Griffolyn 15 mil Green Vapor Barrier by Reef Industries, Inc.
  - 3. VaporBlock 15 by Raven Industries, Inc.
- C. ACCESSORIES
  - 1. Seam Tape
    - a. Tape must have the following qualities:
      - 1) Water Vapor Transmission Rate ASTM E 96: 0.3 perms or lower
  - 2. Vapor Proofing Mastic
    - a. Mastic must have the following qualities:

- 1) Water Vapor Transmission Rate ASTM E 96: 0.3 perms or lower
3. Pipe Boots
  - a. Provide manufacturer's supplied pipe boot system or construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Ensure that subsoil is approved by architect or geotechnical firm
  1. Level and tamp or roll aggregate, sand or tamped earth base.

#### **3.02 INSTALLATION**

- A. Install Vapor Barrier/Retarder:
  1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643.
    - a. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
    - b. Lap Vapor Barrier/Retarder over footings and seal to foundation walls.
    - c. Overlap joints 6 inches and seal with manufacturer's tape.
    - d. Seal all penetrations (including pipes) per manufacturer's instructions.
    - e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
    - f. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

**END OF SECTION**

**SECTION 074113**  
**METAL ROOF PANELS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. A.Foamed-insulation-core standing seam metal roof panels
- B. Fastening system.
- C. Factory finishing.
- D. Accessories and miscellaneous components.

1.02 RELATED REQUIREMENTS

- A. Section 074214 - Insulated Metal Wall Panels: Preformed wall panels.
- B. Section 074213 - Metal Wall Panels: Preformed wall panels.

1.03 REFERENCE STANDARDS

- A. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2012.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Storage and handling requirements and recommendations.
  - 2. Installation methods.
  - 3. Specimen warranty.
- C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
  - 1. Show work to be field-fabricated or field-assembled.
- D. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.
- E. Manufacturer Qualification Statement: Provide documentation showing metal roof panel fabricator is accredited under IAS AC472.
- F. Test Reports: Indicate compliance of metal roofing system to specified requirements.
- G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in the manufacture of roofing systems similar to those required for this project.
  - 1. Not less than 5 years of documented experience
  - 2. Accredited by IAS according to IAS AC472.
- B. Installer Qualifications: Company trained and authorized by roofing system manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

### 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Finish Warranty: Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling within specified warranty period of 20 year period from date of Substantial Completion.
- C. Waterproofing Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of 5 years from date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Basis of Design: Eco-ficient Insulated BattenLok., manufactured by MBCI I Metal Roof and Wall Systems: [www.mbc.com](http://www.mbc.com).
- B. Other acceptable manufacturers are:
  - 1. Kingspan Insulated Panels: [www.kingspanpanels.us](http://www.kingspanpanels.us).
  - 2. Centria Architectural Systems: [www.centria.com](http://www.centria.com).
- C. Substitutions: See Section 016000 - Product Requirements.

### 2.02 PERFORMANCE REQUIREMENTS

- A. General: Provide metal roof panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
- B. Radiative Property Performance:
  - 1. Solar Reflectance Index: Minimum 78 for roof slopes of 2:12 or less and 29 for roof slopes greater than 2:12 under medium wind conditions, per ASTM E 1980.
  - 2. Energy Star Qualified: Listed on USDoE ENERGY STAR Roof Products Qualified Product List.
  - 3. Energy Performance: Listed in CRRC Rated Product Directory, with minimum properties as required by applicable Energy efficiency or High-Performance Green Building standard.
- C. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 applied in accordance with IES AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:
  - 1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
    - a. Wind Uplift Testing: Certify capacity of metal panels by actual testing of proposed assembly per ASTM E 1592.
    - b. Snow Loads: 20 lbf/sq. ft. (958 Pa).
    - c. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of [1/120] [1/180] [1/240] of the span with no evidence of failure.
    - d. Seismic Performance: Comply with ASCE 7, Section 9, "Earthquake Loads."

2. Wind Uplift Resistance: Comply with UL 580 for wind-uplift class UL-90.
- D. Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
  1. Surface-Burning Characteristics: Provide metal panel systems with the following characteristics when tested per ASTM E 84.
    - a. Flame spread index: 25 or less.
    - b. Smoke developed index: 450 or less.
  2. Fire Performance of Insulated Roof: Class 1 roof panel per ANSI/FM 4880.
- E. Air Infiltration, ASTM E 1680:
  1. Maximum 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
  2. Maximum 0.07 cfm/sq. ft. (0.36 L/s per sq. m) at static-air-pressure difference of 12 lbf/sq. ft. (575 Pa).
- F. Water Penetration Static Pressure, ASTM E 1646: No uncontrolled water penetration at a static pressure of 6.24 lbf/sq. ft. (300 Pa).
- G. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.
- H. Thermal Performance: Thermal-resistance (R) value indicated, per ASTM C 1363 at a mean temperature of 75 deg. F (24 deg. C) heat flow up, utilizing test specimen of minimum 64 sq. ft. (5.9 m<sup>2</sup>) incorporating at least two side joints, and not including air films.

### 2.03 INSULATED METAL ROOF PANELS

- A. Mechanically Seamed, Concealed Fastener, Foamed-Insulation-Core Metal Roof Panels: Structural metal roof panel consisting of ribbed exterior metal sheet and interior metal sheet, with factory foamed-in-place polyisocyanurate core in thermally-separated profile, with tongue-and-groove panel edges, mechanically seamed, attached to supports using concealed clips and fasteners.
  1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.
    - a. Exterior Face Sheet: 0.029 inch/22 gage coated thickness, with stucco embossed surface and planked pan profile.
      - 1) Finish: Fluoropolymer two-coat system
      - 2) Color: As selected by Architect from manufacturer's standard colors.
    - b. Interior Face Sheet: 0.023 inch/24 gage (0.60 mm) coated thickness, with stucco embossed surface.
      - 1) Finish: Modified silicone-polyester two-coat system.
      - 2) Color: As selected by Architect from manufacturer's standard colors.
  2. Panel Width: 42 inches (1067 mm).
  3. Panel Thickness: 3 inch (76 mm).
  4. Thermal Resistance R-Value: 21deg. F \* hr \* sq. ft./Btu.

5. Insulating Core: Polyisocyanurate, closed-cell, zero ozone depletion potential, minimum compressive strength 2.0 pcf (32 k/m<sup>3</sup>) and as required to meet structural performance requirements.

#### 2.04 ATTACHMENT SYSTEM

- A. Concealed System: Provide manufacturer's standard stainless steel or hot-dip galvanized concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

#### 2.05 PANEL FINISH

- A. Fluoropolymer Coating System: Manufacturer's standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil (0.023 mm); color and gloss to match sample.
- B. Siliconized Polyester Coating: Epoxy primer and silicone-modified polyester enamel topcoat with minimum dry film thickness of 0.8 mil (0.02 mm); color and gloss to match sample.

#### 2.06 METAL ROOF PANEL ACCESSORIES

- A. General: Provide complete metal roof panel assembly incorporating trim, copings, fascia, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panel face sheet.
- C. Panel Clips: ASTM C 645, with ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating, two-piece, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
- D. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by roof panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating.
- E. Joint Sealers:
  1. Tape Sealers: Manufacturer's standard non-curing butyl tape, AAMA 809.2.
  2. Concealed Joint Sealant: Non-curing butyl, AAMA 809.2.
  3. Elastomeric Joint Sealant: See Section 079005
- F. Steel Sheet Miscellaneous Framing Components: ASTM C 645, with ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized zinc coating.

#### 2.07 FABRICATION

- A. A.General: Provide factory fabricated and finished metal panels and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. B.Fabricate metal panel joints configured to accept sealant tape providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.
- C. C.Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

**3.02 PREPARATION**

- A. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- B. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.
- C. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

**3.03 METAL PANEL INSTALLATION**

- A. Mechanically-Seamed, Foamed-Insulation-Core Metal Roof Panels: Install insulated metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install insulated metal roof panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Attach panels to metal framing using clips, screws, fasteners, sealants, and adhesives recommended by manufacturer and indicated on approved shop drawings.
  - 1. Fasten metal panels to supports with concealed clips at each location indicated on approved shop drawings, with spacing and fasteners recommended by manufacturer.
  - 2. Provide weatherproof jacks for pipe and conduit penetrating metal panels.
  - 3. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.
- C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
- D. Joint Sealers: Install tape sealers and liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.
  - 1. Seal panels in accordance with insulated panel manufacturer's instructions, and project design drawings.
  - 2. Seal wall panel joints utilizing tape sealer and vapor seal bead of non-curing butyl; apply continuously without gaps in accordance with manufacturer's written instructions, approved shop drawings, and project drawings.
  - 3. Prepare joints and apply sealants per requirements of Section 079005.

**3.04 ACCESSORY INSTALLATION**

- A. General: Install metal panel accessories with positive anchorage to building and weather tight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.

2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
3. Provide concealed fasteners except where noted on approved shop drawings.
4. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

### 3.05 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

### 3.06 PROTECTION

- A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.
- B. Touch-up, repair, or replace damaged roof panels or accessories before date of Substantial Completion.

**END OF SECTION**

**SECTION 074214**  
**INSULATED METAL WALL PANELS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Factory-assembled metal panel system for walls, with trim, related flashings and accessory components.

1.02 RELATED REQUIREMENTS

- A. Section 074113 - Metal Roof Panels.
- B. Section 076200 - Sheet Metal Flashing and Trim.
- C. Section 079005 - Joint Sealers.
- D. Section 084500 - Translucent Insulated Wall Panels
- E. Section 133419 - Metal Building Systems: Building framing system.

1.03 REFERENCE STANDARDS

1.04 PRE-INSTALLATION MEETING

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on assembled panel structural capabilities.
- C. Shop Drawings: Indicate dimensions, panel profile and layout, spans, joints, construction details, methods of anchorage, and method and sequence of installation.
- D. Design and Performance Data: Indicate panel profile and dimensions.

1.06 QUALITY ASSURANCE

- A. A. Manufacturer/Source: Provide metal panel assemblies and accessories from a single manufacturer accredited under IAS AC 472, Part B.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store pre-finished material off ground with weather protection to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials that could cause discoloration or staining.

1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Special Manufacturer's Product Warranty: On manufacturer's standard form, in which manufacturer agrees to repair or replace metal panel assemblies that fail in materials and workmanship within one year from date of Substantial Completion.

- C. Special Manufacturer's Panel Finish Warranty: On Manufacturer's standard form, in which Manufacturer agrees to repair or replace metal panels that evidence deterioration of factory-applied finish within 20 years from date of Substantial Completion, including:
1. Color fading in excess of 5 Hunter units per ASTM D 2244.
  2. Chalking in excess of No. 8 rating per ASTM D 4214.
  3. Failure of adhesion, peeling, checking, or cracking.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Basis of Design: MBCI Eco-ficient Vintage, manufactured by MBCI Metal Roof and Wall Systems: [www.mbc.com](http://www.mbc.com).
- B. Other Acceptable Manufacturers:
1. Kingspan Insulated Panels : [www.kingspanpanels.us](http://www.kingspanpanels.us).
  2. Centria: [www.centria.com](http://www.centria.com).
  3. Substitutions: See Section 016000 - Product Requirements.

### **2.02 PANEL SYSTEM**

- A. Metal Panel System: Factory-assembled metal panel system, with trim, related flashings and accessory components.
1. Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
  2. Accommodate tolerances of building structural framing.
- B. PERFORMANCE REQUIREMENTS
1. General: Provide metal panel system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.
  2. Structural Performance: Provide metal panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, as determined by ASTM E 72 or ASTM E 1592 applied in accordance with IES AC 04, Section 4, Panel Load Test Option or Section 5, Panel Analysis Option:
    - a. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
      - 1) Wind Negative Pressure: Certify capacity of metal panels by actual testing of proposed assembly per ASTM E 1592 or ASTM E 72.
    - b. Deflection Limits: Withstand inward and outward wind-load design pressures in accordance with applicable building code with maximum deflection of 1/180 of the span with no evidence of failure.
    - c. Seismic Performance: Comply with ASCE 7, Section 9, "Earthquake Loads."
  3. Fire Performance Characteristics: Provide metal panel systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
    - a. Surface-Burning Characteristics: Provide metal panel systems with the following characteristics when tested per ASTM E 84.
      - 1) Flame spread index: 25 or less.
      - 2) Smoke developed index: 450 or less.
  4. Air Infiltration, ASTM E 283:

- a. Maximum 0.04 cfm/sq. ft. (0.20 L/s per sq. m) at static air pressure difference of 1.52 lbf/sq. ft. (75 Pa).
  - b. Maximum 0.051 cfm/sq. ft. (0.26 L/s per sq. m) at static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
  - c. Maximum 0.066 cfm/sq. ft. (0.33 L/s per sq. m) at static-air-pressure difference of 12 lbf/sq. ft. (575 Pa).
5. Water Penetration Static Pressure, ASTM E 331: No uncontrolled water penetration at a static pressure of 20 lbf/sq. ft. (958 Pa).
  6. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.
  7. Thermal Performance: Thermal-resistance (R) value indicated, per ASTM C 1363 at a mean temperature of 75 deg. F (24 deg. C) heat flow horizontal, utilizing test specimen of minimum 64 sq. ft. (5.9 m<sup>2</sup>) incorporating at least two side joints, and not including air films.
    - a. Thermal Performance: Provide thermal resistance through entire system (R-value) of 21 deg F hr sq ft/Btu ([ ] K sq m/W), minimum.

### 2.03 PANELS AND TRIM

- A. Concealed Fastener, Foamed-Insulation-Core Metal Wall Panels: Structural metal panels consisting of flat exterior metal sheet with Aztec-embossed pattern, and interior metal sheet with planked profile, with factory foamed-in-place polyisocyanurate core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using concealed fasteners.
  1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A 755/A 755M.
  2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50, Coating Class AZ55 (Grade 340, Coating Class AZM165) unpainted Galvalume Plus coating.
    - a. Exterior Face Sheet: 0.029 inch/22 gage (0.76 mm) coated thickness, with Aztec embossed surface.
      - 1) Finish: Fluoropolymer two-coat system
      - 2) Color: As selected by Architect from manufacturer's standard colors.
    - b. Interior Face Sheet: 0.023 inch/24 gage (0.60 mm) coated thickness, with stucco embossed surface and planked profile.
      - 1) Finish: Modified silicone-polyester two-coat system.
      - 2) Color: As selected by Architect from manufacturer's standard colors.
  3. Panel Width: 42 inches (1067 mm).
  4. Panel Thickness: 3 inch (76 mm).
  5. Thermal Resistance R-Value: \_\_\_\_ deg. F \* hr \* sq. ft./Btu (\_\_\_ K \* sq. m/W).
  6. Insulating Core: Polyisocyanurate, closed-cell, zero ozone depletion potential, minimum compressive strength 2.0 pcf (32 k/m<sup>3</sup>) and as required to meet structural performance requirements.

#### 2.04 ACCESSORIES

- A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panels.
- C. Panel Clips: ASTM A 653/A 653M, G90 hot-dip galvanized zinc coating, one-piece, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
- D. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- E. Field Touch-up Paint: As recommended by panel manufacturer.
- F. Bituminous Paint: Asphalt base.

#### 2.05 FABRICATION

- A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. Fabricate metal panel joints configured to accept sealant tape providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

#### 2.06 FINISHES

- A. Finishes, General: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Fluoropolymer Two-Coat System: 0.2 - 0.3 mil primer with 0.7 - 0.8 mil 70 percent PVDF fluoropolymer color coat, AAMA 621.
  - 1. Basis of Design: MBCI, Signature 300.
- C. Interior Face Sheet Coil-Coated Finish System:
  - 1. Modified Silicone-Polyester Two-Coat System: 0.20 - 0.25 mil primer with 0.7 - 0.8 mil color coat.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify that structural framing is ready to receive panel system.

#### 3.02 INSTALLATION - GENERAL

- A. Install panel system on walls in accordance with manufacturer's instructions.
- B. Protect panel surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- C. Permanently fasten panel system to structural supports; aligned, level, and plumb, within specified tolerances.

- D. Provide expansion joints where indicated.
- E. Use concealed fasteners unless otherwise approved by Architect.
- F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

### 3.03 METAL PANEL INSTALLATION

- A. Concealed-Fastener Foamed-Insulation-Core Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Attach panels to metal framing using screws, fasteners, sealants, and adhesives recommended for application by metal panel manufacturer.
  - 1. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
  - 2. Cut panels in field where required using manufacturer's recommended methods.
  - 3. Provide weatherproof jacks for pipe and conduit penetrating metal panels.
- C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers.
- D. Joint Sealers: Install tape sealers and liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies.
  - 1. Seal panel base assembly, openings, panel head joints, and perimeter joints using joint sealers indicated in manufacturer's instructions.
  - 2. Seal wall panel joints utilizing tape sealer and vapor seal bead of non-curing butyl; apply continuously without gaps in accordance with manufacturer's written instructions, approved shop drawings, and project drawings.
  - 3. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants."
- E. ACCESSORY INSTALLATION
  - 1. General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
    - a. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
    - b. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
    - c. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

### 3.04 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.

- C. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

**END OF SECTION**

**SECTION 076200**  
**SHEET METAL FLASHING AND TRIM**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, and other items indicated in Schedule.
- B. Reglets and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 042000 - Masonry: Through-wall flashings in masonry.
- B. Section 061000 - Rough Carpentry: Wood nailers.
- C. Section 074113 - Gutters and Downspouts for Insulated Metal Panel Roofing System
- D. Section 079005 - Joint Sealers.

1.03 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2011.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- C. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.
- D. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2012)e1.
- E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012)e1.
- F. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 6 x 6 inch ( mm) in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

## **PART 2 PRODUCTS**

### **2.01 FLASHING TYPES**

- A. Type 1: Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch (0.6 mm) thick base metal, shop pre-coated with PVDF coating.
  - 1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
  - 2. Color: As selected by Architect from manufacturer's standard colors.
  - 3. Interlocking, 2-piece, pre-formed.
- B. Flashing Type 2: Laminated flashing, consisting of 5 oz./sq. ft. electrolytic copper permanently bonded on both sides by asphalt to heavy, waterproofed, creped Kraft paper, with stainless steel drip edge.
  - 1. Manufacturers and products:
    - a. Wasco Cop-R-Tex Duplex
    - b. AFCO Cop-A-Bond Duplex
    - c. Substitutions: See Section 016000.

### **2.02 ACCESSORIES**

- A. Fasteners: Stainless steel, with soft neoprene washers.
- B. Roofing Felt Underlayment: ASTM D 226, organic roofing felt, Type II ("No. 30").
- C. Primer: Zinc chromate type.
- D. Protective Backing Paint: Asphaltic mastic, ASTM D 4479 Type I.
- E. Sealant: Type 1 specified in Section 079005.
- F. Plastic Cement: ASTM D4586, Type I.
- G. Reglets: Surface mounted type, galvanized steel .
- H. Termination Bars: 1" wide x 1/8" thick; high strength extruded polypropylene.

### **2.03 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
- E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

- B. Verify roofing termination and base flashings are in place, sealed, and secure.

### 3.02 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

### 3.03 INSTALLATION

- A. Conform to drawing details and to the following:
  - 1. SMACNA Architectural Sheet Metal Manual,
- B. See Section 042000 for reglet installation requirements.
- C. Insert flashings into reglets to form tight fit. Secure in place with lead wedges. Pack remaining spaces with lead wool. Seal flashings into reglets with sealant.
- D. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- E. Apply plastic cement compound between metal flashings and felt flashings.
- F. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- G. Fasten cavity wall flashings to stud back-up with a non-corrosive termination bar and seal the top edge of the flashing with sealant.
- H. Seal metal joints watertight.

**END OF SECTION**



**SECTION 079005**  
**JOINT SEALERS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Sealants and joint backing.
- B. Precompressed foam sealers.

1.02 RELATED REQUIREMENTS

- A. Section 088000 - Glazing: Glazing sealants and accessories.
- B. Section 092116 - Gypsum Board Assemblies: Acoustic sealant.

1.03 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2010.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2012.
- D. ASTM D1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005 (Reapproved 2011).
- E. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).
- F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; [www.aqmd.gov](http://www.aqmd.gov).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 5 years experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.

1.06 MOCK-UP

- A. Provide mock-up of sealant joints in conjunction with window, wall, and air barrier system under provisions of Section 014000.
- B. Construct mock-up with specified sealant types and with other components noted.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

1.07 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

## 1.08 COORDINATION

- A. Coordinate the work with all sections referencing this section.

## 1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

## **PART 2 PRODUCTS**

### 2.01 SEALANTS

- A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
- B. Type 1 - General Purpose Exterior Sealant: Silicone; ASTM C 920, Grade NS, Class 50, Uses M, G, A and O; single component.
  - 1. Color: Custom color to match Architect's sample.
  - 2. Joint Movement Range: +/- 50 percent.
  - 3. Product:
    - a. 890FTS manufactured by Pecora Corporation.
  - 4. Applications: Use for:
    - a. Control, expansion, and soft joints in masonry.
    - b. Joints between concrete and other materials.
    - c. Joints between metal frames and other materials.
- C. Type 2 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
  - 1. Color: Colors as selected.
  - 2. Applications: Use for:
    - a. Interior wall and ceiling control joints.
    - b. Joints between door and window frames and wall surfaces.
    - c. Other interior joints for which no other type of sealant is indicated.
- D. Type 3 - NOT USED.
- E. Type 4 - Fire Resistant Foam Sealant:
  - 1. Manufacturers:
    - a. Dow Corning: Product: 3-6548 RTV Foam.
- F. Type 6 - Bathtub/Tile Sealant: White silicone; ASTM C 920, Uses I, M and A; single component, mildew resistant.
  - 1. Applications: Use for:
    - a. Joints between plumbing fixtures and floor and wall surfaces.
    - b. Joints between kitchen and bath countertops and wall surfaces.
- G. Type 7 - Concrete Floor Joint Filler: Self-leveling, pourable, semi-rigid sealant intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
  - 1. Composition: Polyurea or epoxy, single or multi-part, 100 percent solids by weight.

2. Hardness: 75 to 80 after 7 days, when tested in accordance with ASTM D2240 Shore A.
3. Color: Concrete gray.
4. Joint Width: 1/8 to 1/4 inch (3 to 6 mm).
5. Joint Depth: Provide product suitable for joints from 1/8 inch (3 mm) to 3 inches (75 mm) in depth including space for backer rod.
6. Applications: Use for:
  - a. Control joints in concrete slabs and floors
  - b. joints in concrete slabs and floors.
7. Products:
  - a. ARDEX Americas; ARDISEAL RAPID PLUS: [www.ardexamericas.com](http://www.ardexamericas.com).
  - b. W.R. Meadows, Inc; Rezi-Weld Flex: [www.wrmeadows.com](http://www.wrmeadows.com).
  - c. Substitutions: See Section 016000 - Product Requirements.

## 2.02 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; open cell polyurethane or reticulated (soft) polyethylene; oversized 33 to 50 percent larger than joint width; Denver Foam manufactured by Backer Rod Manufacturing, Inc.
- D. Fire Rated Joint Filler: Pre-engineered, patented, flexible, textile fiberglass roll material with a fiberglass matt facing, containing approximately 30 percent by weight unexpanded vermiculite; Ultra Block manufactured by Backer Rod Manufacturing, Inc.
- E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive work.
- B. Verify that joint backing and release tapes are compatible with sealant.

### 3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Protect elements surrounding the work of this section from damage or disfigurement.

### 3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve the following:
  1. Width/depth ratio of 2:1.

- a. Minimum joint depth: 1/4 inch; Maximum joint depth: 1/2 inch, unless otherwise required by manufacturer.
  2. Neck dimension no greater than 1/3 of the joint width.
  3. Surface bond area on each side not less than 75 percent of joint width.
  - D. Install backer rod using blunt or rounded tool to a uniform (+/- 1/8 inch) depth without puncturing the material.
  - E. Install bond breaker where joint backing is not used.
  - F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
  - G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
  - H. Tool joints concave.
- 3.04 CLEANING
- A. Clean adjacent soiled surfaces.
- 3.05 PROTECTION
- A. Protect sealants until cured.
- 3.06 SCHEDULE
- A. Exterior Joints for Which No Other Sealant Type is Indicated: Type 1 .
  - B. Penetrations of Fire Rated Construction: Type 4.
  - C. Control, Expansion, and Soft Joints in Masonry, and Between Masonry and Adjacent Work: Type 1.
  - D. Under Exterior Door Thresholds: Type 1.
  - E. Interior Joints for Which No Other Sealant is Indicated: Type 2; .
  - F. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type 6.
  - G. In STC-Rated Walls, Between Metal Stud Track/Runner and Adjacent Construction: Type 5.

**END OF SECTION**

**SECTION 079513**  
**EXPANSION JOINT COVER ASSEMBLIES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Expansion joint assemblies for floor, wall, ceiling and roof surfaces.

1.02 RELATED REQUIREMENTS

- A. Section 031000 - Concrete Forming and Accessories: Placement of joint assembly frames in formwork.
- B. Section 042000 - Unit Masonry: Placement of joint assembly frames in masonry.
- C. Section 076200 - Sheet Metal Flashing and Trim:
- D. Section 079005 - Joint Sealers: Expansion and control joint finishing utilizing a sealant .

1.03 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices, available colors and finish .
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction, anchorage locations .
- D. Manufacturer's Installation Instructions: Indicate rough-in sizes; provide templates for cast-in or placed frames or anchors; required tolerances for item placement.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Expansion Joint Cover Assemblies:
  - 1. Construction Specialties, Inc: [www.c-sgroup.com](http://www.c-sgroup.com).
  - 2. MM Systems Corp: [www.mmsystemscorp.com](http://www.mmsystemscorp.com).
  - 3. Balco, Inc. .
  - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
  - 1. Joint Dimensions and Configurations: As indicated on drawings.
  - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
  - 3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
  - 4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

### 2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
  - 1. Exposed Finish at Floors: Mill finish or natural anodized.
  - 2. Exposed Finish at Walls and Ceilings: Natural anodized.
- B. Resilient Filler: Neoprene, exhibiting Shore A hardness of 40 to 50 Durometer.
- C. Threaded Fasteners: Aluminum.
- D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

### 2.04 FABRICATION

- A. Joint Covers: Aluminum cover plate, aluminum frame construction, retainers with resilient elastomeric filler strip, designed to permit plus or minus 50 percent joint movement with full recovery, flush and recess mounted.
- B. Back paint components in contact with cementitious materials.
- C. Galvanize embedded ferrous metal anchors and fastening devices.
- D. Shop assemble components and package with anchors and fittings.
- E. Provide joint components in single length wherever practical. Minimize site splicing.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

### 3.02 PREPARATION

- A. Provide anchoring devices for installation and embedding under Section 033000.
  - 1. Provide templates and rough-in measurements.

### 3.03 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

### 3.04 SCHEDULES

- A. Floor Expansion Joint Covers:
  - 1. Exposed areas: Construction Specialties, Inc. Models PC-10 and PCW-100.
- B. Exterior Wall Expansion Joint Covers:
  - 1. Construction Specialties, Inc. Model RJTW-100, with clear anodized finish.
  - 2. Construction Specialties, Inc. Model VF-100, with factory-applied cured silicone face, color as selected from manufacturer's standard range.
- C. Exterior Roof (metal roof areas) Expansion Joint Covers:
  - 1. Construction Specialties, Inc. Model RJTW-100, with clear anodized finish.

### **END OF SECTION**

**SECTION 081113**  
**HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Non-fire-rated steel doors and frames.
- B. Steel frames for wood doors.
- C. Thermally insulated steel doors.
- D. Steel glazing frames.
- E. Accessories, including glazing and matching panels.

1.02 RELATED REQUIREMENTS

- A. Section 087100 - Door Hardware.
- B. Section 088000 - Glazing: Glass for doors and borrowed lites.

1.03 REFERENCE STANDARDS

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.
- B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.
- C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2011).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- E. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.
- F. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
- G. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Steel Doors and Frames:
1. Assa Abloy Ceco or Curries: [www.assaabloydss.com](http://www.assaabloydss.com).
  2. Republic Doors: [www.republicdoor.com](http://www.republicdoor.com).
  3. Steelcraft, an Ingersoll Rand brand: [www.steelcraft.com](http://www.steelcraft.com).
  4. Substitutions: See Section 016000 - Product Requirements.

### **2.02 DOORS AND FRAMES**

- A. Requirements for All Doors and Frames:
1. Accessibility: Comply with ANSI/ICC A117.1.
  2. Door Top Closures: Flush with top of faces and edges.
  3. Door Texture: Smooth faces.
  4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
  5. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
  6. Galvanizing For Exterior Units: All components hot-dipped zinc-iron alloy-coated (galvannealed), A60/ZF180.
  7. Finish: Factory primed, for field finishing.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

### **2.03 STEEL DOORS**

- A. Exterior Doors :
1. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.
  2. Core: Polystyrene foam.
  3. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
  4. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.
  5. Thickness: 1-3/4 inches (44 mm)
- B. Interior Doors, Non-Fire-Rated:
1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
  2. Core: Cardboard honeycomb.
  3. Thickness: 1-3/4 inches (44 mm).
- C. Transom Panels: Same construction, performance, and finish as doors.

### **2.04 STEEL FRAMES**

- A. General:
1. Provide frames as follows:
    - a. Interior Frames: ANSI A250.8 Level 1 Doors: 16 gage frames.
    - b. Exterior Frames: ANSI A250.8 Level 3 Doors: 14 gage frames.

- c. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 16 gage
  - 2. Finish: Factory primed, for field finishing.
  - 3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- B. Exterior Door Frames: Fully welded.
- 1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
  - 2. Weatherstripping: Separate, see Section 087100.
- C. Interior Door Frames <in masonry walls>: Fully welded type.
- D. Interior Door Frames in gypsum board partitions: Drywall slip-on type.
- 1. Fire Rating: Same as door, labeled.
- E. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.
- 2.05 ACCESSORY MATERIALS
- A. Glazing: As specified in Section 088000, field installed.
  - B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
  - C. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
  - D. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
  - E. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.
- 2.06 FINISH MATERIALS
- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
  - B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

#### 3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

#### 3.03 INSTALLATION

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Coordinate installation of hardware.

E. Coordinate installation of electrical connections to electrical hardware items.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.05 SCHEDULE - SEE DRAWINGS

**END OF SECTION**

**SECTION 081416**  
**FLUSH WOOD DOORS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; non-rated as scheduled.

1.02 RELATED REQUIREMENTS

- A. Section 062000 - Finish Carpentry.
- B. Section 081113 - Hollow Metal Doors and Frames.
- C. Section 08 11 14 - Hollow Metal Doors and Frames.
- D. Section 087100 - Door Hardware.
- E. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.
- B. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- C. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).
- D. WDMA I.S.1-A - Architectural Wood Flush Doors; Window and Door Manufacturers Association; 2011.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Specimen warranty.
- D. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, identify cutouts for glazing and other details.
- E. Samples: Submit two samples of door veneer, 6 x 6 inch (150 x 150 mm) in size illustrating wood grain, stain color, and sheen.
- F. Manufacturer's Installation Instructions: Indicate special installation instructions.
- G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.

- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on site to permit ventilation.

#### 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
  - 1. Graham Wood Doors: [www.grahamdoors.com](http://www.grahamdoors.com).
  - 2. Eggers Industries: [www.eggersindustries.com](http://www.eggersindustries.com).
  - 3. Marshfield DoorSystems, Inc: [www.marshfielddoors.com](http://www.marshfielddoors.com).
  - 4. Algoma Hardware.
  - 5. Oshkosh Architectural Door Company.
  - 6. VT Industries, Inc: [www.vtindustries.com](http://www.vtindustries.com).
  - 7. Substitutions: See Section 016000 - Product Requirements.

#### 2.02 DOORS

- A. All Doors: See drawings for locations and additional requirements.
  - 1. Quality Level: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S.1-A.
  - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches (44 mm) (44 mm) thick unless otherwise indicated; flush construction.
  - 1. Provide solid core doors at all locations .
  - 2. Plain-sliced red oak veneer facing with factory transparent finish .

#### 2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated above.

#### 2.04 DOOR FACINGS

- A. Wood Veneer Facing for Transparent Finish: Red oak, veneer grade as specified by quality standard, plain sliced, book veneer match, running assembly match; unless otherwise indicated.
  - 1. Vertical Edges: Same species as face veneer.
  - 2. Pairs: Pair match each pair; set match pairs within 10 feet (3 m) (3 m) of each other when doors are closed.
- B. Facing Adhesive: Type I - waterproof.

#### 2.05 ACCESSORIES

- A. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.

1. At fire-rated doors, veneer wrap flush glazing bead with same species as door facing.

#### 2.06 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
  1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
  2. Provide solid blocking for other throughbolted hardware.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

#### 2.07 FACTORY FINISHING - WOOD VENEER DOORS

- A. Meet or exceed WDMA I.S. 1-A-04 specifications for a TR-6 catalyzed polyurethane finish system. Factory finish to be water based stain and UV curable polyester urethane finish system that complies with all applicable Federal and State regulations for Volatile Organic Compounds (VOC) and Hazardous Air Pollutants (HAP) emission limitations per the EPA Clean Air Act.
- B. Factory finish doors in accordance with approved sample.
- C. Seal door top edge with color sealer to match door facing.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

#### 3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.
- F. Install door louvers plumb and level.

#### 3.03 TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

- C. Maximum Vertical Distortion (Bow): 1/8 inch (3 mm) (3 mm) measured with straight edge or taut string, top to bottom, over an imaginary 36 by 84 inches (915 by 2130 mm) (915 by 2130 mm) surface area.
- D. Maximum Width Distortion (Cup): 1/8 inch (3 mm) (3 mm) measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inches (915 by 2130 mm) (915 by 2130 mm) surface area.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

**END OF SECTION**

**SECTION 083323**  
**OVERHEAD COILING DOORS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Overhead coiling doors , operating hardware, non-fire-rated and exterior, electric operation.
- B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

- A. Section 087100 - Door Hardware: Cylinder cores and keys.
- B. Section 262717 - Equipment Wiring: Power to disconnect.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- E. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).
- F. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.
- G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, component connections and details, electrical equipment, .
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Manufacturer's Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- E. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

#### **A. Overhead Coiling Doors:**

1. Cornell Iron Works, Inc; Product ESD20: [www.cornelliron.com](http://www.cornelliron.com). is the basis of design.
2. Other Approved manufacturers:
  - a. The Cookson Company: [www.cooksondoor.com](http://www.cooksondoor.com).
  - b. Wayne-Dalton, a Division of Overhead Door Corporation: [www.wayne-dalton.com](http://www.wayne-dalton.com).
  - c. Overhead Door Co. .

### **2.02 COILING DOORS**

#### **A. Exterior Coiling Doors: Steel slat curtain.**

1. Capable of withstanding positive and negative wind loads of 20 psf (940 Pa), without undue deflection or damage to components.
2. Insulated Door Slat Material Requirements:
  - a. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84.
  - b. Minimum Sound Transmission Class (STC) rating of 26 as tested per ASTM E90.
  - c. Minimum R-value of 8.0 (U-factor of 0.125) as calculated using the ASHRAE Handbook of Fundamentals.
  - d. Insulation to be CFC Free with an Ozone Depletion Potential (ODP) rating of zero.
3. Nominal Slat Size: 2 inches (50 mm) wide x required length.
4. Exterior Slat Finish: ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation of a chemical bonding, baked-on polyester base coat and a baked-on polyester finish coat.
5. Interior slat finish: Coating System and phosphate treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range, minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.
6. Guides: Angles; galvanized steel.
7. Hood Enclosure: Manufacturer's standard; primed steel.
8. Electric operation.
9. Mounting: As indicated.

### **2.03 MATERIALS**

#### **A. Curtain Construction: Interlocking slats.**

1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
3. Weatherstripping (exterior doors): Moisture and rot proof, resilient type.
  - a. Bottom Bar, Motor Operated Doors: Sensing/weather edge with neoprene astragal extending full width of door bottom bar.
  - b. Guides: Replaceable vinyl strip on guides sealing against fascia side of curtain.

- c. Lintel Seal: Nylon brush seal fitted at door header to impede air flow.
- d. Hood: Neoprene/rayon baffle to impede air flow above coil.
- B. Steel Slats: Minimum 20 gage (0.8 mm thick) ASTM A 653/A 653M galvanized steel sheet.
  - 1. Galvanizing: Minimum G90/Z275 coating.
- C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- D. Steel Guides: Formed from galvanized steel sheet, 3/16 inch (476 mm) thick; complying with ASTM A 653/A 653M.
  - 1. Galvanizing: Minimum G90/Z275 coating.
- E. Hood Enclosure: Internally reinforced to maintain rigidity and shape.
  - 1. Minimum 24 gage (0.5 mm thick).
  - 2. Prime paint.
- F. Hardware:
  - 1. Lock Cylinders: Specified in Section 087100.
- G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

#### 2.04 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by a testing agency acceptable to authorities having jurisdiction.
- B. Electric Operators:
  - 1. Mounting: Side mounted.
  - 2. Motor Rating: 1/2 hp (375 W); continuous duty.
  - 3. Motor Voltage: 208 volt, three phase, 60 Hz.
  - 4. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
  - 5. Controller Enclosure: NEMA 250 Type 1.
  - 6. Opening Speed: 8 inches per second (200 mm/s).
  - 7. Brake: Adjustable friction clutch type, activated by motor controller.
  - 8. Provide manual override chain operation in case of power failure.
  - 9. Provide an integral motor-mounted Interlock system to prevent damage to door and operator when mechanical door locking devices are provided.
- C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.
  - 1. 24 volt circuit.
  - 2. Recessed.
- D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

### 3.02 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Section 262717.
- F. Complete wiring from disconnect to unit components.
- G. Install perimeter trim and closures.

### 3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).
- C. Maximum Variation From Level: 1/16 inch (1.5 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

### 3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

### 3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

**END OF SECTION**

**SECTION 084500**  
**TRANSLUCENT WALL ASSEMBLIES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Supported aluminum framed vertical glazing system.
- B. Sandwich panels of translucent skins separated with an aluminum grid.
- C. Miscellaneous metal trim and related components.
- D. Perimeter sealant.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry
- B. Section 074214 - Insulated Metal Wall Panels
- C. Section 079005 - Joint Sealers: System perimeter sealant and back-up materials.
- D. Section 088000 - Glazing.
- E. Section 099000 - Painting and Coating.

1.03 REFERENCE STANDARDS

- A. AA DAF-45 - Designation System for Aluminum Finishes; The Aluminum Association, Inc.; 2003.
- B. AAMA CW-DG-1 - Aluminum Curtain Wall Design Guide Manual; American Architectural Manufacturers Association; 1996.
- C. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.
- D. AAMA 501.1 - Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure; American Architectural Manufacturers Association; 2005.
- E. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association; 2009 (part of AAMA 501).
- F. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.
- G. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association; 2009.
- H. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2002.
- I. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2010.
- J. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2011.
- K. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

- L. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.
- M. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- N. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.
- O. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.
- P. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2012.
- Q. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2012.
- R. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.
- S. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- T. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).
- U. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
- V. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- W. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential; 2000 (Reapproved 2009).
- X. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2000 (Reapproved 2008)
- Y. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).
- Z. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II; Society for Protective Coatings; 1997 (Ed. 2004).
- AA. SSPC-Paint 25BCS - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Blast Cleaned Steel; Society for Protective Coatings; 1997 (Ed. 2004).

#### 1.04 PERFORMANCE REQUIREMENTS

- A. System Design: Design and size components to withstand dead loads and live loads caused by snow, hail, and positive and negative wind loads acting on plane of panel without damage or permanent set.
  - 1. Design Loads: Calculate in accordance with applicable code.
  - 2. Design Wind Load: 30 lb/sq ft (\_\_\_\_ kPa) positive and negative.

3. Measure performance in accordance with ASTM E330, using test load of 1.5 times the design wind pressure and 10 second duration of maximum load.
- B. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.
- C. Deflection: Limit mullion deflection to 3/4 inch (19 mm) with full recovery of glazing materials.
- D. System Assembly: Accommodate without damage to system, components or deterioration of seals; movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; deflection of structural support framing, tolerance of supporting components and other relevant factors.
- E. Light Transmission: 20 percent.
- F. Thermal Resistance of Panel System (Excluding Vision Areas): U of 23.
- G. Sound Attenuation Through Wall System (Exterior to Interior): STC of 50, minimum, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
- H. Vapor Seal: No vapor seal failure at interior static pressure of 1 inch (25 mm), 72 degrees F (22 degrees C), and 40 percent relative humidity.
- I. Condensation Resistance Factor: CRF of 80 when measured in accordance with AAMA 1503.
- J. Water Leakage: None, when measured in accordance with ASTM E331 at a test pressure difference of 8.00 lbf/sq ft (390 Pa).
- K. Expansion / Contraction: System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components.
- L. System Internal Drainage: Drain water entering joints, condensation occurring in framing system, or migrating moisture occurring within system, to the exterior by a weep drainage network.
- M. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside face of glazing panel and heel bead of glazing compound.
- N. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, panel configuration, internal drainage details and other relevant data.
- C. Design Data: Provide framing member structural and physical characteristics, dimensional limitations, and other relevant data.
- D. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.

- E. Samples: Submit two , 12 x 12 inch (\_\_\_\_x\_\_\_\_ mm) in size, illustrating prefinished aluminum surface, specified panel with skins, glazing materials illustrating edge and corner.
- F. Test Reports: Submit substantiating engineering data, test results of previous tests by independent laboratory which purport to meet performance criteria, and other supportive data.
- G. Installation Data: Special installation requirements.

#### 1.06 QUALITY ASSURANCE

- A. Perform work in accordance with AAMA CW-DG-1.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten (10) years of documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum ten (10) years of experience and approved manufacturer.
- D. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Delaware.

#### 1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire resistance ratings, acoustic attenuation requirements, and minimum sound transmission requirements.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Handle work of this section in accordance with AAMA CW-10.
- B. Protect prefinished aluminum surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Puncture wrappings at ends for ventilation.

#### 1.09 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).
- B. Maintain this minimum temperature during and after installation of sealants.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Approved Manufacturer:
  - 1. Kalwall Corporation, 111 Candia Road, P.O. Box 237, Manchester, NH 03105; Tel. (800) 258-9777, Fax, (603) 627-7905.  
Manufacturer's Representative: Thomas W. Major, 602 Glenmary Road, St. Davids, PA 19077; Tel. (610) 687-1766.
- B. Substitutions: See Section 01600 - Product Requirements

#### 2.02 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

- D. Steel Sections: ASTM A36/A36M; shaped to suit mullion sections.
- E. Fasteners: Stainless or galvanized steel.

### 2.03 COMPONENTS

- A. Translucent Wall and Skylight Systems: Structurally reinforced translucent panels, with self supporting framing, shop fabricated, factory prefinished, battens, cap strips, related flashings, anchorage and attachment devices.
- B. Panels: Bonded to both sides of structural extruded aluminum grid of 12" x 24" Sohji pattern; exposed surfaces of exterior sheet chemically and permanently treated to protect against surface erosion and extreme weather conditions:
  - 1. Panel Length: As shown on drawings.
  - 2. Panel Width: As shown on drawings.
  - 3. Panel Thickness: 2-3/4 inches (\_\_\_\_ mm)
  - 4. Exterior Face: Smooth, .070" thick, white in color.
  - 5. Interior face: Smooth, .045" thick, white in color.
- C. Battens, Cover Strips, Cover Plates, and Integral Flashings: Extruded aluminum, to suit location and application; sized to rigidly retain panels in place.
- D. Flashings: .080 inch (\_\_\_\_ mm) thick aluminum, finish, secured with concealed fastening method.
- E. Weather Seals: To suit application; non-bleeding; non-staining.

### 2.04 GLAZING MATERIALS

- A. Glazing Materials: As specified in Section 088000.

### 2.05 SEALANT MATERIALS

- A. Sealant and Backing Materials: As specified in Section 079005 of Types described below.
- B. Perimeter Sealant: Type 1.

### 2.06 FABRICATION

- A. Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to ensure concealment from view.
- E. Reinforce framing members for external imposed loads.

### 2.07 FINISHES

- A. Finish Coatings: Conform to AAMA 2604. Colors to be selected from manufacturer's standard. Interior and exterior coating: PVDF.
- B. Shop and Touch-Up Primer for Steel Components: SSPC-Paint 25, zinc oxide, alkyd, linseed oil primer or SSPC-Paint 25BCS, zinc oxide, alkyd, linseed primer..
- C. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.
- D. Concealed Steel Items:

1. Galvanized in accordance with requirements of ASTM A123/A123M.
  2. Primed with iron oxide paint.
- E. Apply two (2) coats of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining air barrier and vapor retarder materials are ready to receive work of this section.

#### **3.02 INSTALLATION**

- A. Install translucent panel system in accordance with manufacturer instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install flashings.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install perimeter sealant, backing materials, and installation criteria in accordance with Section 079005.

#### **3.03 TOLERANCES**

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 0.5 inches per 100 ft (12 mm/30 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).
- C. Sealant Space Between Panel System Members and Adjacent Construction: Maximum of 3/4 inch (19 mm) and minimum of 1/4 inch (6 mm).

#### **3.04 CLEANING**

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.05 PROTECTION

- A. Protect finished work from damage.

**END OF SECTION**



**SECTION 085413**  
**FIBERGLASS WINDOWS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Factory fabricated fiberglass windows with operating sash.
- B. Factory glazed .
- C. Operating hardware.
- D. Insect screens.
- E. Perimeter sealant.

1.02 RELATED REQUIREMENTS

- A. Section 079005 - Joint Sealers: Perimeter sealant and back-up materials.
- B. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 2011.
- B. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- C. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
- D. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2007.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.
- D. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.
- E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.
- B. Storage:
  - 1. Store materials in accordance with manufacturer's instructions.
  - 2. Store materials off ground and under cover.
  - 3. Protect materials from weather, direct sunlight, and construction activities.
- C. Handling: Protect materials and finish during handling and installation to prevent damage

#### 1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide ten year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Fiberglass Single-Hung Windows:
  - 1. Basis of Design: Pella Impervia, manufactured by Pella Corporation:  
[www.pella.com](http://www.pella.com).
    - a. Factory-assembled window with sash installed in frame.
    - b. Frame and Sash Material: Duracast. 5-layer, pultruded-fiberglass material, reinforced with interlocking mat.
  - 2. Substitutions: See Section 016000 - Product Requirements.

#### 2.02 WINDOW UNITS

- A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
  - 1. Performance Requirements: AAMA/WDMA/CSA 101/I.S.2/ A440 - 05.
  - 2. Configuration: Single-Hung.
  - 3. Color: White.
- B. Performance Requirements:
  - 1. Windows shall meet Rating H-LC50 specifications in accordance with ANSI/AAMA/NWDA 101/I.S.2.
  - 2. Forced Entry Resistance: Conform to ASTM F588 requirements for performance level 40 .
  - 3. Assembly: To accommodate, without damage to components or deterioration of seals, movement between window and perimeter framing, deflection of lintel.
  - 4. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft (1.5 L/s/sq m) of wall area, measured at a reference differential pressure across assembly of 1.57 psf (75 Pa) as measured in accordance with ASTM E283.
  - 5. Window Water Penetration, ASTM E 547: No water penetration through window when tested under static pressure of 4.5 psf (42 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 8 gallons per hour per square foot.

6. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.
7. Thermal Movement: Design sections to permit movement caused by thermal expansion and contraction of fiberglass to suit glass, infill, and perimeter opening construction.

### 2.03 COMPONENTS

#### A. Frames:

1. Type: Block frame.
2. Overall Frame Depth: 3 inches.
3. Nominal Wall Thickness of Fiberglass Members: 0.050 inch to 0.070 inch.
4. Frame Corners:
5. Mitered.
6. Joined and bonded with thermoset polyurethane adhesive, nylon corner lock, and mechanically fastened.
7. Sill: Fitted with weep valve assemblies.
8. Jamb: Factory-drilled, counter-bored, installation screw holes.

#### B. Sash:

1. Lower Sash: Lower sash vent, removable for cleaning exterior glass.
2. Upper Sash: Fixed.
3. Sash Corners:
  - a. Mitered.
  - b. Bonded and sealed with injected thermoset polyurethane adhesive.

#### C.

- D. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
- E. Insect Screens: Woven vinyl-coated, fiberglass mesh; 18/16 mesh size.
  1. Color: Black.
- F. Operable Sash Weather Stripping: Fin-type, dual-pile; permanently resilient, profiled to effect weather seal.

### 2.04 GLASS AND GLAZING MATERIALS

#### A. Glazing:

1. Float Glass: ASTM C 1036, Quality 1.
2. Type: 1 1/16-inch thick, insulating glass, clear multi-layer Low-E coated with argon.

### 2.05 SEALANT MATERIALS

- A. Perimeter Sealant and Backing Materials: Type 1 as specified in Section 079005.
- B. Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.

### 2.06 HARDWARE

- A. Balances: Galvanized steel block-and-tackle balances.
- B. Lock:
  1. Type: Self-aligning, cam-action lock.

2. Standard Finish: Match window interior.

2.07 FABRICATION

- A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.
- B. Form sills in one piece. Slope sills for wash.
- C. Form snap-in glass stops, closure molds, weather stops, and flashings for tight fit into window frame section.
- D. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- E. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- F. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with \_\_\_\_\_ retainers.
- G. Double weatherstrip operable units.
- H. Factory glaze window units.

**PART 3 EXECUTION**

3.01 INSTALLATION

- A. Install window units in accordance with manufacturers instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Place interior seal around window perimeter to maintain continuity of building thermal barrier using insulating-foam sealant.
- E. Install perimeter sealant and backing materials in accordance with Section 079005.

3.02 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.03 CLEANING

- A. Remove protective material from pre-finished surfaces.
- B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

**END OF SECTION**

**SECTION 087100**  
**DOOR HARDWARE**

**PART 1 GENERAL**

1.01 SUMMARY

- A. Section includes:
  - 1. Mechanical [and electrified] door hardware for the following:
    - a. Swinging doors.
    - b. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
- B. Exclusions: Hardware for the following is not provided under the scope of this section, unless specifically listed in the hardware sets:
  - 1. Windows
  - 2. Cabinets (casework), including locks in cabinets
  - 3. Signage
  - 4. Toilet accessories
  - 5. Overhead doors

1.02 RELATED SECTIONS:

- A. Division 01 Section "Alternates" for alternates affecting the work of this section.
- B. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation under the work of this section.
- C. Division 09 Sections for touchup finishing or refinishing of existing openings modified by the work of this section.
- D. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
- E. Division 28 Sections for coordination with other components of other components of electronic access control system.

1.03 REFERENCES

- A. Applicable state and local building codes and standards.
- B. Fire/Life Safety
  - 1. NFPA - National Fire Protection Association
    - a. NFPA 70 – National Electric Code
    - b. NFPA 80 - Standard for Fire Doors and Fire Windows
    - c. NFPA 101 - Life Safety Code
    - d. NFPA 105 - Smoke and Draft Control Door Assemblies
- C. UL - Underwriters Laboratories
  - 1. UL 10C - Positive Pressure Test of Fire Door Assemblies
  - 2. UL 1784 - Air Leakage Tests of Door Assemblies
  - 3. UL 305 - Panic Hardware
- D. Accessibility
  - 1. ADA - Americans with Disabilities Act.
  - 2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- E. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
  2. Recommended Locations for Builders Hardware
- F. ANSI - American National Standards Institute
1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

#### 1.04 SUBMITTALS

A. General:

1. Submit the following in accordance with Conditions of Contract and Division 01 requirements.
2. Advise Architect within the submittal package of incompatibility or issues which may detrimentally affect the work of this section.

B. Action Submittals:

1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit details of electrified door hardware, indicating the following:
  - a. Wiring Diagrams: For power, signal, and control wiring and including the following:
    - 1) Details of interface of electrified door hardware and building safety and security systems.
    - 2) Schematic diagram of systems that interface with electrified door hardware.
    - 3) Point-to-point wiring.
    - 4) Risers.
3. Samples for Verification: If requested by the Architect, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.
  - a. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Architect may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.
4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening. Include the following information:
  - a. Door Index; include door number, heading number, and Architects hardware set number.
  - b. Opening Lock Function Spreadsheet; list locking device and function for each opening.
  - c. Type, style, function, size, and finish of each hardware item.
  - d. Name and manufacturer of each item.
  - e. Fastenings and other pertinent information.
  - f. Location of each hardware set cross-referenced to indications on Drawings.
  - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
  - h. Mounting locations for hardware.

- i. Door and frame sizes and materials.
  - j. Name and phone number for the local manufacturer's representative for each product.
  - k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and/or access control components). Operational description should include how the door will operate on egress, ingress, and fire/smoke alarm connection.
    - 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
5. Key Schedule:
- a. After a keying meeting between representatives of the Owner, Architect, hardware supplier—provide a keying schedule listing the levels of keying as well as an explanation of the key system's function, the key symbols used and the door numbers controlled.
  - b. Utilize ANSI A156.28 “Recommended Practices for Keying Systems” as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system.
  - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
    - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
  - f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.
6. Templates: After final approval of the hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for the installation of door hardware.
- C. Informational Submittals:
1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
  2. Product Certificates for electrified door hardware, signed by the manufacturer:
    - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
    - b. Certificates of Compliance:
      - 1) Upon request of Architect or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.
      - 2) Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in “QUALITY ASSURANCE” article, herein.

- 3) Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
  - c. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
  - d. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
1. Operations and Maintenance Data : Provide in accordance with Division 01 and include the following:
    - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    - b. Catalog pages for each product.
    - c. Name, address, and phone number of local representative for each manufacturer.
    - d. Parts list for each product.
    - e. Copy of final approved hardware schedule, edited to reflect conditions as-installed.
    - f. Copy of final keying schedule.
    - g. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
    - h. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.

#### 1.05 QUALITY ASSURANCE

- A. Product Substitutions: For the purpose of performing the work of this section, comply with product requirements stated in Division 01 and as specified herein.
1. Where a specific manufacturer's product is named and accompanied by the words "No Substitute," including make or model number or other designation, provide the product exactly as specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
    - a. Where no additional products or manufacturers are listed in a product category, requirements for "No Substitute" govern product selection.
    - b. Where products indicate "acceptable substitute" or "acceptable manufacturer", provide product from specified manufacturers, subject to compliance with specified requirements and "Single Source Responsibility" requirements stated herein.
- B. Supplier Qualifications and Responsibilities: A recognized architectural hardware supplier that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.
1. Warehousing Facilities: In Project's vicinity.
  2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to the Architect and other related subcontractors.
  - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- C. Installer Qualifications: Qualified tradesmen, skilled in the application of commercial grade hardware that has a record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.
- D. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who can meet the following qualification requirements:
  1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
  2. Can provide installation and technical data to the Architect and other related subcontractors.
  3. Can inspect and verify components are in working order upon completion of installation.
  4. Capable of producing wiring diagrams.
  5. Capable of coordinating installation of the electrified hardware with the Architect and electrical engineers.
- E. Single Source Responsibility: Obtain each type of door hardware from a single manufacturer.
  1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
  2. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
  1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- I. 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.

- J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
  2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
    - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
    - d. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
    - e. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Attendees: Owner, Contractor, Architect, Installer, Supplier’s Architectural Hardware Consultant [and Owner's security consultant].
  2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
    - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    - b. Preliminary key system schematic diagram.
    - c. Requirements for key control system.
    - d. Requirements for access control.
    - e. Address for delivery of keys.
- L. Pre-installation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  2. Inspect and discuss preparatory work performed by other trades.
  3. EDIT - Retain first two subparagraphs below for electrified door hardware.
  4. Inspect and discuss electrical roughing-in for electrified door hardware.
  5. Review sequence of operation for each type of electrified door hardware.
  6. Review required testing, inspecting, and certifying procedures.
- M. Coordination Conferences:
1. Installation Coordination Conference: Prior to hardware installation, schedule and hold a meeting for the purpose of reviewing any questions or concerns related to the proper installation and adjustment of door hardware.
    - a. Attendees: doors hardware supplier, door hardware installer, Contractor.
    - b. After the meeting, provide letter of compliance to the Architect, indicating when the meeting was held and who was in attendance.

- c. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold a meeting for the purpose of coordinating door hardware with security, electrical, doors and frames, and other related suppliers.
  - 1) Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Architect and Contractor.
  - 2) After meeting, provide letter of compliance to the Architect, indicating when the coordination conference was held and who was in attendance.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
  1. Each article of hardware shall be individually packaged in manufacturer's original packaging.
- C. Project Conditions:
  1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
  2. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
  1. Promptly replace products damaged during shipping with exactly the same products.
  2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during the course of the Work.
  3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

#### 1.07 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify

existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

F. Direct shipments not permitted, unless approved by the Contractor.

#### 1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers:

1) Mechanical: 10 years.

2) Exit Devices:

(a) Mechanical: 3 years.

(b) Electrified: 1 year.

3) Locksets:

(a) Mechanical: 10 years.

(b) Electrified: 1 year.

4) Continuous Hinges: 10 years.

5) Key Blanks: Lifetime

b. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

B. MAINTENANCE

1. Maintenance Tools:

a. Furnish One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

A. The Awarding Authority has determined that certain products will be selected for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."

1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

B. Approval of manufacturers other than those listed shall be in accordance with QUALITY ASSURANCE article, herein.

C. Approval of products from manufacturers indicated as "Acceptable Manufacturer" in the following table is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

Item	Scheduled Manufacturer	Acceptable Substitute(s)
Hinges	Ives (IVE)	Hager, McKinney, Stanley
Electric Power Transfer	Von Duprin (VON)	None
Flush Bolts & Coordinators	Ives (IVE)	Burns, Rockwood
Locksets & Deadlocks	Schlage (SCH)	None

Exit Devices & Mullions	Von Duprin (VON)	None
Power Supplies	Schlage Electronics (SCE)	None
Roller Latches	Ives (IVE)	Burns, Rockwood
Cylinders & Keying	Schlage (SCH)	Best, Corbin-Russwin, Sargent, Falcon
Door Closers	LCN (LCN)	None
Door Trim	Ives (IVE)	Burns, Rockwood
Protection Plates	Ives (IVE)	Burns, Rockwood
Overhead Stops	Glynn-Johnson (GLY)	Rixson, Sargent
Stops & Holders	Ives (IVE)	Burns, Rockwood
Thresholds & Weatherstrip	National Guard (NGP)	Pemko, Zero
Silencers	Ives (IVE)	Burns, Rockwood
Door Position Switches	Schlage Electronics (SCE)	GE, Sargent

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

## 2.02 MATERIALS

- A. Fasteners
  - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
  - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
  - 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Review door specification and advise Architect if thru-bolts are required.
  - 4. Hardware shall be installed with the fasteners provided by the hardware manufacturer.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
  - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable – Hardwired Electronic Access Control Lockset [and Exit Device Trim]:
  - 1. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.

## 2.03 HINGES

- A. Provide five-knuckle, ball bearing hinges of type, material, and height as outlined in the following guide for this specification:
1. Manufacturers:
    - a. Scheduled Manufacturer: Ives 5BB series.
    - b. Acceptable Substitute: Hager BB series, McKinney TA/T4A series, Stanley FBB Series.
  - B. Requirements:
    1. 1-3/4 inch thick doors, up to and including 36 inches wide:
      - a. Exterior: standard weight, bronze/stainless steel, 4-1/2 inches high
      - b. Interior: standard weight, steel, 4-1/2 inches high
      - c. 1-3/4 inch thick doors over 36 inches wide:
        - 1) Exterior: heavy weight, bronze/stainless steel, 5 inches high
        - 2) Interior: heavy weight, steel, 5 inches high
      - d. 2 inches or thicker doors:
        - 1) Exterior: heavy weight, bronze/stainless steel, 5 inches high
        - 2) Interior: heavy weight, steel, 5 inches high
      - e. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
      - f. Where new hinges are specified for existing doors and/or existing frames, the new hinge size must be identical to hinge preparation present in the existing door and/or existing frame.
      - g. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
        - 1) Steel Hinges: Steel pins
        - 2) Non-Ferrous Hinges: Stainless steel pins
        - 3) Out-Swinging Exterior Doors: Non-removable pins
        - 4) Out-Swinging Interior Lockable Doors: Non-removable pins
        - 5) Interior Non-lockable Doors: Non-rising pins
      - h. The width of hinges shall be 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.
      - i. Provide hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to the electrified locking component.
      - j. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.
      - k. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches or less in height. Provide one additional bearing hinge for each 30 inches of additional door height.

## 2.04 ELECTRIC POWER TRANSFER

- A. Manufacturers:
1. Scheduled Manufacturer: Von Duprin
  2. Acceptable Substitute: None

- B. Provide power transfer sufficient for number and gage of wires to accommodate electric function of specified hardware.
- C. Electric power transfer is to be located per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

## 2.05 FLUSH BOLTS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Ives
  - 2. Acceptable Substitute: Burns, Rockwood
- B. Requirements:
  - 1. Provide automatic and manual flush bolts with forged bronze face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. Top rods at manual flush bolts for doors over 90 inches in height shall be increased by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.

## 2.06 COORDINATORS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Ives
  - 2. Acceptable Substitute: Burns, Rockwood
- B. Requirements:
  - 1. Provide a bar-type coordinating device, surface applied to the underside of the stop at the frame head where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors.
  - 2. Provide a filler bar of the correct length for the unit to span the entire width of the opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

## 2.07 CYLINDRICAL LOCKS – GRADE 1

- A. Manufacturer:
  - 1. Scheduled Manufacturer: Schlage ND Series
  - 2. Acceptable Substitute: None
- B. Requirements:
  - 1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1. Cylinders: Refer to "KEYING" article, herein.
  - 2. Provide solid steel rotational stops to control excessive rotation of the lever.
  - 3. Lockset to be completely refunctionable. Lockset design shall allow function of lock to be changed into over twenty other common functions by swapping easily accessible parts.
  - 4. Provide locks with a standard 2-3/4 inches backset, unless noted otherwise, with a 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
  - 5. Provide locksets with a separate anti-rotation throughbolts, and shall have no exposed screws. Levers shall operate independently, and shall have two external return spring cassettes mounted under roses to prevent lever sag.
  - 6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
  - 7. Provide electrical options as scheduled.

8. Lever trim shall be solid cast levers without plastic inserts, and wrought roses on both sides. Locksets shall be thru-bolted to assure proper alignment.
  - a. Lever design shall be Schlage Rhodes.
  - b. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.

## 2.08 EXIT DEVICES

### A. Manufacturers:

1. Scheduled Manufacturer: Von Duprin 98 series - No Substitute

### B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit and/or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
3. Exit devices shall incorporate a fluid damper or other device that eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail. End-cap will have two-point attachment to door. Touch-pad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes; for all other finishes, the touch-pad finish shall be of compatible finish to exit device. Only compression springs will be used in devices, latches, and outside trims or controls.
4. Exit devices to incorporate a deadlatching feature for security and/or for future addition of alarm kits and/or other electrical requirements.
5. Concealed vertical exit devices shall be a cable-actuated concealed vertical latch system available in two-point and less bottom latch (LBL) configurations. Vertical rods are not acceptable.
  - a. Cable shall include color-coded stainless steel with polytetrafluoroethylene (Teflon®) liner and stainless steel core wire. Latches and center slides are color coded to aid in installation. Conduit and core wire ends snap into latch and center slides without the use of tools. Latchbolts and blocking cams shall be manufactured from sintered metal low carbon copper- infiltrated steel, with a molybdenum disulfide coating for low friction and consistent performance.
  - b. Top latchbolt shall have a minimum 0.382 inch and greater than 90 degree engagement with strike to prevent door and frame separation under high static load. Bottom latchbolt, when used, shall have a minimum of 0.44 inch engagement with strike.
  - c. Product cycle life shall exceed 1,000,000 cycles.
  - d. Latch release does not require separate trigger mechanism.
  - e. Top and bottom latch must operate independently of each other. Top latch will fully engage top strike even when bottom latch is compromised.
  - f. Cable and latching system shall have the ability to:
    - 1) Be assembled as a complete assembly and function prior to being installed in the door.
    - 2) Install into the door as a one-piece single assembly
    - 3) Be installed independently of device installation and function on door even prior to device and trim installation.

- 4) Connect to the exit device at a single attachment point.
  - 5) Adjust bottom latch height from a single point, after the system is installed and connected to exit device, while the door is hanging
  - 6) Alter latch position up and down within two-inches without additional adjustment.
  - 7) Ability to remove the system while door is hanging.
  - 8) Configure latchbolt mounting: double or single tab mount for steel doors, and wood doors, face mount for aluminum doors, eliminating requirement of tabs.
  - 9) Provide adjustable exit device to latch center line adjustment. Ensures double tab mounting option for top latch, regardless of exit device centerline.
- g. Provide exit devices with manufacturer's approved strikes.
  - h. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.
  - i. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
  - j. Non-fire-rated exit devices shall have cylinder [hex key] dogging.
  - k. Removable mullions shall be a 2 inches x 3 inches steel tube. Where scheduled, mullion shall be of a type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
  - l. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
    - 1) Lever style will match the lever style of the locksets.
    - 2) Lever trim on doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
  - m. Exit devices for fire rated openings shall be UL labeled fire exit hardware.
  - n. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in the hardware sets.
  - o. Provide electrical options as scheduled.

## 2.09 POWER SUPPLIES

### A. Manufacturers:

1. Scheduled Manufacturer: Schlage Electronics PS900 series
2. Acceptable Substitutes: None

### B. Requirements:

1. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.
2. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking components with consideration for each

electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.

3. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.
4. Options: Provide the following options.
  - a. Provide a power supply, where specified, with the internal capability of charging optional sealed backup batteries 24 VDC, or as required, in addition to operating the DC load.
  - b. Provide sealed batteries for battery back-up at each power supply where specified.
  - c. Provide keyed power supply cabinet.
  - d. Provide a power supply complete requiring only 120VAC to the fused input and shall be supplied in an enclosure.
  - e. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating "no delay" exiting mode.

#### 2.10 ROLLER LATCHES

##### A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Substitutes: Burns, Rockwood.

##### B. Requirements:

1. Provide roller latches with a 4-7/8 inches strike at single doors to fit ANSI frame prep. If dummy levers are used in conjunction with roller latch mount the roller latch at a height as to not interfere with the proper mounting and height of the dummy lever.
2. Provide roller latches 2-1/4 inches full lip strike at pair doors. Mount roller in the top rail of each leaf per manufacturer's template.

#### 2.11 CYLINDERS

##### A. Manufacturer:

1. Scheduled Manufacturer: Schlage Lock Company existing key system manufacturer and product, No Substitute

##### B. Requirements: Provide cylinders/cores complying with the following requirements.

1. Furnished by same manufacturer as locks.
2. Cylinders/cores compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated.
  - a. Full-sized cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
    - 1) High Security Primus, interchangeable core on exterior doors. Everest D restricted cores on interior doors Conventional cylinder with interchangeable core with keyway compatible with existing system.
  - b. Keying:
    - 1) Manufacturer-keyed permanent cylinders/cores, configured into existing keying system per "KEYING" article herein.
  - c. Features: Cylinders/cores shall incorporate the following features.

- 1) Nickel silver bottom pins.
  - d. Identification:
    - 1) Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.
    - 2) Identification stamping provisions must be approved by the Architect and Owner.
    - 3) Failure to comply with stamping requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.
  - e. Forward cylinders/cores to Owner, separately from keys, by means as directed by Owner.
  - f. Exterior Doors: Security cylinders with permanent interchangeable cores requiring use of restricted, patented keys incorporating dual-locking mechanism with 5 interlocking pins to check for patented key features.
  - g. Doors Designated as High Security: High security cylinders with permanent cores requiring use of restricted, patented keys incorporating dual-locking mechanism with 5 interlocking pins to check for patented key features; compliant with UL437 for drill and pick resistance; and integrated into exterior keying system without change to bitting combinations.
  - h. Interior Doors: Conventional cylinders with interchangeable cores requiring use of restricted, patented keys incorporating dual-locking mechanism with 1 nickel silver blocking pin to check for patented key features; and integrated into exterior system without change to bitting combinations.
- C. Temporary Construction Cylinder Keying.
- 1. Provide construction cores that permit voiding construction keys without cylinder removal, furnished in accordance with the following requirements.
    - a. Construction Keying System.
    - b. 3 construction control keys and extractor tool, if required.
    - c. 12 construction change (day) keys.
    - d. Owner or Owner's Representative will void operation of temporary construction keys.
- D. Replaceable Construction Cores..
- 1. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
    - a. 12 construction change (day) keys.
    - b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.
- 2.12 KEYING
- A. Keying System: Factory registered, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
  - B. Keying System: Existing Schlage Primus Great Grand Masterkey system maintained by Owner or Owners representative, incorporating decisions made at keying conference.
  - C. Keying Requirements – General
    - 1. Permanent cylinders/cores keyed by the manufacturer according to the following key system.

- a. Keying system tied into existing system as directed by the Owner.
  - b. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.
- D. Key Features: Provide keys with the following features.
- 1. Patent Protection: Keys and blanks protected by one or more utility patent(s).
  - 2. Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.
    - a. One allocation within postal zip codes with the same first 2 digits.
    - b. One allocation per time zone.
    - c. One allocation per Country.
- E. Keys
- 1. Material: Nickel silver; minimum thickness of .092-inch (2.3mm)
  - 2. Identification:
    - a. Coordinate with cylinder/core and key identification requirements above.
    - b. Stamp keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    - c. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.
    - d. Quantity: Furnish in the following quantities.
      - 1) Change (Day) Keys: 3 per cylinder/core.
      - 2) Permanent Control Keys: 3.
      - 3) Master Keys: 6.
      - 4) Unused balance of key blanks shall be furnished to Owner with the cut keys.

## 2.13 KEY CONTROL SYSTEM

- A. Key Control System Manufacturers:
- 1. Scheduled Manufacturer: Telkee
  - 2. Acceptable Substitution: HPC, Lund
- B. Requirements:
- 1. Provide a key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the Project.
    - a. Provide complete cross index system set up by the hardware supplier, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
    - b. Provide hinged-panel type cabinet for wall mounting.

## 2.14 DOOR CLOSERS

- A. Manufacturers:
- 1. Scheduled Manufacturer: LCN 4010/4110 series. No Substitute

## B. Requirements:

1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
2. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder, and shall utilize full complement bearings at shaft. Cylinder body shall be 1-1/2 inch diameter, and double heat-treated pinion journal shall be 11/16 inch diameter.
3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
5. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within a 6-inch top rail without the use of a mounting plate so that closer shall not be visible through vision panel from pull side.
6. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
7. Closer cylinders, arms, adapter plates, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or shall have special rust inhibitor (SRI).
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

## 2.15 DOOR TRIM

## A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Substitution: Burns, Rockwood.

## B. Requirements:

1. Provide push plates 4 inches wide x 16 inches high x 0.050 inch thick and beveled 4 edges. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Push bars shall be of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as specified. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.

6. Provide pull plates 4 inches wide x 16 inches high x 0.050 inch thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.

#### 2.16 PROTECTION PLATES

##### A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Substitute: Burns, Rockwood.

##### B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch thick as scheduled. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be as follows:
  - a. Kick Plates – 10 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs
  - b. Mop Plates – 4 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs
  - c. Armor Plates – 36 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs

#### 2.17 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

##### A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Substitutes: Rixson, Sargent

##### B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or overhead stop/holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or overhead stop/holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or overhead stop/holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking a wall, open against equipment, casework, sidelights, and/or where conditions do not allow a wall stop or a floor stop presents a tripping hazard.
4. Where overhead holders are specified provide friction type at doors without a closer and positive type at doors with a closer.

#### 2.18 DOOR STOPS AND HOLDERS

##### A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Substitution: Burns, Rockwood.

##### B. Provide door stops for all doors in accordance with the following requirements:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where wall stops cannot be used, provide dome type floor stops of the proper height.
3. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.

## 2.19 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

### A. Manufacturers:

1. Scheduled Manufacturer: National Guard.
2. Acceptable Substitutions: Pemko, Zero.

### B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items as closely as possible. Size of thresholds shall be as follows:
  - a. Saddle Thresholds – 1/2 inch high x jamb width x door width
  - b. Bumper Seal Thresholds – 1/2 inch high x 5 inches wide x door width
  - c. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

## 2.20 SILENCERS

### A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Substitutions: Burns, Rockwood.

### B. Requirements:

1. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.

## 2.21 DOOR POSITION SWITCHES

### A. Manufacturers:

1. Scheduled Manufacturer: Schlage Electronics.
2. Acceptable Substitutions: GE-Interlogix, Sargent.

### B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Switches shall be installed as recommended by manufacturers installation instructions and coordinated with other hardware being installed on the opening. Coordinate door and frame preparations with door and frame suppliers. If separate switches are being used with a magnetic locking device provide a minimum of 4 inches between the switch and the magnetic locking device.

## 2.22 FINISHES

### A. Finish of all hardware shall be US26D (BHMA 626/652) with the exceptions as follows:

1. Hinges at Exterior Doors: US32D (BHMA 630).
2. Continuous Hinges: US32D (BHMA 630).
3. Push Plates, Pulls, and Push Bars: US32D (BHMA 630).
4. Protection Plates: US32D (BHMA 630).
5. Overhead Stops and Holders: US32D (BHMA 630).
6. Door Closers: Powder Coat to Match.
7. Wall Stops: US32D (BHMA 630).
8. Latch Protectors: US32D (BHMA 630).

9. Weatherstripping: Clear Anodized Aluminum.
10. Thresholds: Mill Finish Aluminum.

## 2.23 EXECUTION

### A. EXAMINATION

1. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
2. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with the existing door and frame preparation and existing conditions.
3. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

### B. PREPARATION

1. Where on-site modification of doors and frames is required, prepare hardware locations in accordance with the following:
  - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
  - b. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
  - c. Where doors are in rated assemblies, comply with NFPA 80 for restrictions on on-site door hardware preparation.
  - d. Where on-site modification of existing doors and frames is required:
    - 1) Remove existing hardware being replaced, tag, and store according to contract documents.
    - 2) Field modify and prepare existing door and/or frame for new hardware being installed.
    - 3) When modifications are exposed to view, use concealed fasteners, when possible.

### C. INSTALLATION

1. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - a. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - b. Custom Steel Doors and Frames: HMMA 831.
  - c. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
2. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
3. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
4. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

5. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
6. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.
7. 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.
8. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).
9. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - a. Furnish permanent cores to Owner for installation.
10. Wire (including low voltage): Coordinate with the following work, provided under the scope of Division 26, ELECTRICAL.
  - a. Conduit, junction boxes and wire pulls.
  - b. Connections to and from power supplies to electrified hardware.
  - c. Connections to fire/smoke alarm system and smoke evacuation system.
  - d. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
  - e. Testing and labeling wires with the Architect's opening number.
11. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
12. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
13. Closer/holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
14. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
  - a. Configuration: Provide [one power supply for each door opening][least number of power supplies required to adequately serve doors] with electrified door hardware.
15. Thresholds: Set thresholds scheduled herein, in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
16. 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 may impede traffic or present a tripping hazard.
17. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
18. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

19. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

D. FIELD QUALITY CONTROL

1. Architectural Hardware Consultant: Engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  - a. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

E. ADJUSTING

1. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - a. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  - b. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
2. Occupancy Adjustment: Approximately three [six] <Insert number> months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

F. CLEANING AND PROTECTION

1. Clean adjacent surfaces soiled by door hardware installation.
2. Clean operating items as necessary to restore proper function and finish.
3. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

G. DEMONSTRATION

1. Provide training for the Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

H. DOOR HARDWARE SCHEDULE

1. Provide hardware for each door to comply with requirements of this section and the below-listed scheduled sets.
2. It is intended that the following schedule includes complete items of door hardware necessary to complete the work. If a discrepancy is found in the scheduled hardware sets, such as a missing item, improper hardware for a frame, door or fire codes, provisions of the above-specifications shall govern.
3. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
4. Hardware Sets:

HARDWARE SET NO. 01

FOR USE ON DOOR #(S):

100, 111, 126C

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3 EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1 EA	POWER TRANSFER	EPT10	689	VON
1 EA	ELEC PANIC HARDWARE	RX-98-L-E996-06-FSE	626	VON
1 EA	RIM CYLINDER	20-057	626	SCH
1 EA	PRIMUS CORE	20-740	626	SCH
1 EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	DRIP CAP	17	AL	NGP
1 SET	SEALS	5050B	BRN	NGP
1 EA	DOOR SWEEP	C627A	CL	NGP
1 EA	THRESHOLD	896S	AL	NGP
1 EA	CARD READER	FURNISHED BY OTHERS		
1 EA	DOOR CONTACT	679-05HM	BLK	SCE
1 EA	POWER SUPPLY	PS902	LGR	SCE

DOOR OPERATION: DOOR NORMALLY CLOSED AND SECURE. ENTRY FROM SECURE SIDE BY VALID CARD CREDENTIAL OR KEY OVERRIDE WHICH WILL UNLOCK ELECTRIFIED LOCK. FREE EGRESS FROM INSIDE AT ALL TIMES. DOOR POSITION SWITCH AND REQUEST TO EXIT CONNECTED TO BE CONNECTED TO ACCESS CONTROL SYSTEM FOR MONITORING.

HARDWARE SET NO. 02

FOR USE ON DOOR #(S):

118A, 126A, 126B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3 EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1 EA	PANIC HARDWARE	98-EO 626		VON
1 EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	DRIP CAP	17	AL	NGP
1 SET	SEALS	5050B	BRN	NGP

1 EA	DOOR SWEEP	C627A	CL	NGP
1 EA	THRESHOLD	896S	AL	NGP
1 EA	DOOR CONTACT	679-05HM	BLK	SCE

HARDWARE SET NO. 03  
 FOR USE ON DOOR #(S):  
 112, 118B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	DUMMY PUSH BAR	350-L-DT-996-06	626	VON
1 EA	SURFACE CLOSER	4111 SCUSH	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 04  
 FOR USE ON DOOR #(S):

125C, 125D, 125E, 125F, 126D, 126E, 126F, 126G

PROVIDE EACH RU DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
ALL HARDWARE BY DOOR MANUFACTURER				

HARDWARE SET NO. 05  
 FOR USE ON DOOR #(S):

123B

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2 EA	CONT. HINGE	715	630	IVE
1 EA	PANIC HARDWARE	9849-EO-LBL	626	VON
1 EA	PANIC HARDWARE	9849-L-996-06-LBL	626	VON
1 EA	RIM CYLINDER	20-057	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
2 EA	SURFACE CLOSER	4111 SHCUSH	689	LCN
2 EA	KICK PLATE	8400 10" X 1" LDW B4E	630	IVE
1 SET	SEALS	5050B	BRN	NGP
1 SET	SEALS	5060B	BRN	NGP

2 EA	DOOR SWEEP	600A	CL	NGP
2 EA	THRESHOLD	513	AL	NGP

HARDWARE SET NO. 06

FOR USE ON DOOR #(S):

125A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1 EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
1 EA	SURFACE CLOSER	4111 CUSH	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 SET	SEALS	5050B	BRN	NGP
1 EA	DOOR SWEEP	600A	CL	NGP
1 EA	THRESHOLD	513	AL	NGP

HARDWARE SET NO. 07

FOR USE ON DOOR #(S):

125B

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6 EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE

1 EA	MANUAL FLUSH BOLT	FB458	626	IVE
1 EA	DUST PROOF STRIKE	DP2	626	IVE
1 EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
1 EA	OH STOP	90S INACTIVE LEAF ONLY	630	GLY
1 EA	SURFACE CLOSER	4111 HCUSH ACTIVE LEAF ONLY	689	LCN
2 EA	KICK PLATE	8400 10" X 1" LDW B4E	630	IVE
1 SET	SEALS	5050B	BRN	NGP
1 SET	SEALS	5060B	BRN	NGP
2 EA	DOOR SWEEP	600A	CL	NGP
1 EA	THRESHOLD	513	AL	NGP

HARDWARE SET NO. 08

NOT USED.

HARDWARE SET NO. 09

FOR USE ON DOOR #(S):

103

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1 EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
1 EA	SURFACE CLOSER	4111 HCUSH	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 SET	SEALS	5020B	BRN	NGP

HARDWARE SET NO. 10

FOR USE ON DOOR #(S):

102, 106, 107, 122A, 122B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	ENTRANCE/OFFICE LOCK	ND50TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
1 EA	WALL STOP	WS406CCV	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 11

FOR USE ON DOOR #(S):

109

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
1 EA	SURFACE CLOSER	4011	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	WALL STOP	WS406CCV	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 12

FOR USE ON DOOR #(S):

108, 117A, 117B, 119

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
1 EA	WALL STOP	WS406CCV	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 13

FOR USE ON DOOR #(S):

117C

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
6 EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
2 EA	MANUAL FLUSH BOLT	FB458	626	IVE
1 EA	DUST PROOF STRIKE	DP2	626	IVE
1 EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
2 EA	OH STOP	90S	630	GLY

2 EA SILENCER SR64 GRY IVE

HARDWARE SET NO. 14  
 FOR USE ON DOOR #(S):  
 117

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	DUMMY PUSH BAR	350-L-DT-996-06	626	VON
1 EA	SURFACE CLOSER	4111 HCUSH	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 15  
 FOR USE ON DOOR #(S):  
 105, 113, 121

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1 EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
1 EA	OH STOP	90S	630	GLY
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 16  
 FOR USE ON DOOR #(S):  
 110

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2 EA	ROLLER LATCH	RL32	626	IVE
2 EA	DOOR PULL, 3/4" RND	8102 8" STD	630	IVE
2 EA	OH STOP	90S	630	GLY
2 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 17

FOR USE ON DOOR #(S):

101, 120

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	PRIVACY LOCK	ND40S RHO	626	SCH
1 EA	SURFACE CLOSER	4011	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 SET	SEALS	5020B	BRN	NGP

HARDWARE SET NO. 18

FOR USE ON DOOR #(S):

115, 116

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	PUSH PLATE	8200 4" X 16"	630	IVE
1 EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1 EA	SURFACE CLOSER	4111 EDA	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	WALL STOP	WS406CCV	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 19

FOR USE ON DOOR #(S):

104

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY.	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3 EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1 EA	STOREROOM LOCK	ND80TD RHO	626	SCH
1 EA	SURFACE CLOSER	4011	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 EA	WALL STOP	WS406CCV	630	IVE
3 EA	SILENCER	SR64	GRY	IVE

HARDWARE SET NO. 20

FOR USE ON DOOR #(S):

123A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

<u>QTY.</u>	<u>DESCRIPTION</u>	<u>CATALOG NUMBER</u>	<u>FINISH</u>	<u>MFR</u>
3 EA	HW HINGE	5BB1HW 4.5 X 4.5	652	IVE
1 EA	CLASSROOM LOCK	ND70TD RHO	626	SCH
1 EA	FSIC CORE	23-030	626	SCH
1 EA	SURFACE CLOSER	4011	689	LCN
1 EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1 SET	SEALS	5050B	BRN	NGP
1 EA	DOOR SWEEP	600A	CL	NGP
1 EA	THRESHOLD	513	AL	NGP

**END OF SECTION**

**SECTION 088000****GLAZING****PART 2 PRODUCTS****1.01 GLAZING TYPES**

- A. Type 1 - Sealed Insulating Glass Units: Vision glazing, low-E.
  - 1. Application(s): All exterior glazing unless otherwise indicated.
  - 2. Substitutions: Refer to Section 016000 - Product Requirements.
  - 3. Between-lite space filled with argon.
  - 4. Thermal Resistance (U-Value): 0.26, nominal.
  - 5. Total Solar Heat Gain Coefficient: 0.27, nominal.
  - 6. Total Visible Light Transmittance: 64 percent.
  - 7. Basis of Design: PPG Industries, Inc: [www.ppgideascape.com](http://www.ppgideascape.com).
  - 8. Outboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
    - a. Coating: PPG Sungate 500 on #2 surface, no coating on #3 surface.
    - b. Tint: None (clear).
    - c. Tint: None (clear).
  - 9. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick.
    - a. Tint: None (clear).
  - 10. Total Thickness: 1 inch (25 mm).
- B. Type 1A - Sealed Insulating Glass Units: Safety glazing:
  - 1. Applications: Provide this type of glazing in the following locations:
    - a. Glazed lites in exterior doors.
    - b. Glazed sidelights and panels next to doors.
    - c. Windows and storefront that extend to below 18" above finished floor.
    - d. Other locations required by applicable federal, state, and local codes and regulations.
    - e. Other locations indicated on the drawings.
  - 2. Type: Same as Type 1 except use fully tempered float glass for both outboard and inboard lites.
- C. Type 2 - NOT USED.
- D. Type 3 - Single Safety Glazing: Non-fire-rated.
  - 1. Applications: Provide this type of glazing in the following locations:
    - a. Glazed lites in doors, except fire doors.
    - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
    - c. Other locations required by applicable federal, state, and local codes and regulations.
    - d. Other locations indicated on the drawings.
  - 2. Type: Laminated safety glass as specified.
  - 3. Tint: Clear.
  - 4. Thickness: 1/4 inch (6 mm).
- E. Type 4 - NOT USED.
- F. Type 5 - Single Vision Glazing:
  - 1. Applications: All interior glazing unless otherwise indicated.
  - 2. Type: Annealed float glass.

3. Tint: Clear.
4. Thickness: 1/4 inch (6 mm).

#### 1.02 EXTERIOR GLAZING ASSEMBLIES

- A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.
  1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
  2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
  3. Thicknesses listed are minimum.
- B. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:
  1. In conjunction with vapor retarder and joint sealer materials described in other sections.
  2. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

#### 1.03 GLASS MATERIALS

- A. Float Glass Manufacturers:
  1. AGC Flat Glass North America, Inc: [www.na.agc-flatglass.com](http://www.na.agc-flatglass.com).
  2. Guardian Industries Corp: [www.sunguardglass.com](http://www.sunguardglass.com).
  3. Pilkington North America Inc: [www.pilkington.com/na](http://www.pilkington.com/na).
  4. PPG Industries, Inc: [www.ppgideascape.com](http://www.ppgideascape.com).
  5. Substitutions: Refer to Section 016000 - Product Requirements.
- B. Float Glass: All glazing is to be float glass unless otherwise indicated.
  1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
  2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
  3. Tinted Types: Color and performance characteristics as indicated.
  4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.
- C. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
  1. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
  2. Plastic Interlayer: 0.060 inch (1.52 mm) thick, minimum.
  3. Where fully tempered is specified or required, provide glass that has been tempered by the tong-less horizontal method.
- D. Fire-Resistance-Rated Composite Glazing: Multi-layer glazing UL- or WH-listed as fire-resistance-rated glazing and complying with 16 CFR 1201 test requirements for Category II without the use of a surface-applied film.
  1. Fire Rating: As indicated; tested as a wall, not as opening protection.
  2. Manufacturers:
    - a. Technical Glass Products.
    - b. Substitutions: Refer to Section 016000 - Product Requirements.

#### 1.04 SEALED INSULATING GLASS UNITS

- A. Manufacturers:
  - 1. Any fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty, if any.
  - 2. Substitutions: Refer to Section 016000 - Product Requirements.
- B. Sealed Insulating Glass Units: Types as indicated.
  - 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
  - 2. Edge Spacers: Aluminum, bent and soldered corners.
  - 3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
  - 4. Purge interpane space with dry hermetic air.

#### 1.05 GLAZING COMPOUNDS

- A. Glazing Putty : Polymer modified latex , knife grade consistency; grey color.
- B. Polysulfide Sealant : Two component; chemical curing, non-sagging type; ASTM C 920, Type M, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; color as selected.
- C. Silicone Sealant : Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; color as selected.

**END OF SECTION**



**SECTION 092116**  
**GYP SUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Metal stud wall framing.
- B. Acoustic insulation.
- C. Gypsum wallboard.
- D. Glass Mat Water-Resistant Gypsum Backer Board
- E. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 054000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.
- B. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 072100 - Thermal Insulation: Acoustic insulation.
- D. Section 079005 - Joint Sealers: Acoustic sealant.

1.03 REFERENCE STANDARDS

- A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).
- B. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2009a.
- C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2009a.
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2008.
- E. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2010.
- F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.
- G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2010a.
- H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2009a.
- I. ASTM C1629/C1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2006.
- J. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000 (Reapproved 2005).
- K. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2010.
- L. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. Test Reports: For all stud framing products that do not comply with ASTM C645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

#### 1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing.

### **PART 2 PRODUCTS**

#### 2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
  - 1. See PART 3 for finishing requirements.
- B. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
  - 1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL Fire Resistance Directory. Refer to Drawings for UL Assembly Numbers.

#### 2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
  - 1. Clarkwestern Dietrich Building Systems LLC: [www.clarkdietrich.com](http://www.clarkdietrich.com).
  - 2. Dietrich Metal Framing: [www.dietrichindustries.com](http://www.dietrichindustries.com).
  - 3. MarinoWare: [www.marinoware.com](http://www.marinoware.com).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/360 at 5 psf (240 Pa).
  - 1. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi (275 MPa) minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
    - a. Acceptable Products:
      - 1) Dietrich Metal Framing; UltraSteel (tm): [www.dietrichindustries.com](http://www.dietrichindustries.com).
      - 2) Clark Western Building Systems; UltraSteel (tm): [www.clarkwestern.com](http://www.clarkwestern.com).
  - 2. Studs: "C" shaped with flat or formed webs 33 mil (20 gage) minimum.
  - 3. Runners: U shaped, sized to match studs.
  - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
- C. Loadbearing Studs for Application of Gypsum Board: As specified in Section 054000.

- D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.

## 2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
1. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
  2. Georgia-Pacific Gypsum LLC: [www.gp.com/gypsum](http://www.gp.com/gypsum).
  3. Lafarge North America Inc: [www.lafargenorthamerica.com](http://www.lafargenorthamerica.com).
  4. National Gypsum Company: [www.nationalgypsum.com](http://www.nationalgypsum.com).
  5. USG Corporation: [www.usg.com](http://www.usg.com).
  6. Substitutions: See Section 016000 - Product Requirements.
- B. Gypsum Wallboard (Typical): Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  2. Glass-mat-faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
  3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold-resistant board is required at all locations.
  4. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
  5. Thickness:
    - a. Vertical Surfaces: 5/8 inch (16 mm).
    - b. Ceilings: 5/8 inch (16 mm).
  6. Mold-Resistant Paper-Faced Products:
    - a. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.
    - b. Lafarge North America Inc; Mold Defense Drywall.
    - c. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
    - d. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
    - e. Substitutions: See Section 016000 - Product Requirements.
  7. Glass-Mat-Faced Products:
    - a. Georgia-Pacific Gypsum LLC; DensArmor Plus.
    - b. Temple-Inland Inc; GreenGlass Interior Gypsum Board.
    - c. Georgia-Pacific Gypsum LLC; DensArmor Plus Abuse Guard.
    - d. National Gypsum Company; Gold Bond e2XP Interior Extreme.
    - e. Substitutions: See Section 016000 - Product Requirements.
- C. Abuse-Resistant Wallboard: Tested to Level 2, Moderate Duty in accordance with ASTM C 1629.
1. Application: Locations below 8'-0" above finished floor, in the following spaces: Meeting/Break Room, Vestibule 111, Lobby 112, Lockers 114, Work 118, Storage 123, Parts 124 and Janitor 121..
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
  4. Thickness: 5/8 inch (16 mm).

5. Edges: Tapered.
  6. Products:
    - a. National Gypsum Company; Gold Bond Hi-Abuse Brand XP Wallboard
    - b. National Gypsum Company; Gold Bond Hi-Impact Brand XP Wallboard.
    - c. Temple-Inland Inc; ComfortGuard AR Abuse Resistant.
    - d. Temple-Inland Inc; ComfortGuard IR Impact Resistant.
    - e. Georgia Pacific; DensArmor Plus Abuse Resistant.
    - f. Substitutions: See Section 016000 - Product Requirements.
- D. Backing Board for Tile:
1. Application: Surfaces behind tile in wet areas including toilet rooms.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. Glass-Mat-Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178.
    - a. Standard Type: Thickness 5/8 inch (16 mm).
    - b. Fire-Resistant Type: Type X core, thickness 5/8 inch (16 mm).
    - c. Products:
      - 1) Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
      - 2) National Gypsum Company; Gold Bond e2XP Tile Backer.
      - 3) Temple-Inland Inc; GreenGlass Tile Backer.
      - 4) Substitutions: See Section 016000 - Product Requirements.

#### 2.04 ACCESSORIES

- A. Acoustic Sealant: As specified in Section 079005; Type 5.
- B. Finishing Accessories: ASTM C 1047, paper-faced galvanized steel, unless otherwise indicated.
  1. Types: As detailed or required for finished appearance.
- C. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
  1. Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
  2. Ready-mixed vinyl-based joint compound.
  3. Chemical hardening type compound.
- D. Screws for Attachment to Steel Members Less Than 0.03 inch (0.7 mm) In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type.
- E. Screws for Attachment to Steel Members From 0.033 to 0.112 inch (0.8 to 2.8 mm) in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.
- F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
  1. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.
- G. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that project conditions are appropriate for work of this section to commence.

**3.02 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Studs: Space studs at 16 inches (406 mm) on center.
  - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
  - 2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- D. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.
  - 1. Orientation: Horizontal.
  - 2. Spacing: At 16 inches (400 mm) on center.
- E. Blocking: Install wood blocking for support of:
  - 1. Framed openings.
  - 2. Wall mounted cabinets.
  - 3. Plumbing fixtures.
  - 4. Toilet partitions.
  - 5. Toilet accessories.
  - 6. Wall mounted door hardware.
  - 7. Handrails, grab bars and toilet accessories.
  - 8. Wall brackets.
  - 9. Tack and markerboards.

**3.03 ACOUSTIC ACCESSORIES INSTALLATION**

- A. Acoustic Sealant: Install at all acoustical partitions as follows:
  - 1. Place one bead continuously on substrate before installation of perimeter framing members.
  - 2. Place continuous bead at perimeter of each layer of gypsum board.
  - 3. In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts, and rough-in boxes.

**3.04 BOARD INSTALLATION**

- A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

- C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
- D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- E. Installation on Metal Framing: Use screws for attachment of all gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.
- F. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

### 3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
  - 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
- B. Corner Beads: Install at external corners, using longest practical lengths.

### 3.06 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Paper Faced Gypsum Board: Use paper or fiberglass joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
  - 3. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
  - 2. Taping, filling and sanding is not required at base layer of double layer applications.
- E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

### 3.07 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

**END OF SECTION**

**SECTION 093000**

**TILING**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Marble thresholds.
- D. Trim.

1.02 RELATED REQUIREMENTS

- A. Section 079005 - Joint Sealers.
- B. Section 092116 - Gypsum Board Assemblies: Installation of tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2012.1.
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2012.1.
- C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; 2012.1.
- D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2012.1.
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 2012.1.
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 2012.1.
- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 2012.1.
- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2012.1.
- J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2012.1.
- K. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2012.1.
- L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior glue plywood) Latex-Portland Cement Mortar; 2012.1.
- M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2012.1.

- N. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 2012.1.
- O. ANSI A118.7 - American National Standard Specifications for Polymer Modified Cement Grouts for Tile Installation; 2012.1.
- P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.
- Q. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2012.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Samples: Mount tile and apply grout on two plywood panels, minimum 24 x24 inches (\_\_\_x\_\_\_ mm) in size illustrating pattern, color variations, and grout joint size variations.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Tile: 1 percent of each size, color, and surface finish combination.

#### 1.05 QUALITY ASSURANCE

- A. Maintain one copy of The Tile Council of North America Handbook and ANSI A108 Series/A118 Series on site.
- B. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

#### 1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

### **PART 2 PRODUCTS**

#### 2.01 TILE

- A. Manufacturers: All products by the same manufacturer.
  - 1. American Olean: [www.americanolean.com](http://www.americanolean.com).
  - 2. Dal-Tile Corporation: [www.daltile.com](http://www.daltile.com).
  - 3. Substitutions: See Section 016000 - Product Requirements.
- B. Ceramic Mosaic Tile : ANSI A137.1, and as follows:
  - 1. Unglazed Colorbody Porcelain Mosaics manufactured by American Olean or approved equivalent product.
  - 2. Moisture Absorption: 0 to 0.5 percent.
  - 3. Size and Shape: 2 inch square (50 mm square).

4. Edges: Square.
  5. Surface Finish: Unglazed.
  6. Colors: price group 1 or 2 .
  7. Trim Units: Matching cove shapes in sizes coordinated with field tile.
- C. Glazed Wall Tile : ANSI A137.1, and as follows:
1. Bright and Matte manufactured by American Olean or approved equivalent product.
  2. Moisture Absorption: 3.0 to 7.0 percent.
  3. Size and Shape: 4.25 inches, square (108 mm).
  4. Edges: Cushioned.
  5. Surface Finish: High gloss.
  6. Colors: Price Group 1 or 2.
  7. Trim Units: Matching bullnose shapes in sizes coordinated with field tile.

## 2.02 TRIM AND ACCESSORIES

- A. Ceramic Trim: Matching bullnose and cove base ceramic shapes in sizes coordinated with field tile.
1. Applications: Use in the following locations:
    - a. Open Edges: Bullnose.
    - b. Inside Corners: Jointed.
    - c. Floor to Wall Joints: Cove base.
  2. Manufacturer: Same as for tile.
- B. Thresholds: Marble, white or gray, honed finish; 4 inches (100 mm) wide by full width of wall or frame opening; \_\_\_\_ inch thick; beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.

## 2.03 SETTING MATERIALS

- A. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
1. Application(s): Use this type of bond coat where indicated and where no other type of bond coat is indicated.
  2. Products:
    - a. Custom Building Products; MegaLite: [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
    - b. LATICRETE International, Inc; LATICRETE 254 Platinum: [www.laticrete.com](http://www.laticrete.com).
    - c. Merkrete, by Parex USA, Inc; Merkrete 720 Marble Pro: [www.merkrete.com](http://www.merkrete.com).
    - d. ProSpec, an Oldcastle brand; Permalastic System: [www.prospec.com](http://www.prospec.com).
    - e. Substitutions: See Section 016000 - Product Requirements.

## 2.04 MORTAR MATERIALS

- A. Mortar Bond Coat Materials for Thin-Set Installations:
1. Latex-Portland Cement type: ANSI A118.4.

## 2.05 GROUTS

- A. Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
  2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.

3. Color(s): As selected by Architect from manufacturer's full line.
- B. Grout Sealant: Manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.
  1. Products:
    - a. Bonsal, W. R., Company; Grout Sealer.
    - b. Bostik; CeramaSeal Grout Sealer.
    - c. C-Cure; Penetrating Sealer 978.
    - d. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
    - e. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
    - f. TEC Specialty Products Inc.; TA-256 Penetrating Silicone Grout Sealer.”

#### 2.06 THIN-SET ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
  1. Crack Resistance: No failure at 1/16 inch (1.6 mm) gap, minimum.
  2. Providing compliance with performance requirements and manufacturer's installation requirements, the following trowel applied crack prevention membrane is approved:
    - a. RedGard Waterproofing and Crack Prevention Membrane manufactured by Custom Building Products.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

#### 3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler.

#### 3.03 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and The Tile Council of North America Handbook recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install thresholds where indicated.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints.
- K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

#### 3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with The Tile Council of North America Handbook Method F113 - Latex/Polymer Modified Portland Cement Mortar and Polymer Modified Grout, unless otherwise indicated.

#### 3.05 INSTALLATION - WALL TILE

- A. Over coated glass mat backer board on studs, install in accordance with The Tile Council of North America Handbook Method W245, thin-set with latex-Portland cement bond coat.

#### 3.06 GROUTING

- A. Follow grout manufacturer's recommendations as to grouting procedures and precautions.
- B. Remove all grout haze, observing both tile and grout manufacturer's recommendations as to use of acid and chemical cleaners.
- C. Rinse tile work thoroughly with clean water before and after chemical cleaners.
- D. Polish surface of tile work with soft cloth.

#### 3.07 PROTECTION, CLEANING AND GROUT SEALING

- A. Do not permit traffic over finished floor surface for 4 days after installation.
- B. Apply to clean, completed tile walls and floors a protective coat of neutral cleaner solution, 1 part cleaner to 1 part water.
- C. Cover tile floors with heavy-duty, non-staining construction paper, masked in place.
- D. Prior to final acceptance of tile work, remove paper and rinse protective coat of neutral cleaner from all the surfaces.
- E. Clean tile and grout surfaces.
- F. Apply grout sealant according to manufacturer's directions.

**END OF SECTION**



**SECTION 095100**  
**ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Accessories

1.02 RELATED REQUIREMENTS

- A. Section 072100 - Thermal Insulation: Acoustical insulation.
- B. Section 079005 - Joint Sealers: Acoustical sealant.
- C. Section 283100 - Fire Detection and Alarm: Fire alarm components in ceiling system.
- D. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.
- E. Section 233700 - Air Outlets and Inlets: Air diffusion devices in ceiling.
- F. Section 265100 - Interior Lighting: Light fixtures in ceiling system.
- G. Section 275117 - Public Address Systems: Speakers in ceiling system.

1.03 REFERENCE STANDARDS

- A. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2007.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2008.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2011.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2008e1.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components, acoustical units, and other related components.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and related work.

1.06 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

#### 1.07 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

#### 1.08 PROJECT CONDITIONS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Install acoustical units after interior wet work is dry.

#### 1.09 EXTRA MATERIALS

- A. Provide 1/2 of 1 percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project.

### **PART 2 PRODUCTS**

#### 2.01 ACOUSTICAL UNITS

- A. Manufacturers:
  - 1. Armstrong World Industries, Inc: [www.armstrong.com](http://www.armstrong.com).
  - 2. Certaineed BPB Celotex: [www.certainteed.com](http://www.certainteed.com).
  - 3. USG: [www.usg.com](http://www.usg.com).
  - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Acoustical Units - General: ASTM E1264, Class A.
- C. Acoustical Panels Type 1: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
  - 1. Size: 24 x 24 inches (600 x 600 mm).
  - 2. Thickness: 5/8 inches (15 mm).
  - 3. Composition: Wet formed.
  - 4. Light Reflectance: 81 percent, determined as specified in ASTM E1264.
  - 5. NRC Range: .55, determined as specified in ASTM E 1264.
  - 6. Ceiling Attenuation Class (CAC): 33, determined as specified in ASTM E1264.
  - 7. Edge: Square.
  - 8. Surface Color: White.
  - 9. Surface Pattern: Non-directional fissured.
  - 10. Basis of design product: Armstrong - Fine Fissured; Item no. 1728
  - 11. Equivalent products of the following manufacturers are also approved:
    - a. USG
    - b. Certaineed BPB Celotex
  - 12. Suspension System: Exposed grid Type 1.
  - 13. Location: Typical, unless otherwise noted

#### 2.02 SUSPENSION SYSTEM(S) AND PERIMETER TRIM

- A. Manufacturers:
  - 1. Armstrong World Industries, Inc: [www.armstrong.com](http://www.armstrong.com).
  - 2. CertainTeed Corp. (BPB-Celotex): [www.bpb-na.com](http://www.bpb-na.com).

3. Chicago Metallic Corporation: [www.chicagometallic.com](http://www.chicagometallic.com).
  4. USG: [www.usg.com](http://www.usg.com).
  5. Substitutions: See Section 016000 - Product Requirements.
- B. Suspension Systems - General: ASTM C635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, hold down clips, and other related accessories as required.
- C. Exposed Steel Suspension System Type 1 (for Acoustical Panel Ceiling TYPE-1): Acoustical panel ceiling suspension system complying with the following:
1. Products:
    - a. ZXLA; USG
    - b. Prelude Plus; Armstrong
  2. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized-Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet hot-dip galvanized according to ASTM A 653/A 653M, G60 (Z180) coating designation, with pre-finished, 15/16-inch- (24-mm-) wide, aluminum caps on flanges; other characteristics as follows:
    - a. Aluminum Cap Finish: Painted white.
  3. Classification: Intermediate duty.

### 2.03 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
- C. Acoustical Sealant For Perimeter Moldings: Specified in Section 079005.
- D. Touch-up Paint: Type and color to match acoustical and grid units.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

### 3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected ceiling plans.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.
- J. 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 (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
  - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- K. Form expansion joints . Form to accommodate plus or minus 1 inch (25 mm) movement. Maintain visual closure.
- L. 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 spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
  - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, powder-actuated fasteners, or drilled-in anchors that extend through forms into concrete.
  - 6. Do not attach hangers to steel deck tabs.
  - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  - 8. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.
- M. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- N. Install special brake-metal shapes at window heads so that they are square and finished to provide a precise fit. Do not use exposed fasteners.

- O. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
  - 1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
  - 2. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
  - 3. Paint cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
  - 4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated or required.

### 3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Lay directional patterned units with pattern parallel to shortest room axis.
- D. Fit border trim neatly against abutting surfaces.
- E. Install units after above-ceiling work is complete.
- F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- G. Cutting Acoustical Units:
  - 1. Cut to fit irregular grid and perimeter edge trim.
  - 2. Make field cut edges of same profile as factory edges.
  - 3. Double cut and field paint exposed reveal edges.
- H. Where round obstructions, bullnose concrete block corners, and other similar conditions occur, provide preformed closures to match perimeter molding.
- I. Install hold-down clips on panels within 20 ft (6 m) of an exterior door.

### 3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

**END OF SECTION**



**SECTION 096500**  
**RESILIENT FLOORING**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Edge/transition strips between dissimilar materials.
- D. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2010)e1.
- C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).
- D. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.
- E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Flooring Material: 100 square feet (9.29 square meters) of each type and color.

1.05 FIELD CONDITIONS

- A. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

## **PART 2 PRODUCTS**

### **2.01 TILE FLOORING**

- A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness, and:
  - 1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
  - 2. Size: 12 x 12 inch (305 x 305 mm).
  - 3. Thickness: 0.125 inch (3.2 mm).
  - 4. Pattern: Marbleized.
  - 5. Manufacturers:
    - a. Armstrong World Industries, Inc; Product Standard Excelon, Imperial Texture: [www.armstrong.com](http://www.armstrong.com).
    - b. Mannington Mills, Inc; Product Progressions: [www.mannington.com](http://www.mannington.com).
    - c. Tarkett Inc; Product Expressions: [www.tarkett.com](http://www.tarkett.com).
    - d. Substitutions: See Section 016000 - Product Requirements.
- B. Feature Strips: Of same material as tile, 2 inch ( mm) wide.

### **2.02 RESILIENT BASE**

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
  - 1. Height: 4 inch (100 mm).
  - 2. Thickness: 0.125 inch (3.2 mm) thick.
  - 3. Finish: Satin.
  - 4. Length: Roll.
  - 5. Color: Color as selected from manufacturer's standards.
  - 6. Manufacturers:
    - a. Burke Flooring: [www.burkemercer.com](http://www.burkemercer.com).
    - b. Johnsonite, Inc: [www.johnsonite.com](http://www.johnsonite.com).
    - c. Roppe Corp: [www.roppe.com](http://www.roppe.com).
    - d. Substitutions: See Section 016000 - Product Requirements.

### **2.03 ACCESSORIES**

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
  - 1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.
- C. Moldings, Transition and Edge Strips: Same material as flooring.
- D. Sealer and Wax: Types recommended by flooring manufacturer.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
  - 1. Test in accordance with ASTM F710.
  - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

**3.02 PREPARATION**

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is cured.

**3.03 INSTALLATION**

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's instructions.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
  - 1. Resilient Strips: Attach to substrate using adhesive.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- I. Install feature strips where indicated.

**3.04 TILE FLOORING**

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.
- B. Unless otherwise indicated, lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

**3.05 RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

- B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions.

3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION**

**SECTION 096800**  
**CARPETING**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Carpet, direct-glued.
- B. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied carpet.

1.03 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006 (Reapproved 2011).
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2010e1.
- C. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.
- D. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute; Current Edition.
- E. CRI (GLC) - Green Label Testing Program - Approved Product Categories for Carpet; Carpet and Rug Institute; Current Edition.
- F. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; Carpet and Rug Institute; Current Edition.
- G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2011.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two samples 12 x 12 inch (300 x 300 mm) in size illustrating color and pattern for each carpet material specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional requirements.
  - 2. Extra Carpet: 100 square feet of each type, color, and pattern installed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet with minimum five years documented experience.

### 1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.
- B. Maintain minimum 70 degrees F (21 degrees C) ambient temperature 24 hours prior to, during and 24 hours after installation.
- C. Ventilate installation area during installation and for 72 hours after installation.

## **PART 2 PRODUCTS**

### 2.01 CARPET

- A. Carpet Type CPT-1:
  - 1. Product: Faculty IV manufactured by Lees Carpets.
  - 2. Roll Width: 12 ft ( mm).
  - 3. Color: as scheduled.
  - 4. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E 648 or NFPA 253.
  - 5. Surface Flammability Ignition: Pass ASTM D 2859 (the "pill test").
  - 6. VOC Content: Provide CRI Green Label Plus certified product.
  - 7. Substitutions: See Section 016000 - Product Requirements.

### 2.02 ACCESSORIES

- A. Sub-Floor Filler: Type recommended by carpet manufacturer.
- B. Moldings and Edge Strips: Rubber, color as selected.
- C. Adhesives - General: Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI Green Label certified.
- D. Seam Adhesive: Recommended by manufacturer.
- E. Contact Adhesive: Compatible with carpet material; releasable type.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesives to sub floor surfaces.
- D. Verify that concrete sub-floor surfaces are dry enough and ready for adhesive installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

### 3.02 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- C. Clean substrate.

### 3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet and cushion in accordance with manufacturer's instructions and CRI Carpet Installation Standard.
- C. Verify carpet match before cutting to ensure minimal variation between dye lots.
- D. Lay out carpet and locate seams in accordance with shop drawings:
  - 1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
  - 2. Do not locate seams perpendicular through door openings.
  - 3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
  - 4. Locate change of color or pattern between rooms under door centerline.
  - 5. Provide monolithic color, pattern, and texture match within any one area.
- E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

### 3.04 DIRECT-GLUED CARPET

- A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
- B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
- C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
- D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
- E. Trim carpet neatly at walls and around interruptions.
- F. Complete installation of edge strips, concealing exposed edges.

### 3.05 CLEANING

- A. Remove excess adhesive from floor and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

**END OF SECTION**



**SECTION 099000**  
**PAINTING AND COATING**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Surfaces to be finished are indicated in this section and on the Drawings.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 055000 - Metal Fabrications: Shop-primed items.
- C. Section 055100 - Metal Stairs: Shop-primed items.

1.03 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, [www.paintinfo.com](http://www.paintinfo.com).
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Master Painters and Decorators Association; 2004.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
  - 2. MPI product number (e.g. MPI #47).
  - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system (copy of relevant MPI Manual page is acceptable).
- C. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- D. Samples: Submit one paper "drop" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating colors selected for each finishing product specified.
  - 1. Where sheen is specified, submit samples in only that sheen.

1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience.
- B. Material Safety Data Sheets: At project site maintain file of MSDS sheets for each product used; become familiar with and follow manufacturer's stated application and safety requirements.

1.06 MOCK-UP

- A. See Section 014000 - Quality Requirements, for general requirements for mock-up.

- B. Provide wall panel, 8 feet (2.44 m) long by 10 feet (2.44 m) wide, illustrating coating color, texture, and finish.
- C. Locate where directed.
- D. Mock-up may remain as part of the Work.

#### 1.07 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 (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

#### 1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

#### 1.09 EXTRA MATERIALS

- A. See Section 016000 - Product Requirements, for additional provisions.
- B. Supply 1 gallon (4 L) of each color; store where directed.
- C. Label each container with color in addition to the manufacturer's label.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer.
- B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
- C. In the event that a single manufacturer cannot provide all specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- D. Paints: Acceptable manufacturers are limited to the following:
  - 1. Benjamin Moore & Co: [www.benjaminmoore.com](http://www.benjaminmoore.com).
  - 2. Sherwin-Williams: [www.sherwin-williams.com](http://www.sherwin-williams.com).
  - 3. Glidden Professional: [www.gliddenprofessional.com](http://www.gliddenprofessional.com).

E. Substitutions: See Section 016000 - Product Requirements.

## 2.02 MATERIALS - GENERAL

### A. Volatile Organic Compound (VOC) Content:

1. Provide coatings that comply with the most stringent requirements specified in the following:
  - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
  - b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; [www.otcair.org](http://www.otcair.org); specifically:
    - 1) Opaque, Flat: 50 g/L, maximum.
    - 2) Opaque, Nonflat: 150 g/L, maximum.
    - 3) Opaque, High Gloss: 250 g/L, maximum.
    - 4) Varnishes: 350 g/L, maximum.
  - c. Architectural coatings VOC limits of State in which the project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

### B. Paints and Coatings: Provide products listed in Master Painters Institute Approved Product List, current edition available at [www.paintinfo.com](http://www.paintinfo.com), for specified MPI Categories, except as otherwise indicated.

1. Provide ready mixed paints and coatings .
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

## 2.03 PAINT SYSTEMS

### A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.

### B. Provide colors as directed by Architect.

1. Allow for minimum of five colors for each system, unless otherwise indicated, without additional cost to Owner.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

## 2.04 EXTERIOR PAINT SYSTEMS

## 2.05 INTERIOR PAINT SYSTEMS

### A. SYSTEM I-1:

1. Substrate: Concrete Masonry Units
2. Manufacturers and Products:
  - a. Sherwin Williams:
    - 1) 1st Coat:S-W PrepRite® Block Filler, B25W25
    - 2) 2nd Coat:S-W ProMar® 200 Latex Semi-Gloss, B20W2200 Series
    - 3) 3rd Coat:S-W ProMar® 200 Latex Semi-Gloss, B20W2200 Series
  - b. Benjamin Moore:
    - 1) 1st Coat:Moore 160 Super Spec Latex Block Filler

- 2) 2nd Coat:333 Regal AquaGlo Acrylic Semi-Gloss Enamel
  - 3) 3rd Coat:333 Regal AquaGlo Acrylic Semi-Gloss Enamel
  - c. Glidden Professional:
    - 1) 1st Coat:Glidden Professional Block Filler 3010 primer
    - 2) 2nd Coat:Glidden Professional Diamond 450 7400 topcoat
    - 3) 3rd Coat:Glidden Professional Diamond 450 7400 topcoat
- B. SYSTEM I-2
1. Substrate: Concrete Masonry Units (Epoxy paint, Semi-gloss finish)
  2. Manufacturers and Products:
    - a. Sherwin Williams:
      - 1) 1st Coat:S-W Heavy Duty Block Filler, B42W46
      - 2) 2nd Coat:S-W Pro Industrial HB/ Waterbased Epoxy, B71W111/B71W100 Series
      - 3) 3rd Coat:S-W Pro Industrial HB/ Waterbased Epoxy, B71W111/B71W100 Series
    - b. Benjamin Moore:
      - 1) 1st Coat: Super Spec HP Waterborne Epoxy Block Filler P31
      - 2) 2nd Coat:Super Spec HP Acrylic Epoxy Coating P43
      - 3) 3rd Coat:Super Spec HP Acrylic Epoxy Coating P43
    - c. Glidden Professional:
      - 1) 1st Coat:Tru-Glaze 4015 Block Filler
      - 2) 2nd Coat:Tru-Glaze WB 4426 Water-Based Epoxy
      - 3) 3rd Coat:Tru-Glaze WB 4426 Water-Based Epoxy
- C. SYSTEM I-3
1. Substrate: Structural Steel and Metal Fabrications:
  2. Finish: Semi-Gloss.
  3. Manufacturers and Products:
    - a. Sherwin Williams:
      - 1) 1st Coat:S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series
      - 2) 2nd Coat: S-W ProMar® 200 Latex Semi-Gloss, B31W2200 Series
      - 3) 3rd Coat:S-W ProMar® 200 Latex Semi-Gloss, B31W2200 Series
    - b. Benjamin Moore:
      - 1) 1st Coat: Moore P04 Super Spec HP Acrylic Metal Primer
      - 2) 2nd Coat:N333 Regal AquaGlo Acrylic Semi-Gloss Enamel
      - 3) 3rd Coat: N333 Regal AquaGlo Acrylic Semi-Gloss Enamel
    - c. Glidden Professional:
      - 1) 1st Coat: Devoe Coatings DEVFLEX Direct-to-Metal 4020 primer
      - 2) 2nd Coat:Glidden Professional Diamond 450 7400 topcoat
      - 3) 3rd Coat:Glidden Professional Diamond 450 7400 topcoat
- D. SYSTEM I-4
1. Substrate: Hollow metal door frames:
  2. Finish: Gloss.
  3. Manufacturers and Products:
    - a. Sherwin Williams:
      - 1) 1st Coat: DTM Acrylic Primer/Finish, B66W1

- 2) 2nd Coat:DTM Acrylic Gloss Coating, B66W100
  - 3) 3rd Coat: DTM Acrylic Gloss Coating, B66W100
  - b. Benjamin Moore:
    - 1) 1st Coat: Moorcraft Super Spec DTM Alkyd Satin, Z163
    - 2) 2nd Coat:Moorcraft Super Spec Urethane Gloss Enamel, Z22
    - 3) 3rd Coat: Moorcraft Super Spec Urethane Gloss Enamel, Z22
  - c. Glidden Professional:
    - 1) 1st Coat: DEVGUARD 4360 Low VOC Universal Primer
    - 2) 2nd Coat:DEVGUARD 4309 Rust Preventative Gloss Enamel
    - 3) 3rd Coat: DEVGUARD 4309 Rust Preventative Gloss Enamel
- E. SYSTEM I-5
1. Substrate: Galvanized Metal, Not Chromate Passivated:
  2. Applications include but are not limited to doors, frames, railings, and exposed ductwork.
  3. Manufacturers and Products:
    - a. Sherwin Williams:
      - 1) 1st Coat:S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series
      - 2) 2nd Coat:S-W ProMar® 200 Latex Semi-Gloss, B31W2200 Series
      - 3) 3rd Coat:S-W ProMar® 200 Latex Semi-Gloss, B31W2200 Series
    - b. Benjamin Moore:
      - 1) 1st Coat: Moore P04 Super Spec HP Acrylic Metal Primer
      - 2) 2nd Coat:N333 Regal AquaGlo Acrylic Semi-Gloss Enamel
      - 3) 3rd Coat:N333 Regal AquaGlo Acrylic Semi-Gloss Enamel
    - c. Glidden Professional:
      - 1) 1st Coat: Devoe Coatings DEVFLEX Direct-to-Metal 4020 primer
      - 2) 2nd Coat:Glidden Professional Diamond 450 7400 topcoat
      - 3) 3rd Coat:Glidden Professional Diamond 450 7400 topcoat
- F. SYSTEM I-7
1. Substrate: Wood Floors and Stage (Transparent Finish):
  2. Manufacturers and Products:
    - a. Sherwinn Williams:
      - 1) 1st Coat:Minwax 250 Wood Finish Stain
      - 2) 2nd Coat:Minwax High Build Polyurethane Varnish
      - 3) 3rd Coat:Minwax High Build Polyurethane Varnish
    - b. Benjamin Moore:
      - 1) 1st Coat: Penetrating Oil Stain
      - 2) 2nd Coat:Permathane Satin Urethane
      - 3) 3rd Coat:Permathane Satin Urethane
    - c. Glidden Professional:
      - 1) 1st Coat:1700 Wood Pride Oil-Based Wood Stain
      - 2) 2nd Coat:1902 Wood Pride Polyurethane Satin Varnish
      - 3) 3rd Coat:1902 Wood Pride Polyurethane Satin Varnish
- G. SYSTEM I-8
1. Substrate: Wood Stage (Opaque Finish):
  2. Manufacturers and Products:

- a. Sherwinn Williams:
    - 1) 1st Coat:ProMar 200 Alkyd Undercoater 49
    - 2) 2nd Coat:ProMar Alkyd Semi-Gloss B34WZ1101
    - 3) 3rd Coat:ProMar Alkyd Semi-Gloss B34WZ1101
  - b. Benjamin Moore:
    - 1) 1st Coat: Alkyd Enamel Underbody 135
    - 2) 2nd Coat:Satin Impervo 235
    - 3) 3rd Coat:Satin Impervo 235
  - c. Glidden Professional:
    - 1) 1st Coat:3210 Gripper Interior/Exterior Primer Sealer
    - 2) 2nd Coat:3018 Concrete Coatings Acrylic Floor Enamel
    - 3) 3rd Coat:3018 Concrete Coatings Acrylic Floor Enamel
- 3.

#### H. SYSTEM I-9

1. Substrate: Gypsum Board (Satin Finish):
2. Applications include but are not limited to walls, ceilings, soffits, bulkheads, and column covers.
3. Manufacturers and Products:
  - a. Sherwin Williams:
    - 1) 1st Coat:S-W PrepRite 200 Int. Latex Primer, B28 Series
    - 2) 2nd Coat:S-W ProMar® 200 Latex Eggshell, B20Series
    - 3) 3rd Coat:S-W ProMar® 200 Latex Semi-Gloss, B31Series
  - b. Benjamin Moore:
    - 1) 1st Coat: Moore P04 Super Spec HP Acrylic Metal Primer
    - 2) 2nd Coat:N319 Regal Acrylic Latex Eggshell Finish Enamel
    - 3) 3rd Coat:N319 Regal Acrylic Latex Eggshell Finish Enamel
  - c. Glidden Professional:
    - 1) 1st Coat: Glidden Professional High Hide 1000 primer
    - 2) 2nd Coat:Glidden Professional Diamond 450 7300 topcoat
    - 3) 3rd Coat:Glidden Professional Diamond 450 7300 topcoat

#### I. SYSTEM I-10

1. Substrate: Gypsum Board (Epoxy Finish):
2. Manufacturers and Products:
  - a. Sherwin Williams:
    - 1) 1st Coat:PrepRite 200 Int Latex Primer
    - 2) 2nd Coat:ProIndustrial Precat. WB Epoxy, S-G, Series K46
    - 3) 3rd Coat:ProIndustrial Precat. WB Epoxy, S-G, Series K46
  - b. Benjamin Moore:
    - 1) 1st Coat:Super Spec HP Waterborne Polyamide Epoxy Metal Primer P42-70
    - 2) 2nd Coat:Super Spec HP Acrylic Epoxy Coating P43
    - 3) 3rd Coat:Super Spec HP Acrylic Epoxy Coating P43
  - c. Glidden Professional:
    - 1) 1st Coat: Glidden Professional High Hide 1000 primer
    - 2) 2nd Coat: Devoe Coatings TRU-GLAZE WB Epoxy 4426 topcoat

3) 3rd Coat: Devoe Coatings TRU-GLAZE WB Epoxy 4426 topcoat

J. SYSTEM I-11

1. Substrate: Concrete Floor (Sealed):
2. Manufacturers and Products:
  - a. W. R. Meadows:
    - 1) 1st Coat: CS-309/30 Concrete Curing and Sealing Compound

**PART 3 EXECUTION**

3.01 SCOPE -- SURFACES TO BE FINISHED

- A. Paint all exposed surfaces except where indicated not to be painted or to remain natural; the term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
- B. Paint the surfaces described in PART 2, indicated on the Drawings, and as follows:
  1. If a surface, material, or item is not specifically mentioned, paint in the same manner as similar surfaces, materials, or items, regardless of whether colors are indicated or not.
  2. Paint surfaces behind movable equipment and furnishings the same as similar exposed surfaces.
  3. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of the permanent item.
  4. Paint back sides of access panels and removable and hinged covers to match exposed surfaces.
  5. Finish top, bottom, and side edges of exterior doors the same as exposed faces.
  6. Paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces, unless otherwise indicated.
  7. Paint shop-primed mechanical and electrical items occurring in finished areas.
  8. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
  9. Paint interior surfaces of air ducts and convector and baseboard heating cabinets with flat, nonspecular black paint where visible through registers, grilles, or louvers.
  10. Paint dampers exposed behind louvers, grilles, to match face panels.
  11. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- C. Do Not Paint or Finish the Following Items:
  1. Items fully factory-finished unless specifically noted; factory-primed items are not considered factory-finished.
  2. Items indicated to receive other finish.
  3. Items indicated to remain naturally finished.
  4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
  5. Anodized aluminum.
  6. Polished and brushed stainless steel items.
  7. Brick, precast concrete, integrally colored plaster.
  8. Polished and brushed stainless steel, anodized aluminum, bronze, terne, and lead.

9. Acoustical materials.
10. Concealed piping, ductwork, and conduit.

### 3.02 EXAMINATION

- A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials; report incompatible primer conditions and submit recommended changes for Architect's approval.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  1. Plaster and Gypsum Board: 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.
- E. Measure the ph factor of concrete, masonry, and mortar before starting any finishing process, using the method specified in MPI Architectural Painting Manual.
  1. Report results in writing to Architect before starting work.
  2. If results of test indicates need for remedial action, provide written description of remedial action. If a different primer or paint systems is required, state the total cost of the change. Do not proceed with remedial action or change without receiving written authorization from Architect.

### 3.03 PREPARATION

- A. Prepare surfaces as specified in MPI Architectural Painting Specification Manual and as follows for the applicable surface and coating; if multiple preparation treatments are specified, use as many as necessary for best results; where the Manual references external standards for preparation (e.g. SSPC standards), prepare as specified in those standards; comply with coating manufacturer's specific preparation methods or treatments, if any.
- B. Coordinate painting work with cleaning and preparation work so that dust and other contaminants do not fall on newly painted, wet surfaces.
- C. Surface Appurtenances: Prior to preparing surfaces or finishing, remove electrical plates, hardware, light fixtures, light fixture trim, escutcheons, machined surfaces, fittings, and similar items already installed that are not to be painted.
  1. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before preparation and finishing.
  2. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section.
- E. Marks: Seal with shellac those which may bleed through surface finishes.
- F. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete, Cement Plaster and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with

- a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
  - I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
  - J. Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
  - K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
  - L. Interior Wood Items to Receive Transparent Finish: Sand wood to obtain a uniform appearance before immediately starting work. Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
  - M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

#### 3.04 APPLICATION

- A. Apply products in accordance with manufacturer's instructions and as specified or recommended by MPI Manual, using the preparation, products, sheens, textures, and colors as indicated.
  - 1. Remove, refinish, or repaint work not complying with requirements.
- B. Do not apply finishes over dirt, rust, scale, grease, moisture, scuffed surfaces, or other conditions detrimental to formation of a durable coating film; do not apply finishes to surfaces that are not dry.
- C. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.
  - 1. Number of coats and film thickness required are the same regardless of application method.
  - 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
  - 3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.
- E. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.

1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
3. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
4. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to lift or lose adhesion.
5. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
6. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
7. Pigmented (Opaque) Finishes: Provide smooth, opaque surface of uniform finish, color, appearance, and coverage.

### 3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

### 3.06 CLEANING AND PROTECTION

- A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from site.
- C. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Architect.
- D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
- E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in MPI Manual.

**END OF SECTION**

**SECTION 101101**  
**VISUAL DISPLAY BOARDS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Markerboards.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Blocking and supports.
- B. Section 092116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. ASTM A424 - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.
- D. Test Reports: Show conformance to specified surface burning characteristics requirements.
- E. Manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Visual Display Boards:
  - 1. Claridge Products and Equipment, Inc: [www.claridgeproducts.com](http://www.claridgeproducts.com).
  - 2. Polyvision Corporation (Nelson Adams); Product e3 ceramicsteel: [www.polyvision.com](http://www.polyvision.com) is the Basis of Design.
    - a. Fabricators shall be limited to those approved by manufacturer.
  - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 VISUAL DISPLAY BOARDS

- A. Markerboards: Porcelain enamel on steel, laminated to core.
  - 1. Color: As selected from manufacturer's full range.
  - 2. Metal Face Sheet Thickness: 0.024 inch, 24 gage (0.61 mm).

3. Core: Particleboard, 1/2 inch (13 mm) thick, laminated to face sheet.
4. Backing: Aluminum foil, laminated to core.
5. Size: As indicated on drawings.
6. Frame: Extruded aluminum, with concealed fasteners.
7. Frame Profile: Box chalktray with end closures; 1 1/2" perimeter trim
8. Frame Finish: Anodized, natural.
9. Accessories: Provide chalk tray, flag holder, and map rail with 2" tack strip, hanging devices for audio-visual aids.

### 2.03 MATERIALS

- A. Porcelain Enameled Steel Sheet: ASTM A424, Type I, Commercial Steel, with fired-on vitreous finish.
- B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.
- C. Foil Backing: Aluminum foil sheet, 0.005 inch (0.13 mm) thick.
- D. Adhesives: Type used by manufacturer.

### 2.04 ACCESSORIES

- A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 2 inch (50 mm) wide, full width of frame.
- B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail. Provide 2 per board.
- C. Temporary Protective Cover: Sheet polyethylene, 8 mil (0.2 mm) thick.
- D. Flag Holders: Cast aluminum bored to receive 1 inch (25 mm) diameter flag staff, bracketed to fit top rail of board. Provide one per classroom, plus 20 additional units.
- E. Cleaning Instruction Plate: Provide instructions for chalkboard cleaning on a metal plate fastened to perimeter frame near chalkrail.
- F. Chalk Tray: Aluminum, manufacturer's standard profile one piece full length of chalkboard, molded ends; concealed fasteners, same finish as frame.
- G. Mounting Brackets: Concealed.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.
- C. Verify flat wall surface for frameless adhesive-applied boards.

### 3.02 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Install with top of chalk tray at 30 inches (760 mm) above finished floor, unless otherwise noted.
- C. Secure units level and plumb.

### 3.03 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.

- B. Cover with protective cover, taped to frame.
- C. Remove temporary protective cover at date of Substantial Completion.

**END OF SECTION**



**SECTION 102113**  
**PLASTIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Solid plastic toilet compartments.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Blocking and supports.
- B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

- A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

1.04 PERFORMANCE REQUIREMENTS

- A. Fire Resistance: Partition Materials shall comply with the following requirements, when tested in accordance with ASTM 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
  - 1. Smoke Developed Index: less than 450
  - 2. Flame Spread Index: less than 75
  - 3. Interior Finish Classification
    - a. NFPA 101: Class B
    - b. IBC: Class B

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Product Data: Provide data on panel construction, hardware, and accessories.
- D. Manufacturer's Installation Instructions: Indicate perimeter conditions requiring special attention.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Plastic Toilet Compartments:
  - 1. Metpar Corp: [www.metpar.com](http://www.metpar.com).
  - 2. Scranton Products (Santana/Comtec/Capital): [www.scrantonproducts.com.com](http://www.scrantonproducts.com.com).
  - 3. General Partitions
  - 4. Substitutions: Section 016000 - Product Requirements.

2.02 COMPONENTS

- A. Toilet Compartments: Solid molded high density polyethylene (HDPE) plastic panels, doors, and pilasters, floor-mounted headrail-braced.
  - 1. Color: Single color as selected.
- B. Door and Panel Dimensions:
  - 1. Thickness: 1 inch (25 mm).

2. Door Width: 24 inch (610 mm).
3. Door Width for Handicapped Use: 36 inch (915 mm), out-swinging.
4. Height: 58 inch (1 473 mm); full height panels at shower compartments.
5. Thickness of Pilasters: 1 inch (25 mm).

### 2.03 ACCESSORIES

- A. Pilaster Shoes: Formed ASTM A 666, Type 304 stainless steel with No. 4 finish, 3 in (75 mm) high, concealing floor fastenings.
  1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Hollow anodized aluminum tube, 1 x 1-5/8 inch (25 x 41 mm) size, with anti-grip strips and stainless steel wall brackets.
- C. Pilaster Brackets: Satin stainless steel.
- D. Wall Brackets: Continuous type, polished stainless steel.
- E. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.
- F. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
  1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- G. Hardware: Satin stainless steel:
  1. Toilet compartments: Pivot hinges, gravity type, adjustable for door close positioning; two per door.
  2. Nylon bearings.
  3. Door Latch: Slide type with exterior emergency access feature. Thumbturn type not permitted.
  4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
  5. Coat hook with rubber bumper; one per compartment, mounted on door.
  6. Provide door pull for outswinging doors.
  7. Provide additional door pull at interior of outswinging doors of accessible stalls or compartments.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.

### 3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 to 1/2 inch (9 to 13 mm) space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

**END OF SECTION**



**SECTION 102601**  
**WALL AND CORNER GUARDS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Corner guards.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Blocking for wall and corner guard anchors.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2012.
- B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2012.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.
- C. Samples for Initial Selection: For each type of impactresistant wall protection unit indicated.
- D. Material Test Reports: For each impact-resistant plastic material.
- E. Maintenance Data: Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wallprotection units through one source from a single manufacturer.
- C. FireTestResponse Characteristics: Provide impactresistant, plastic wallprotection units with surfaceburning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside wellventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
- B. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
- C. Keep plastic sheet material out of direct sunlight.
- D. Store plastic wallprotection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Wall and Corner Guards (CG-1):
  - 1. Construction Specialties, Inc; Product Acrovyn: [www.c-sgroup.com](http://www.c-sgroup.com).
  - 2. InPro Corporation; Product Sanparrel: [www.inprocorp.com](http://www.inprocorp.com).
  - 3. Koroseal; Product Koroguard.
  - 4. Substitutions: See Section 016000 - Product Requirements.

### **2.02 COMPONENTS**

- A. Corner Guards - Surface Mounted (CG-1): High impact vinyl with extruded aluminum full height retainer and integral impact absorbing device.
  - 1. Size: 3 inches (76 mm).
  - 2. Height: 6'-0"
  - 3. Corner: Square.
  - 4. Color: As selected from manufacturer's standard colors.
  - 5. Length: One piece.
  - 6. Preformed end caps.
  - 7. Basis of Design: Construction Specialties Acrovyn SM-20.

### **2.03 FABRICATION**

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on Drawings.

### **3.02 INSTALLATION**

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members only.
- B. Position corner guard 0 inches (0 mm) above finished floor to 72 inches (1828 mm) high.

### **3.03 SCHEDULE**

- A. Provide corner guards at all external corners of all gypsum board partitions.

**END OF SECTION**

**SECTION 102800**

**TOILET, BATH, AND LAUNDRY ACCESSORIES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Accessories for toilet rooms and utility rooms.
- B. Grab bars.

1.02 RELATED REQUIREMENTS

- A. Section 061000: Concealed supports for accessories, including in wall framing and plates.
- B. Section 102113.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

- A. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2010.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011e1.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Products listed are made by Bobrick Washroom Equipment, Inc., [www.bobrick.com](http://www.bobrick.com).
- B. Other Acceptable Manufacturers:
  - 1. American Specialties, Inc: [www.americanspecialties.com](http://www.americanspecialties.com).
  - 2. Bradley Corporation: [www.bradleycorp.com](http://www.bradleycorp.com).
  - 3. Substitutions: Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide 2 keys for each accessory to Owner; key alike all lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.

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- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- G. Adhesive: Two component epoxy type, waterproof.
- H. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.
- I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

#### 2.03 FINISHES

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

#### 2.04 TOILET ROOM ACCESSORIES

- A. Item A: Mirrors: Stainless steel framed, 6 mm thick laminated glass mirror.
  - 1. Product: Bobrick B-290 series, manufactured by Bobrick.
  - 2. Size: As shown.
  - 3. Frame: 0.05 inch (1.3 mm) angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
- B. Item B: Paper Towel Jumbo Roll Dispenser (Furnished by Owner )
  - 1. Dispenser Reference: Scott D2 Hard Roll Towel Dispenser
  - 2. Size: 17 x 5" x 16" x 10"
  - 3. Surface Mounted
- C. Item C: Toilet Tissue Jumbo Roll Dispenser (Furnished by Owner )
  - 1. Dispenser Reference: Scott D2 JRT Jr Tissue Dispenser
  - 2. Size 14.5" high x 5.5" deep
  - 3. Surface Mounted
- D. Item D: Waste Receptacle Free standing on floor (Furnished/Installed by Owner)
- E. Item E: Grab Bars: Stainless steel, 1-1/2 inches (38 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches (38 mm) clearance between wall and inside of grab bar.
  - 1. Product: B-5806.99 series manufactured by Bobrick.
  - 2. Length and configuration: As indicated on drawings.
- F. Item F: NOT USED.
- G. Item G: Soap Dispenser Surface Mounted (Furnished By Owner)
  - 1. Reference: Impact Products Model: No. 4020
  - 2. Size: 4-1/4" by 8-1/4" by 2-3/4" D.
  - 3. Liquid or foam soap.

#### 2.05 UTILITY ROOM ACCESSORIES

- A. Item H: Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.

1. Hooks: 2, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
2. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.
3. Length: Manufacturer's standard length for number of holders/hooks.
4. Product: B-224 manufactured by Bobrick.
5. Locations: Provide one (1) unit in each Janitors Closet.

**PART 3 EXECUTION**

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

**END OF SECTION**



**SECTION 104400**  
**FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 211200 - Fire-Suppression Standpipes: Cabinet enclosure for extinguishers.

1.03 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, location, and other relevant information.
- C. Product Data: Provide extinguisher operational features, color and finish, anchorage details, and other relevant information.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Fire Extinguishers, Fire Extinguisher Cabinets and Accessories:
  - 1. JL Industries, Inc: [www.jlindustries.com](http://www.jlindustries.com).
  - 2. Larsen's Manufacturing Co: [www.larsensmfg.com](http://www.larsensmfg.com).
  - 3. Potter-Roemer: [www.potterroemer.com](http://www.potterroemer.com).
  - 4. Elkhart.
  - 5. Substitutions: See Section 016000 - Product Requirements.

## 2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gage.
  - 1. Class ABC.
  - 2. Size 10 pound multi-purpose.
  - 3. Finish: Baked enamel, color as selected..

## 2.03 FIRE EXTINGUISHER CABINETS

- A. Metal: Formed primed steel sheet.
- B. Cabinet Configuration: Recessed.
  - 1. Sized to accommodate accessories.
  - 2. Exterior nominal dimensions of 12 inch wide x 27 inch high x 8 inch deep.
  - 3. Trim: Flat.
  - 4. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
- C. Door: 1/2 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with continuous piano hinge.
- D. Door Style and lock: Recess mounted, vertical duo style, 18 gauge pressed steel construction with Duo-Panel doors and emergency safety locks (such as Larsen-Loc/Saf-T-lok).
- E. Verify that cabinets are sized to accommodate extinguishers.
- F. Door Glazing: Glass, clear, 1/8 inch (3 mm) thick tempered. Set in resilient channel gasket glazing.
- G. Lettering: Vertical, die cut, red.
- H. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- I. Weld, fill, and grind components smooth.
- J. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- K. Finish of Cabinet Interior: White enamel.

## 2.04 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

## **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings.
- C. Secure rigidly in place.

- D. Place extinguishers and accessories in cabinets and on wall brackets.

**END OF SECTION**



**SECTION 105100**  
**METAL LOCKERS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Locker units with hinged doors.
- B. Metal bases, tops, filler panels, and related components.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on locker types, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout and numbering plan.
- D. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS

- A. Lockers:
  - 1. ASI Lockers: [www.asilockers.com](http://www.asilockers.com)
  - 2. Lyon Workspace Products: [www.lyonworkspace.com](http://www.lyonworkspace.com).
  - 3. Penco Products, Inc: [www.pencoproducts.com](http://www.pencoproducts.com).
  - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Sheet Steel: ASTM A446, commercial grab, stretcher level, phosphatized; to the following minimum thicknesses:
  - 1. Body and Shelf: 16 gage.
  - 2. Door: 14 gage.
  - 3. Door Frame: 16 gage, 0.060 inch (1.5 mm).
  - 4. Hinges: 14 gage, 0.075 inch (1.9 mm).
  - 5. Base: 18 gage (\_\_\_\_ mm).
  - 6. Sloping Top: 18 gage.
  - 7. Trim: 18 gage. (vertical and/or recess)

2.03 LOCKER UNITS

- A. Metal Locker Types
  - 1. Type A (Typical)
    - a. 12" wide by 12" deep by 72" high single lockers, freestanding.
    - b. Provide Z base and continuous sloped top with closures.

- c. Provide for each locker three single wall hooks, one double prong coat hook mounted to underside of shelf, and one metal number plate.
- d. Basis of specification: ASI Traditional.

#### 2.04 LOCKER COMPONENTS

- A. Locking: Equipped for padlock hasps.
- B. Ventilation Method: Louvered top and bottom of door.
- C. Class: Quiet.
- D. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
- E. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
- F. Doors: Hollow edge construction, 1-3/16 inch thick, welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
- G. Hinges: Two for doors under 42 inches (1 050 mm) high; three for doors over 42 inches (1 050 mm) high; weld securely to locker body and door.
- H. Recessed stainless steel handle with latch arrangement for locks & number plate. Provide quiet operation by encasing exposed portion of the lifting trigger in a molded ABS thermoplastic cover that provides isolation from metal-to-metal contact and be contained in a formed 20 gauge stainless steel recessed pocket; or similar means.
- I. Locking device supplied by Owner.
- J. Number Plates: Provide rectangular shaped aluminum plates. Form numbers of block font style with ADA designation, in contrasting color.
- K. Provide ventilation openings at top and bottom of each locker.
- L. Form recess for operating handle and locking device.
- M. Finish edges smooth without burrs.
- N. Fabricate sloped metal tops, ends and closure pieces.

#### 2.05 FINISHING

- A. Clean, degrease, and neutralize metal; prime and finish with two coats of baked enamel.
- B. Paint locker units in colors to be selected from manufacturer's standard color selection.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

#### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Place and secure on locker base. Minimum pull out force 100lbs.
- D. Bolt adjoining locker units together to provide rigid installation.
- E. Install end panels, filler panels, sloped tops, miscellaneous panels, and other necessary related components.

F. Install accessories.

G. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

**END OF SECTION**



**SECTION 107316**  
**ALUMINUM CANOPIES**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following: Hanger Rod Architectural Canopies

1.03 PERFORMANCE REQUIREMENTS

- A. General: Design, fabricate, and install awnings to withstand loads from gravity, wind, snow, ponding, drift, and structural movement, including thermally induced movement; and to resist, without failure, other conditions of in-service use, including exposure to weather.
- B. Structural Performance: Provide awnings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. International Building Code.
  - 2. ASCE 7 Minimum Design Loads for Buildings and Other Structures.
  - 3. Wind Loads: Determine loads based on the following minimum design wind pressures: Uniform pressure of 60 lbf/sq. ft acting upward or downward.
  - 4. Thermal Movements: Provide awnings 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 connections, tearing of fabric, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
    - a. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.04 SUBMITTALS

- A. Product Data: Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, finishes, and operating instructions for awnings.
- B. Shop Drawings: Show location and extent of awnings. Include elevations, sections, and details not shown in Product Data. Show materials, fabrication, dimensions, mounting heights, connections, anchorages, installation details, attachments to other work, operational clearances, and relationship to adjoining work. Show colors and graphic layout and content. Indicate related work by others, including Mechanical and Electrical installers
- C. Provide shop drawings and calculations that are signed and sealed by an engineer licensed within the state canopy is installed.
- D. Installer qualifications and Manufacturer's approval
- E. Samples for Initial Selection: Upon request, submit for each colored or finished component of each type of awning indicated.

### 1.05 COORDINATION

- A. Coordinate installation of anchorages for soffit. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

### 1.06 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of awnings in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Where awning installation is indicated to fit to other work, verify dimensions of other work by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for fenestration operation throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Deliver, Storage, Handling: Deliver and store all canopy components in protected and covered areas. Protect from damage.

## **PART 2 - PRODUCTS**

### 2.01 MANUFACTURERS

- A. Basis of Design: Mapes Industries, Inc., Lincoln, Nebraska Phone: 1-888-273-1132
- B. Other Manufacturers: Subject to compliance with requirements, other manufactures that may provide products:
  - 1. Dittmar Architectural Products
  - 2. E. L. Burns
  - 3. Protectal
  - 4. Perfection Architectural Systems
  - 5. Peterson Metal Products, Inc.

### 2.02 MATERIALS: AND COMPONENTS

- A. Decking to be 3” extruded flat soffit. Thickness as required for design loads indicated or required, but not less than 078. Extruded self-flashing sections interlocking into a composite unit. Closures at deck ends shall be welded plates.
- B. Fascia shall be standard 8” extruded “J” style (minimum .125 aluminum).
- C. Hanger rods and attachment hardware shall be powder coated to match canopy.
- D. Beams: Open-top tubular extrusion with top edges thickened for strength and designed to receive deck members in self-fastening manner. Structural ties shall be installed in the tops of all beams.
- E. Aluminum Members: All sections shall be extruded aluminum 6063 alloy, heat treated to T-6 temper.
- F. Fasteners: Aluminum, 18-8 stainless steel or 300 series stainless steel with neoprene
- G. Protective Coating: Insulate from electrolytic action with other materials. Aluminum columns embedded in concrete shall be protected by mastic coating.
- H. Grout: 2000 psi compressive strength, one part Portland Cement and 3 parts masonry sand. Add water to produce pouring consistency.

- I. Gaskets: Dry seal santoprene pressure type.
- J. Drainage Boots: Prefabricated connections from column downspouts to underground storm drainage system.

### 2.03 FABRICATION

- A. Bent Construction: Beams and columns shall be factory welded with neatly mitered corners into one-piece rigid bents. All welds shall be smooth and uniform using inert gas shielded arc. Rigid mechanical joints shall be used when shipping limitations prohibit the shipment of fully welded bents.
- B. Deck Construction: Deck shall be manufactured of extruded modules that interlock in a self-flashing manner. Interlocking joints shall be positively fastened at 8" o.c. Fastenings must have minimum shear strength of 350 pounds each. Deck shall be assembled with sufficient camber to offset dead load deflection.
- C. All connections shall be mechanically assembled utilizing 3/16" fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
- D. Concealed drainage. Water shall drain from covered surfaces into integral rear gutter and directed to ground level discharge via one or more designated downspouts.
- E. Flashing and sheet metal enclosures shall be minimum 22 gage sheet aluminum with expansion provisions. Comply with SMACNA standards and Design Manual.

### 2.04 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Exposed Finishes: Two-Coat Fluoropolymer, AAMA 620. 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.
- E. 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).
- F. (Colors: Up to Two (2) colors as selected by Architect from Manufactures full range of colors.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION:**

- A. Comply with manufacturer's written installation instructions and drawings. Coordinate with other work including electrical and Mechanical. Anchor as shown to withstand stresses and loads.
- B. Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed.
- C. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing awnings to structural support and for properly transferring load to in-place construction.

#### **3.03 CLEANING AND PROTECTION**

- A. Clean exposed metal surfaces.
- B. Touchup Painting: Immediately after erection, clean field welds, connections, and abraded areas. Paint uncoated and abraded areas with same or compatible material as used for shop-applied finish painting.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that canopies are without damage or deterioration at time of Substantial Completion.
- D. Replace damaged canopies that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

**END OF SECTION**

**SECTION 123400**  
**LAMINATE CLAD CASEWORK**

**PART 1 – GENERAL**

1.01 SECTION INCLUDES

- A. Fixed modular laminate clad casework and components.
- B. Laminate clad countertops.
- C. Laminate clad vanities.

1.02 RELATED SECTIONS

- A. Section 061000: Blocking within walls for casework
- B. Section 096500: Base molding
- C. Division 22: Sinks and service fixtures, service waste lines, connections, and vents
- D. Division 26: Electrical service fixtures

1.03 DEFINITIONS

- A. Identification of casework components and related products by surface visibility.
  - 1. Open Interiors: Any open storage unit without solid door or drawer fronts, units with full glass insert doors and/or acrylic doors, and units with sliding solid doors.
  - 2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts.
  - 3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
  - 4. Other Exposed Surfaces: Faces of doors and drawers when closed, and tops of cabinets less than 72 inches above furnished floor.
  - 5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72 inches or more above finished floor.
  - 6. Concealed Surfaces: Any surface not visible after installation.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Minimum of 5 years experience in providing manufactured casework systems for similar types of projects, produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to perform on this project.
- B. Manufacturer: Provide products certified as meeting or exceeding ANSI-A 161.1-2000 testing standards.

1.05 SUBMITTALS

- A. Comply with Section 013000, unless otherwise indicated.
- B. Product Data: Manufacturer's catalog with specifications and construction details.
- C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
  - 1. Include section drawings of typical and special casework, work surfaces and accessories.
  - 2. Indicate locations of plumbing and electrical service field connection by others.

#### 1.06 PRODUCT HANDLING

- A. Deliver completed laminate clad casework, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 25 percent to 55 percent.
- B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

#### 1.07 JOB CONDITIONS

- A. Environmental Requirements: Do not install casework until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.
  - 1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
  - 2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.
- B. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.

#### 1.08 WARRANTY

- A. All materials and workmanship covered by this section will carry a five (5) year warranty from date of acceptance.

### **PART 2 – PRODUCTS**

#### 2.01 ACCEPTABLE MANUFACTURERS:

- A. Basis of specification: TMI Systems Design Corporation.
- B. Other Approved Manufacturers:
  - 1. LSI
  - 2. Polyvision
  - 3. Case Systems, Inc.
  - 4. Other manufacturers shall comply with the minimum levels of material and detailing indicated on the drawings or as specified.
- C. Substitutions: See Section 016000 .

#### 2.02 MATERIALS

- A. Core Materials:
  - 1. Particleboard up to 7/8 inch thick: Industrial Grade average 47-pound density particleboard, ANSI A 208.1-1999, M-3.
  - 2. Particleboard 1 inch thick and thicker: Industrial Grade average 45-pound density particle-board, ANSI A 208.1-1999, M-2.
  - 3. Medium Density Fiberboard 1/4 inch thick: Average 54-pound density grade, ANSI A208.2.
  - 4. MR Moisture Resistant Particleboard: Average 47-pound density particleboard, ANSI A208.1 1-1999, M-3.
- B. Decorative Laminates:
  - 1. High-pressure decorative laminate VGS (.028), NEMA Test LD 3-2005.
  - 2. High-pressure decorative laminate HGS (.048), NEMA Test LD 3-2005.
  - 3. High-pressure decorative laminate HGP (.039), NEMA Test LD 3-2005.

4. High-pressure cabinet liner CLS (.020), NEMA Test LD 3-2005.
5. High-pressure backer BKH (.048), (.039), (.028), NEMA Test LD3-2005.
6. Thermally fused melamine laminate, NEMA Test LD 3-2005, color matched with White.

C. Edging Materials:

1. 1mm PVC banding, machine applied.
2. 3mm PVC banding, machine applied and machine profiled to 1/8 inch radius.

## 2.03 SPECIALTY ITEMS

A. Support Members:

1. Countertop support brackets: Epoxy powder coated, 11 gauge steel with integral cleat mount opening and wire management opening.
2. Undercounter support frames: Epoxy powder coated.
3. Legs: Epoxy powder coated.

## 2.04 CABINET HARDWARE

A. Hinges:

1. Five knuckle, epoxy powder coated, institutional grade, 2-3/4 inch overlay type with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1.
  - a. Doors 48 inches and over in height have 3 hinges per door.
  - b. Magnetic door catch with maximum 5 pound pull provided, attached with screws and slotted for adjustment.

B. Pulls:

1. Door and drawer front pulls: 4" (100 mm) epoxy powder-coated metal pulls.

C. Drawer Slides:

1. Full extension, 150-pound load rated epoxy coated steel, bottom corner mounted with smooth and quiet nylon rollers. Positive stop both directions with self-closing feature.

D. Adjustable Shelf Supports:

1. Injection molded transparent polycarbonate friction fit into cabinet end panels and vertical dividers, adjustable. Shelf support have min. 2 integral support pins to interface pre-drilled holes, and to prevent accidental rotation of support. The support shall adapt to 3/4 inch or 1 inch thick shelving and provides non-tip feature for shelving. Supports may be field fixed if desired. Structural load to 1200 pounds (300 pounds per support) without failure.

E. Locks:

1. Manufacturer's standard cylinder type, pin tumbler locks.
2. Provide locks on all door and drawer units.
3. Removable core, disc tumbler, cam style lock with strike.
4. Elbow catch or chain bolt used to secure inactive door on all locked cabinets.

- F. File Suspension System: Extruded molding integral with top of drawer box sides to accept standard hanging file folders.

## 2.05 FABRICATION:

- A. Fabricate casework, countertops and related products to dimensions, profiles, and details shown.

- B. All casework panel components sized/cured to be precisely finished in size and squareness to within 0.010 inches, ensuring strict dimensional quality and structural integrity in the final fabricated product.
- C. Cabinet Body Construction:
  - 1. Tops and bottoms shall be glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals.
    - a. Tops, bottoms and sides of all cabinets are particleboard core.
    - b. Tops, bottoms and sides of sink base units are moisture resistant particleboard core.
  - 2. Cabinet backs: 1/4 inch thick medium density fiberboard panel fully captured by the cabinet top, bottom and side panels. Finish to match cabinet interior. 3/4 inch x 4 inch particleboard rails will be placed behind the back panel at the top and bottom, and doweled to the sides utilizing 10mm hardwood fluted dowels. A third intermediate rail will be included on all cabinets taller than 56 inches. Utilize hot melt glue to further secure back and increase overall strength.
    - a. Exposed back on fixed or movable cabinets: 3/4 inch thick particleboard with the exterior surface finished in VGS laminate as selected.
    - b. Exposed back on fixed or movable sink base cabinets: 3/4 inch thick moisture resistant particleboard with the exterior surface finished in VGS laminate as selected.
    - c. Flexible rail mounted cabinet backs: 3/4 inch thick particleboard structurally doweled into cabinet sides and top panels.
  - 3. Fixed base and tall cabinets shall have factory mounted bases of 3/4 inch thick exterior grade plywood. Base is nominal 4 inch high unless otherwise indicated on the drawings.
  - 4. Base units, except sink base units: Full sub-top. Sink base units are provided with open top and a stretcher at the front, attached to the sides. Back to be split removable access panel.
  - 5. Side panels and vertical dividers shall receive adjustable shelf hardware. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.
  - 6. Exposed and semi exposed edges.
    - a. Edging: 1mm PVC.
  - 7. Adjustable shelf core: 3/4 inch thick particleboard up to 36 inches wide, 1 inch thick particleboard over 36 inches wide.
    - a. Front edge: 1mm PVC.
  - 8. Interior finish, units with open Interiors:
    - a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with VGS high-pressure decorative laminate.
  - 9. Interior finish, units with closed Interiors:
    - a. Top, bottom, back, sides, horizontal and vertical members, and adjustable shelving faces with thermally fused melamine laminate.
  - 10. Exposed ends:
    - a. Faced with VGS high-pressure decorative laminate.
  - 11. Wall unit top and bottom:
    - a. Faced with VGS high-pressure laminate.

12. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), are not permitted.

D. Drawers:

1. Sides, back and sub front: Minimum 1/2 inch thick particleboard, laminated with thermally fused melamine doweled and glued into sides. Top edge banded with 1mm PVC.
2. Drawer bottom: Minimum 1/2 inch thick particleboard laminated with thermally fused melamine, screwed directly to the bottom edges of drawer box.
3. Paper storage drawers: Minimum 3/4 inch thick particleboard sides, back, and sub front laminated with thermally fused melamine. Minimum 1/2 inch thick particleboard drawer bottoms screwed directly to the bottom edges of the drawer box. Provide PVC angle retaining bar at the rear of the drawer.

E. Door/Drawer Fronts:

1. Core: 3/4 inch thick particleboard except at sink units which is 3/4 inch thick moisture resistant particleboard.
2. Provide double doors in opening in excess of 24 inches wide.
3. Faces:
  - a. Exterior: VGS High-pressure decorative laminate.
  - b. Interior: High-pressure cabinet liner CLS.
4. Door/drawer edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

F. Miscellaneous Shelving:

1. Core material: 3/4 inch or 1 inch thick particleboard.
2. Exterior: VGS High-pressure decorative laminate.
3. Edges: 3mm PVC, external edges and outside corners machine profiled to 1/8 inch radius.

## 2.06 DECORATIVE LAMINATE COUNTERTOPS:

A. Core:

1. All countertops except at sink elevations: 1 inch thick ANSI A208.1-1993 M-2 particleboard.
2. Countertops at sink elevations: 1 inch thick ANSI A208.1-1993 M-3 moisture resistant (MR) particleboard.

B. Surface: HGS/HGP high-pressure decorative laminate with balanced backer sheeting.

C. Edges, including applied backsplash: 3mm PVC, exposed edges and corners machine profiled to 1/8 inch radius.

D. All countertops joints must be dry fit at the factory to check for consistency in color from one panel to the other and overall finished panel thickness.

## PART 3- EXECUTION

### 3.01 INSPECTION:

- A. The casework contractor must examine the job site and the conditions under which the work under this section is to be performed, and notify the building owner in writing of unsatisfactory conditions. Do not proceed with work under this Section until satisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PREPARATION:

- A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.

3.03 KEYING:

- A. Key alike by room, unless otherwise instructed.

3.04 INSTALLATION:

- A. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit.
- B. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind.
- C. Repair minor damage per plastic laminate manufacturer's recommendations.

3.05 CLEANING:

- A. Remove and dispose of all packing materials and related construction debris.
- B. Clean cabinets inside and out. Wipe off fingerprints, pencil marks, and surface soil etc., in preparation for final cleaning by the building owner.

3.06 COLOR SELECTION:

- A. Laminate Color Selection: From Wilsonart stock colors.
- B. Hinge and Pull Color Selection: From manufacturer's standard
- C. Miscellaneous Hardware Color Selection (support brackets, table frames, rail): From manufacturer's standard.
- D. 1mm PVC Edge Banding Color Selection: From manufacturer's standard of colors matching decorative laminate.
- E. 3mm PVC Edge Banding Color Selection: From manufacturer's standard of minimum 10 colors.

**END OF SECTION**

**SECTION 133419**  
**METAL BUILDING SYSTEMS**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Manufacturer-engineered, shop-fabricated structural steel building frame.

1.02 RELATED REQUIREMENTS

- A. Section 055000 - Metal Fabrications.
- B. Section 074113- Insulated Metal Roof Panels
- C. Section 074213 - Insulated Metal Wall Panels
- D. Section 079005 - Joint Sealers.
- E. Section 081113 - Hollow Metal Doors and Frames.
- F. Section 083613 - Sectional Doors.
- G. Section 084500 - Translucent Insulated Wall Panels

1.03 ALTERNATES

- A. Refer to Section 012300 - Alternates for description of Alternates that affect the work of this Section.

1.04 REFERENCE STANDARDS

- A. AISC 360 - Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.; 2010.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2012.
- D. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
- E. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.
- F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.
- G. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.
- H. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2005 (Reapproved 2009).
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.
- K. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

- L. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

#### 1.05 DESIGN REQUIREMENTS

- A. Design members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with design load schedule indicated on Drawings.
- B. Design members to withstand UL 580 Uplift Class 60.
- C. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:
  - 1. Girts: Horizontal deflection of 1/180 of the span.
  - 2. Metal Roof Panels: Vertical deflection of 1/180 of the span.
  - 3. Metal Wall Panels: Horizontal deflection of 1/180 of the span.
- D. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.
  - 1. Purlins and Rafters: Vertical total load deflection of 1/180 and live load deflection of 1/240 of the span.
- E. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:
  - 1. Lateral Drift: Maximum of 1/60 of the building height.
- F. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.
- G. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE7 /SEI

#### 1.06 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene two weeks before starting work of this section.
- B. Require attendance of parties directly affecting work of this section, including General Contractor, Architect, Engineer, installer, and metal building system manufacturer's representative.
- C. Review materials, installation, protection, and coordination with other work.

#### 1.07 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on profiles, component dimensions, fasteners.
- C. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, and loads; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths.
  - 1. Provide signed and sealed shop drawings by Engineer licensed to practice in the State of Delaware.
- D. Supplier Certification: Submit certification that the metal building system supplier is a manufacturer's authorized and franchised dealer of the system to be furnished.

- E. Installer Certification: Submit certification that the metal building system installer has been regularly engaged in the installation of building systems of the same or equal construction to the system specified.

#### 1.08 QUALITY ASSURANCE

- A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.
  - 1. Design Engineer Qualifications: Licensed in the State of Delaware.
  - 2. Conform to applicable code for submission of design calculations and reviewed shop and erection drawings as required for acquiring permits.
  - 3. Cooperate with regulatory agency or authority and provide data as requested.
- B. Perform work in accordance with AISC 360 - Specification for Structural Steel Buildings.
  - 1. Maintain one copy on site.
- C. Perform welding in accordance with AWS D1.1 and D1.3.
- D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
  - 1. Not less than 5 years of documented experience
- E. Erector Qualifications: Company specializing in performing the work of this section with minimum five years experience.

#### 1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty for metal building system.
  - 1. Include coverage for weather tightness of building enclosure elements after installation.

### **PART 2 PRODUCTS**

#### 2.01 MANUFACTURERS

- A. Metal Buildings:
  - 1. Butler Manufacturing Company: [www.butlermfg.com/speclink](http://www.butlermfg.com/speclink).
  - 2. Ceco Building Systems: [www.cecobuildings.com](http://www.cecobuildings.com).
  - 3. VP Buildings: [www.vp.com](http://www.vp.com).
  - 4. Star Building Systems: [www.starbuildings.com](http://www.starbuildings.com).
  - 5. American Buildings: [www.americanbuildings.com](http://www.americanbuildings.com)
  - 6. Substitutions: See Section 016000 - Product Requirements.

#### 2.02 METAL BUILDING

- A. Primary Framing: Rigid frame of rafter beams and columns, intermediate columns, and wind bracing.
- B. Secondary Framing: Purlins, Girts, Eave struts, Flange bracing, Sill supports, and Clips, and other items detailed.
- C. Wall System: Preformed insulated metal panels of vertical profile, with anchorage assembly, and accessory components. See Section 074213.

- D. Roof System: Preformed insulated metal panels oriented parallel to slope, with anchorage assembly, and accessory components. See Section 074113.
- E. Roof Slope: 1/2 inches in 12 inches (\_\_\_).

#### 2.03 MATERIALS - FRAMING

- A. Structural Steel Members: ASTM A 572/A 572M, Grade 50.
- B. Structural Tubing: ASTM A 500, Grade B cold-formed.
- C. Plate or Bar Stock: ASTM A 529/A 529M, Grade 50.
- D. Anchor Bolts: ASTM A307, galvanized to ASTM A153/A153M.
- E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M, Class C.
- F. Welding Materials: Type required for materials being welded.
- G. Primer: SSPC-Paint 20, zinc rich.

#### 2.04 COMPONENTS

- A. Doors and Frames: Specified in Section 081113.
- B. Overhead Doors: Specified in Section 083613.
- C. Overhead Door Frame: Formed steel sections braced to building frame specified in Section 055000.
- D. Translucent Insulated Wall Panels: Specified in Section 084500.

#### 2.05 FABRICATION - FRAMING

- A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.
- B. Anchor Bolts: Formed with bent shank, assembled with template for casting into concrete.
- C. Provide supplemental framing for wall and roof openings.

#### 2.06 FINISHES

- A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

### **PART 3 EXECUTION**

#### 3.01 EXAMINATION

- A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

#### 3.02 ERECTION - FRAMING

- A. Erect framing in accordance with AISC 360 - Specification for Structural Steel Buildings.
- B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing.
- C. Set column base plates with non-shrink grout to achieve full plate bearing.
- D. Do not field cut or alter structural members without approval.

- E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.03 INSTALLATION - ACCESSORIES

- A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.
- B. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 079005.

**END OF SECTION**



**SECTION 21 01 70**

**FIRE PROTECTION SYSTEMS**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. This Section shall include all work necessary and/or required and furnish all materials and equipment for extension of the existing automatic sprinkler system for the building areas indicated. Such work includes but is not limited to the following:
  - 1. UL/FM labeled equipment.
  - 2. All piping and equipment required for a complete wet sprinkler system on occupied floor levels.
  - 3. Installation of zoned test assemblies.
  - 4. Installation of tamper and flow switches.
  - 5. All piping and equipment for a complete wet standpipe system.
  - 6. To coordinate with the Mechanical, Plumbing and Electrical Contractors, the installation of the mains and sprinkler piping and supports to allow installation of their work with maximized accessibility for these trades and service requirements for maintenance and repair. Prior to installing any piping or other devices, obtain written confirmation from these contractors that requirements, conflicts and coordination issues have been discussed and resolved. Provide system drawings with elevation of any piping or other systems to the Mechanical Contractor so he can prepare the necessary coordination drawings that may be required. No work may be installed until the coordination issues are resolved. Any and all expense relating to coordination issues shall be born by the Contractor who did not install his work according to the coordination drawings.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

- B. Sprinkler System Contractor shall provide new separate and complete sprinkler systems (wet and dry) in satisfactory operating condition which shall conform to requirements of the following:
  - 1. NFPA Pamphlet 13.
  - 2. City of Wilmington Fire Marshal's Office.
  - 3. Owner's Insurance Agency.
- C. Submit working drawings to the City of Wilmington Fire Marshal's Office and obtain approval before beginning work.
- D. Sprinkler systems shall be "Light Hazard Occupancy" and shall cover all rooms, closets, attic spaces, etc., in the entire building.
- . Sprinkler systems shall be "Ordinary Hazard Occupancy" for Mechanical Rooms and Storage Rooms.
  - 1. Design and layout shall be based on Calculated System (Hydraulic).
  - 2. Exact routing of piping shall be governed by structural conditions and obstructions.
  - 3. The Sprinkler Contractor shall coordinate his work with the other trades so as to clear all construction items, lights, ducts, piping, etc, within the Auditorium and associated rooms.

## **1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.

Submit shop drawings with Fire Marshal's approval and descriptive data, complete with product designation for the following:

- 1. UL/FM Listed Butterfly Valves
  - 2. Sprinkler Heads
  - 3. Check Valves
  - 4. Backflow Preventer
- B. Submit complete sprinkler layout indicating location of heads by dimensions from walls, pipe size, and locations of valves, fittings and accessories, with Fire Marshal's approval.
- C. Submit manufacturer's product data on sprinkler heads, valves, siamese connections, compressor, etc.

## **1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

## **1.7 TESTS AND INSPECTIONS**

- A. Contractor shall arrange and pay for all inspections, examinations and tests required by authorities specified herein and deliver certificates of such inspections to Owner.
- B. Complete sprinkler system shall be tested in accordance with the latest requirements of NFPA Pamphlet 13 and the City of Wilmington Fire Marshal's Office.
- C. Fire Marshal's acceptance test shall be performed before system is placed in service and not less than five working days after Fire Marshal is notified.

## **1.8 QUALIFICATIONS OF CONTRACTOR**

- A. Contractor for sprinkler installation shall be licensed by the State of Delaware and be regularly engaged in installation of automatic sprinkler systems and other fire protection equipment.
- B. Consult General Provisions for additional requirement.

## **PART 2 – PRODUCTS**

### **2.1 FIRE PROTECTION PIPING MATERIALS & PRODUCTS**

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire protection piping systems. Where more than 1 type of materials or products are indicated, selection is installer's option.

### **2.2 BASIC IDENTIFICATION**

- A. Provide identification complying with applicable Division 22 sections in accordance with the following listings:
  - 1. Fire Protection Piping: Plastic pipe markers.
  - 2. Fire Protection Valves: Metallic valve tags.

### **2.3 BASIC PIPE AND FITTINGS**

- A. Comply with the weight, size and type of pipe and fittings by the latest issued schedule of NFPA Pamphlet 13, adopted by Authorities having jurisdiction.
- B. All fire protection piping within the Mechanical Room shall be minimum Schedule 40 black iron pipe.
- C. Plastic piping shall not be permitted in classrooms, office spaces, etc, in accordance with the listed applications. No exposed plastic pipe will be permitted.
- D. Uni-Flange type connections shall not be permitted on this project.

**2.4 BASIC PIPING SPECIALTIES**

- A. Provide piping specialties complying with Section 220010 Basic Materials & Methods in accordance with the following listing:

- Pipe escutcheons
- Dielectric unions
- Drip pans
- Sleeves
- Sleeve seals

**2.5 BASIC VALVES**

- A. Comply with the latest issue of NFPA 13 adopted by the Authorities having jurisdiction for the following:

- Control Valve – Butterfly Valve
- Check – Swing Valve

**2.6 FIRE PROTECTION SPECIALTIES**

- A. Provide fire protection specialties, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.
- B. Automatic Sprinklers: Sprinkler heads shall be UL approved for intended use and have temperature ratings as indicated or required for location.

Provide the following type sprinkler heads as indicated:

- Upright: Viking “Micromatic Model "M" bronze finish, 1/2" orifice.
- Pendent: Viking “Micromatic Model "M" chrome plated, 1/2" orifice and escutcheon plate.
- Pendent: Viking “Microfast Model “M” quick response with all white finish including escutcheon plate, 1/2” orifice.
- Sidewall: Viking “Micromatic Model “M”, chrome plate, 1/2” orifice.
- Sidewall: Viking “Microfast Model “M” – quick response, all white finish including escutcheon plate, 1/2” orifice.
- Sidewall: (Extended Coverage) Viking “Microfast Model “M”, quick response, all white finish, extra large orifice.
- Semi-Recessed: Viking “Silhouette Model A-1 quick response, chrome plated, 1/2” orifice.
- Full Concealed: Viking “Horizon-Mirage” large orifice quick response, white cover plate.

- C. Sprinkler Cabinet and Wrench: Furnish steel, baked red enameled, sprinkler box with capacity to store 10 sprinklers and wrench sized to sprinklers.

**2.7 MANUFACTURERS**

- A. Subject to compliance with requirements, manufacturers offering fire protection specialties and or equipment which may be incorporated in the work include and are limited to the following:

Sprinkler Heads

Central  
Viking  
Star-Chemetron  
Automatic Sprinkler

Fire Protection Specialties

W.D. Allen  
Sierra  
Elkhart  
Potter-Roemer  
Seco

Special Valves (Backflow Device)

Ames Silver Bullet

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF BASIC IDENTIFICATION**

- A. Install fire protection signs on piping in accordance with ANSI/NFPA 13.

**3.2 FIRE SPRINKLER PIPING SYSTEMS**

- A. Comply with requirements of ANSI/NFPA 13 for installation of fire sprinkler piping materials. Install fire sprinkler piping products where indicated, in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that fire sprinkler piping complies with requirements and serves intended purposes.
- B. Coordinate with ceiling space available, other trades, including plumbing piping, as necessary to interface components of fire sprinkler piping properly with all other items of construction.
- C. Install drain piping at low points of fire sprinkler piping.
- D. Provide auxiliary drains as required.
- E. Install the following type sprinkler head in the following locations:
- F. Install sprinkler in acoustical tile suspended ceilings, in the center of the tile with heads installed in such a way that the requirements for both coverage and symmetry are fulfilled.

**3.3 INSTALLATION OF SUPPORTS, ANCHORS AND SEALS**

- A. Comply with the latest issue of NFPA adopted by the Authorities having jurisdiction.

**3.4 INSTALLATION OF FIRE PROTECTION SPECIALTIES**

- A. Comply with the latest issue of NFPA adopted by the Authorities having jurisdiction.

**3.5 ADJUST & CLEAN**

- A. Sprinkler Piping Flushing: Prior to connecting sprinkler risers for flushing, flush water feed mains, lead-in connections and control portions of sprinkler piping. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in ANSI/NFPA 13. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.

**3.6 FIELD QUALITY CONTROL**

- A. Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically, for period of 2 hours, at not less than 200 psi or at 50 psi in excess of maximum static pressure when maximum static pressure is in excess of 150 psi. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested.

**3.7 EXTRA STOCK**

- A. For each style and temperature range required, furnish additional sprinkler heads, amounting to 1 unit for every 100 installed units.

END OF SECTION 21 01 70

**SECTION 22 00 00**

**GENERAL PROVISIONS – PLUMBING/FIRE PROTECTION**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and all other applicable Divisions, apply to work of this Section.
- B. This specification or drawing and the design features or resulting construction disclosed, are the property of Furlow Associates, Inc., and shall not be reproduced without written permission.
- C. All fire protection suppression systems shall be part of and included in all of the following 220000 thru 220191 Sections.

**1.2 WORK INCLUDED**

- A. Provide labor, materials, equipment and supervision necessary to install complete operating Plumbing and Fire Protection Systems as indicated the drawings and specified herein, including all work at the site and within the proposed construction areas to accomplish the required work.

**1.3 REGULATIONS, CODES AND STANDARDS**

- A. Work shall be performed in accordance with latest adopted codes, regulations and ordinances by authorities having jurisdiction. Observe all safety regulations.
- B. Latest editions of any referenced standards shall govern.
- C. Obtain all municipal and/or the Authorities Having Jurisdiction permits and inspection certificates and pay all charges.
- D. Make or arrange for any/or all inspection agency reviews or visits and pay all charges. This includes communication with each respective agency and/or utility to verify the project system work, coordination responsibilities, fees, back charges, etc., required.
- E. All fees and back charges shall be verified during the bidding phase of the work. Any discrepancy of this item between any utility, inspection agency and the Contractor shall be brought to the attention of the A/E prior to bid opening.
- F. Submission of a bid will be deemed evidence of having complied with these requirements.

**1.4 RELATED WORK**

- A. Refer to equipment shown or specified in all other applicable Divisions that require Plumbing and Fire Protection services.

- B. Refer to work related to Plumbing and Fire Protection as shown on the following contract drawings:
- Architectural & Structural
  - HVAC
  - Electrical

## 1.5 COORDINATION

- A. The Mechanical, Plumbing and Electrical Contractors are responsible to coordinate all manufacturer's recommended circuit breakers, starters, disconnects and fuse sizes for all equipment. Submission of a shop drawing will certify that this has been completed. Any necessary changes required will be included as part of this contract.
- B. Plumbing and Sprinkler Contractors shall coordinate scheduling, submittals and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of independent work elements, with provisions to accommodate items that may be installed at a later time.
- C. Plumbing and Sprinkler Contractors shall verify utility requirements and all characteristics of operating equipment are compatible with the building utilities. Coordinate the work of all sections related and required for installing, connection and placing in service of all equipment.
- D. Plumbing and Sprinkler Contractors shall coordinate all space requirements, supports and installation of all mechanical, electrical, plumbing and fire protection work, which are indicated diagrammatically on the Drawings. Verify routing of all pipes, ducts, conduits and equipment connections. Maximize accessibility for other work, and service requirements for maintenance and repairs.
- E. Obtain written confirmation from all related trade Contractors and the Owner or his representative that requirements, conflicts and coordination issues have been discussed and resolved.

## 1.6 SUBMITTALS

- A. Shop Drawings & Product Data:
1. Shop drawings and product data shall be submitted in accordance with Division 22 specifications except where herein modified.

**NOTE: Submittals will only be reviewed once and resubmittals will be reviewed once. Any other submittals will be billed to the Contractor at the Engineer's standard rates.**

2. Listed are the required shop drawings and reports required for this project. The Engineer/Owner shall reserve the right to require additional submissions not listed below:
  - All fixtures, equipment and associated devices so listed on the Fixture Schedule on Drawing P-501.
  - Insulation

- All specified piping systems.
  - All specified valves.
  - Hanger and supports including Sumner system.
  - Piping labels and identification.
  - Sprinkler System and all related data, devices, switches and trimmings.
  - Testing reports.
  - Sterilization report.
  - Operating/Maintenance manuals.
  - As-Built Drawings.
3. Submittals comprising complete catalog cuts, shop drawings and performance test data for Plumbing materials and equipment as required by other sections of Division 22, shall be submitted for review checking. The Contractor shall review these for conformance to contract documents prior to submission and affix contractor's signature to each submittal certifying that this review has been done. By approving and submitting shop drawings, product data, samples and similar materials, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction data that relates to the work, and has checked and coordinated this information with all of the requirements contained in the contract documents for the work of all trades.
4. All submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto.
- a. Project name.
  - b. Project number.
  - c. Sub-contractor's, vendor's and/or manufacturer's name and address.
  - d. Product identification.
  - e. Identification of deviation from contract documents.
  - f. Applicable contract drawings and specification section number.
  - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
  - h. Resubmit revised or additional submittals as requested.
  - i. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the contractor making the submission to identify by name, the contractor who is to do this work. If the contractor named is other than the contractor making the submission, the shop drawing submission must be reviewed by the named contractor and bear his mark of approval, prior to submission to the Architect/Engineer.
  - j. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.

- k. The Contractor shall keep one copy of approved shop drawings at the job site,, filed in a suitable metal container. The shop drawings shall be cataloged and kept in good repair, and shall be available for use by the Owner, Architect and Engineer.
- l. No equipment shall be ordered, fabricated, etc., before approval of shop drawings.
- B. Contractor is responsible for the shop drawing coordination and interface with the work of other contracts and adjacent work. The relationship of Contractor's work shall be verified as it relates to adjacent and critical features of the work of this and all contracts and materials.

### **1.7 WARRANTY/GUARANTEES**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in all other applicable Divisions. In addition, refer to specifications for special guarantees.
- B. Wherever in the specification sections of this division, reference is made to a specific warranty period, this warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the contract documents.
- C. Contractor to include an 11 month "walk-thru" of the building systems with representatives of the School District, Architect, Engineer and the Construction Manager. The purpose is to establish a list of corrective work that relates to operational issues, material/installation deficiencies.

### **1.8 SITE INSPECTION**

- A. The Contractor shall visit the site, inspect, and become aware of all conditions which may affect the work during the estimation phase of his work and prior to bid openings. Investigate utilities, protection requirements for adjacent facilities, storage locations, and access to the construction area.
- B. Submission of a bid will be deemed evidence of having complied with this requirement.

### **1.9 SUBSTITUTIONS**

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.
- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the Contractor or an equipment vender to deviate from the written portion of the specifications unless so stated in the addendum.
- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.

- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements as indicated on all contract documents and as described within the specifications. This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, then they shall be responsible for any and all additional costs associated with the changes required by other trades.

**1.10 LUBRICATION**

- A. Furnish, install and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

**1.11 EQUIPMENT START-UP**

- A. Verify proper installation by manufacturer or his representative.
- B. Advise General Contractor 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to General Contractor.

**1.12 OPERATION & MAINTENANCE INSTRUCTIONS**

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
- B. Insure that the Owner's personnel are familiar with all operations to carry on required activities.
- C. Such instruction shall be for each item of equipment and each system as a whole.
- D. Provide report that instruction has taken place. Include in the report the equipment and/or systems instructed, date, contractor, Owner's personnel, vendor, and that a complete operating and maintenance manual has been reviewed.
- E. Manual shall include all instructions on operation, maintenance, repair parts list, lubrication requirements, brochures, catalogue cuts, wiring diagrams, piping diagrams, control sequences, service requirements, names and addresses of vendors, suppliers and emergency contacts. Three manuals shall be provided.
- F. Submit manuals for review prior to operating instruction period. Manuals shall be 8-1/2 x 11" with hard cover, suitably bound.

- G. Provide to the Owner any special tools necessary for operation and routine maintenance of any of the equipment.
- H. Furnish three (3) copies of a professionally taped video and three (3) copies of professionally prepared drawings demonstrating the following:
- Location of main shut-off valves
  - Procedures for equipment start-up and seasonal shut-downs.
  - Procedures for maintenance.
  - Provide written version of all procedures included in video.

The above should cover all equipment/systems including, but not limited to the following:

- Sprinkler Systems
- Flush valves
- Manual Faucets
- 3-Person Lavatory System

### **1.13 TOOLS**

- A. All equipment furnished by the Contractor which requires special tools or devices other than those normally available to the maintenance or operating staff shall be furnished in duplicate to the Owner, sufficiently marked, packed or boxed for staff usage. The tools provided shall be listed by the Contractor identified as to their use or the equipment applicable in a written transmittal to the Owner.

### **1.14 CLEANING AND FINISHING**

- A. After equipment start-up and all operating tests have been made and the system pronounced satisfactory, each respective Contractor shall go over the entire project, clean all equipment, etc., installed by him and leave in a clean and working condition. Any surfaces found marred after this final cleaning shall be refinished or replaced by each Contractor at no cost to the Owner.
- B. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care shall be taken to provide protection for bearings, open connections, pipe coils, pumps, compressors and similar equipment.
- C. All NEW fixtures, piping, finished surfaces and equipment installed shall have all grease, adhesive labels and foreign materials removed.
- D. All new piping installed shall be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, traps, flush valves and similar items shall be thoroughly cleaned. Remove and thoroughly clean and reinstall all liquid strainer screens after the system has been in operation ten (10) days.
- E. When connections are made to existing systems, the Contractor shall do all cleaning and purging of the existing systems required to restore them to the condition existing prior to the start of work.

- F. Clean-up: Remove from the premises, all unused material and debris resulting from the performance of work under this section.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. All material and equipment shall be new and of present day manufacture, and shall conform to accepted standards of the trade where such a standard has been established for the particular type of equipment or material.
- B. Whenever equipment or material is referred to in the singular, such as "the plumbing fixture", it shall be deemed to apply to as many such items as necessary to complete the work.

### **2.2 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. During loading, transporting and unloading exercise care to prevent damage to material.
- B. Store all materials in dry enclosures or under protective coverings out of way of work progress.
- C. Material shall not be allowed to be stored directly on ground.
- D. Deliver in manufacturer's original cartons or on skids.
- E. Handle and protect so as to prevent damage to product or any surrounding material.

### **2.3 CONCRETE**

- A. Concrete if used on this project, shall be in accordance with Section 033000.
- B. The 28-day minimum compressive strength shall be 3000 psi.

## **PART 3 – EXECUTION**

### **3.1 PROTECTION**

- A. Plug or cap open ends of piping systems.
- B. Stored materials shall be covered to prevent damage by inclement weather, sun, dust or moisture.
- C. Protect all installed work until accepted in place by the Owner.
- D. Plates, polished metal escutcheons and other finished devices shall not be installed until masonry, tile, and painting operations are complete unless otherwise protected.
- E. Protect all work from operations which may cause damage such as hauling, welding, soldering, painting, insulating and covering.
- F. Do not remove protective material until equipment is placed in service.

### **3.2 WORKMANSHIP**

- A. Install all work neat, trim and plumb with building lines.
- B. Install work in spaces allocated.
- C. Cutting and patching shall be performed by skilled tradesmen normally employed for the work involved.

### **3.3 EXCAVATION**

- A. The excavation shall be of the open-trench method and to the depths and widths as may be necessary. The Contractor shall do all excavation required in connection with his work. Bottoms of trenches shall be excavated to a uniform grade. All materials excavated shall be deposited on the side of the trenches and beyond the reach of the slides. Excavated material shall not be piled where it will interfere with traffic. If rock is encountered, it shall be removed by the General Contractor. See provisions in Division 2.
- B. No piping shall be bedded directly on rock. They shall be cushioned by a 6-inch layer of crushed stone or gravel of selected grade, of size to pass through 3/4" mesh sieve. Not less than 30% shall be fine which will pass through a 3/8" mesh sieve.

### **3.4 SHORING AND PUMPING**

- A. The Contractor shall provide all shoring, bracing or sheet piling necessary to maintain the banks of his excavation and shall take out same as the work progresses and filling in has been accomplished. Shoring shall be in accordance with OSHA Standards.
- B. The arrangement of shoring must be such as to prevent any movement of the trench banks and consequent strains on the conduits. Shoring shall be provided to prevent damage to work installed by other trades.
- C. The Contractor shall do all pumping required to keep his excavations free of water. The water shall be conveyed in piping or watertight troughs a sufficient distance that it will flow from the site and not affect other work being performed.

### **3.5 BACKFILLING**

- A. After work in trenches has been completed, they shall be filled with select fill in 8" layers and shall be pneumatically tamped before the next layer of material has been filled in. The backfill shall be free of excavated rock, cinders, stones, brickbats or other debris.
- B. Wherever rock is removed, the Contractor shall secure and fill select clean earth to a minimum depth of 3'-0" above the top of the pipe. Unless otherwise indicated, no rock shall be deposited in the trench fill. This clean earth fill shall be procured other than from the site unless permission for earth borrow from the site is granted by the Architect. If site borrow is permitted, the topsoil removal, relocation and finished grading will be accomplished as directed by the Architect.

- C. Under no circumstances shall excavated material be left where it will interfere with the Owner's or other Contractor's operations.
- D. All earth and other materials taken from the trenches and not required for backfilling shall be deposited where directed, or removed from the premises as directed by the Architect.
- E. Any rock removed from the excavation shall be removed from the project site by the Contractor.
- F. Trenches which pass under wall footings or within 18" of column footings shall be backfilled with lean concrete. To secure adequate foundation support, the method and depositing of the concrete fill shall be as directed by the Architect. To prevent the concrete from adhering to the pipes, necessary pipe protection shall be applied.

### **3.6 EQUIPMENT SETTING**

- A. Furnish and install as a minimum, a 4 inch concrete pad beneath all floor-mounted equipment. Install anchor bolts in pour.
- B. Furnish and install as a minimum, spring vibration isolation under any equipment 10 HP and over and rubber in shear vibration isolation on any equipment up to 10 HP.
- C. Concrete shall be 3,000 psi, 28 day compressive strength in accordance with ACI-613. Reinforce with No. 4 rod 12" on centers both ways or as otherwise detailed.

### **3.7 FASTENERS, HANGERS AND SUPPORTS**

- A. Furnish and install all hangers and supports required to suspend, mount, or hang the work.
- B. Furnish and install all miscellaneous steel angles, channels, beams, clips, brackets and anchors necessary to hang or support the work. Provide submissions for review.
- C. Install concrete inserts before concrete is poured.
- D. Drilled inserts shall not be loaded more than 1/4 rated capacity or 200 pounds.
- E. Power-driven fasteners shall not be allowed for piping larger than 2 inch, or equipment. When used they shall not be loaded more than 1/8 rated capacity or 200 pounds.
- F. All hangers, miscellaneous steel, braces and supports shall be galvanized, cadmium plated, or primed steel. Copper tubing shall be supported with copper hangers. No direct contact of dissimilar metals between the piping system and its hanger support shall be permitted.
- G. Piping shall be supported from adjustable clevis type hangers with insulation pipe saddles. Where hangers are 18" or longer, provide lateral bracing at every fourth hanger. See IPC Pipe Support Table below:

**PIPE SUPPORT SPACING**

Material	Horizontal Max. Feet	Vertical Max. Feet
ABS Pipe	4	10
Aluminum	10	15
Brass	10	10
Brass Tube up to 1-1/4"	6	10
Brass Tube over 1-1/2"	10	10
Cast Iron	5	15
Copper up to 1-1/4"	6	10
Copper over 1-1/4"	10	10
CPVC Up to 1"	3	10
CPVC Over 1"	4	10
Lead Pipe	Continuous	4
PB Pipe/Tubing	2.6 ft. (32")	10
PVC Pipe	4	10
PEX	2.6 ft. (32")	10
Steel Tubing	8	10
Steel Pipe	12	15

- H. Support vertical piping at floor levels using approved riser clamps. Clamp material shall be compatible with pipe material. Maximum vertical spacing shall be 10'-0".

**3.8 SLEEVES**

- A. Provide each pipe passing through a masonry or concrete wall, floor or partition with a sleeve made from standard weight steel pipe for pipe with smooth edges, securely and neatly cemented in place. Provide each pipe passing through a frame or metal partition with a sleeve made from No. 22 gauge galvanized sheet metal, securely fastened in place.
- B. Pipe passing through foundation wall or under foundation shall be provided with relieving arch or steel pipe per IPC Section 305.5.
- C. Be responsible for the proper location and alignment of all sleeves.
- D. Provide hydrostatic seals for sleeves passing through outside walls, below grade, or through hydrostatically sealed slabs or floors on grade. Provide fire-rated seals for all other sleeves.
- E. Install both piping and sleeve seals so as to maintain integrity of seals with expansion and contraction of piping.
- F. Set floor sleeves flush with floor surface in finished areas, 1" above the finished floor in kitchens, cafeterias, and similar service areas unless such areas are slab-on-grade; 1" above the floor in mechanical rooms, pipe chases, pipe spaces and other unfinished areas, unless otherwise indicated, and flush with the underside of slabs. Extend wall and partition sleeves through and cut flush with each surface unless otherwise indicated or specified.

- G. Select sleeves two pipe sizes larger than any pipe that is to remain uncovered, unless otherwise required by the sealing method specified. Where pipes are to be covered, provide sleeves large enough to allow the covering to pass through the sleeves with sufficient clearance for sealing as specified hereinafter. Size sleeves for branch piping from vertical risers large enough to permit vertical expansion at the riser.
- H. Place sleeves imbedded in concrete floors or walls in the forms before concrete is poured; sleeves shall have integral waterstop flanges, where they are to receive either watertight or hydrostatic seals.
- I. Install sleeves passing through above-grade floors of mechanical rooms, toilet rooms, kitchens or similar service areas where liquid leaks or spillover may occur in a watertight manner. Sleeves shall be such that waterproofing membrane can be flashed around and into the sleeve where necessary.
- J. Seal sleeves for pipes passing through ceiling air plenum walls or the floor above air tight in a manner similar to that specified for fire-rated sleeves.
- K. Hydrostatic Sealing Method: Provide compressible synthetic rubber seals, equivalent to LINK SEAL, manufactured by the Thunderline Corporation, or THRUWALL manufactured by O.Z. Gedney. Install seals in accordance with the manufacturer's recommendations to provide air tightness aboveground and hydrostatic sealing belowgrade. Caulking or other type mastic is not acceptable.
- L. Fire-Rated Sealing Method:
  - 1. Sleeves, openings and sealants shall comply with applicable codes, recommended practices and standards, and manufacturer's instructions. Fire sealants shall have ability to prevent spread of flame, smoke or water throughout the penetration and shall pass 3 hour test, UL test ASTM E814 and UL 1479.
  - 2. Products: Chase Corporation CTC PR-855, O. Z. Gedney CRS/CAFS, 3M Electro-Products Division Putty 303 or Caulk CP25 penetration sealing kits, General Electric Company sealants type RTV-850, 6428 or 7403, Thunderline Corporation "Link-Seal Pyro-Pak". Installation and type of sealant to be used as recommended by the manufacturer.
  - 3. Expansion collars, fire seal/firestop collars – ASTM E814 (UL1479). Spec Seal Corporation, Inc. (plastic pipe).

### **3.9 PLATES**

- A. Furnish and install chrome plated plates wherever piping passes into finished area.
- B. Plates shall be securely fastened to piping or building construction.
- C. Floor plates shall cover 1 inch sleeve extension.

**3.10 OFFSETS, TRANSITIONS, MODIFICATIONS**

- A. Furnish and install all offsets necessary to install the work and to provide clearance for other trades.
- B. Maintain adequate headroom and clearance.
- C. Incidental modifications necessary to the installation of the systems shall be made as necessary and as approved by the Architect.

**3.11 RECESSES**

- A. Furnish information to the General Contractor as to sizes and locations of recesses required to install panels, boxes, and other equipment or devices which are to be recessed in walls.
- B. Make offsets or modifications as required to suit final locations.

**3.12 LABELING**

- A. All Plumbing equipment such as pumps, and devices requiring identification for operating procedures shall be provided with permanent black laminated micarta white core labels with 3/8 inch letters.
- B. This shall also apply to all controllers, remote start/stop pushbuttons and equipment cabinets.

**3.13 FLASHING AND COUNTERFLASHING**

- A. Roof drains, vents, roof curbs, etc., shall have counterflashing fittings. General Contractor shall provide flashing.
- B. Piping and conduit thru the roof shall be flashed by the General Contractor. Furnish and install counterflashing.

**3.14 ACCESS**

- A. Locate all equipment, valves, devices and controllers which may need service in accessible places.
- B. Where access is not available, access panels shall be provided. Furnish access doors to the General Contractor for installation.
- C. Access doors shall be Elmdor, Karp Co., MIFAB or Controlled Air Manufacturing Limited, with 16 gauge frames and 14 gauge steel door, prime painted.
- D. Maintain required access clearances.

**3.15 WIRING**

- A. Packaged plumbing system equipment shall be furnished with disconnect switches, and magnetic starters, factory furnished and wired by the unit manufacturer.
- B. All control wiring shall be furnished and installed under this Division of the work.
- C. All wiring shall be in accordance with the National Electrical Code and as recommended by the equipment manufacturer.

**3.16 UTILITIES**

- A. Do not interrupt any utility or service to the Owner without adequate previous notice and schedule.
- B. Arrange and pay for the relocation, disconnection or removal of, or relocate, disconnect or remove existing utilities and services where such work is shown or where such utilities or services interfere with new construction, whether or not shown. Provide all excavation, backfilling and paving required by such work.
- C. Perform alteration of utilities and services in accordance with the rules, regulations and requirements of the involved utility companies, regulatory agencies having jurisdiction.

**3.17 CUTTING AND PATCHING EXTERIOR SURFACES**

- A. This Contractor shall be responsible for returning disturbed paved and/or grass areas to original condition where excavation for utilities has been required.
- B. Cut and patch paved areas to match original surface.
- C. Properly tamp backfill before finishing or repairing disturbed area surfaces.

**3.18 OPENINGS - CUTTING, REPAIRING**

- A. This contractor shall cooperate with the work to be done under other sections in providing information as to openings required in walls, slabs and footings for all piping and equipment, including sleeves where required.
- B. Any drilling or cutting required for the performance of work under this Section, shall be the responsibility of this Contractor and the cost thereof shall be borne by him.
- C. Holes in Concrete: Sleeves shall be furnished, accurately located and installed in forms before pouring of concrete. This contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drill or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling.
- D. It shall be the responsibility of this Contractor to ascertain that all chases and openings are properly located.

**3.19 GUARANTEE**

- A. All materials and equipment provided and/or installed under this section of the specifications shall be guaranteed for a period of one year from the date of acceptance of the work by the Owner unless otherwise specified in other applicable Divisions. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without any cost to the Owner. Any defective materials or inferior workmanship noticed at time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.

In the event of occupancy by the Owner prior to final acceptance of the project, the guarantee date for equipment placed in operation shall be mutually agreed to by the Contractor and the Owner's representative.

- B. Contractor to include an 11 month "walk-thru" of the building system with representatives of the School District, Architect, Engineer and the Construction Manager. The purpose is to establish a list of corrective work that relates to operational issues, material/installation deficiencies.

**3.20 DRAWINGS**

- A. The Plumbing and Fire Protection Systems are indicated on the Contract Drawings. Certain pertinent information and details required by the Plumbing and Fire Protection Work appear on the Architectural, Structural and Electrical Drawings; become familiar with all Drawings; and incorporate all pertinent requirements.
- B. Drawings are diagrammatic and indicate the general arrangement of systems and requirements of the Work. Do not scale Drawings. Exact locations of fixtures and equipment, not specifically shown shall be obtained before starting work.
- C. When indicated on the drawings, plumbing riser diagrams are completely diagrammatic and indicate the intent of the work for both the Contractor, L&I review agencies and/or Authorities Having Jurisdiction. Where valves, shock absorbers, incidental equipment, devices, etc., including execution notes are indicated on the riser diagrams, they shall be so required and installed as part of the system work.

**3.21 RECORD DRAWINGS**

- A. As-Built record drawings, showing dimensions, locations and depth of all buried and concealed piping, plugged outlets and equipment shall be kept up to date. Master copy shall be kept on the job. No backfilling of trenches shall be permitted until as-built drawings are approved as up-to-date by the Owner/Representative. No plumbing progress payments shall be approved unless as-built drawings are up-to-date. Depth of sewers shall be from a permanent bench mark as shown on the contract drawings. Refer to project record drawings under General Conditions.

END OF SECTION 22 00 00

**SECTION 22 00 10**

**BASIC MATERIALS AND METHODS - PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

**1.2 REFERENCE**

- A. Install all piping, fixtures, equipment, etc., to meet the requirements of the following:

City of Wilmington Department of License and Inspection  
New Castle County Department of Sewers  
City of Wilmington Plumbing Code  
City of Wilmington Fire Marshal's Office  
International Plumbing Code (All applicable sections)  
International Mechanical Code (All applicable sections)  
NFPA  
OSHA

All requirements of the above governing agencies shall be in compliance with the latest issues, rules or regulations in effect.

- B. Appliances and materials governed by UL requirements shall meet such requirements and bear the label.

**1.3 QUALITY ASSURANCE**

- A. Provide adequate supervision of labor force to assure all aspects of specifications are being fulfilled.
- B. Insure that all work and equipment is installed in accordance with manufacturer's warranty requirements.
- C. Replace all pipes and fittings shown to be defective as a result of testing.

**1.4 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
  - 1. Manufacturer's Product Data on all pipe and fittings to be used in project.
  - 2. Manufacturer's Product Data on all valves to be used in project.

## **1.5 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

## **PART 2 – PRODUCTS**

### **2.1 CAST IRON PIPE AND FITTINGS**

(Note: Any cast iron piping made or marked “CHINA” will NOT be acceptable on this project)

- A. Aboveground:
  - 1. Pipe & Fittings: Hubless cast iron, CISPI 301, ASTM A-74 and ASTM A-888 shall be marked with the collective trademark of the Cast Iron Institute (soil pipe).
  - 2. Joints: Neoprene sleeve and stainless steel shield and clamp assembly, CISPI 310, ASTM-1277.
- B. Below grade and/or slab: (Contractor's Option)
  - 1. Bell and Spigot: Service weight bell and spigot pattern ASTM-74 with compression type neoprene gaskets ASTM C-564.
  - 2. Hubless: Hubless cast iron pipe CISPI 301, with heavy duty 3.04.016 stainless steel bands for below-grade installation. Elastomeric seal component ASTM C-564 and CSA B-602.
  - 3. Hubless Joints: Cast iron CISPI 310 and as TM C-1277.
  - 4. PVC DWV pipe and fittings, Schedule 40, ASTM D-2665, D2949, F891 and CSA B181.2.
  - 5. Corrosion protection shall be in accordance with IPC 305.1. Provide appropriate wrapping or sheathing when pipe is exposed to lime and acid of concrete, cinder or other corrosive materials.
  - 6. Protection of all below-grade storm and sanitary shall be in accordance with IPC Section 305.
- C. Corrosion protection shall be in accordance with IPC 305.1. Provide appropriate wrapping or sheathing when piping is exposed to lime and acid of concrete, cinder or other corrosive materials.

### **2.2 COPPER TUBING**

- A. Domestic hot, cold and recirculated water:
  - 1. Aboveground:
    - a. Tubing: Hard-drawn, seamless ASTM B-88, Type "L".

- b. Fittings: Solder joint wrought copper ANSI B-16.22.
- c. Joints: Lead-free solder 410°, ASTM B-32 alloy designation "TC", ASTM B-828.
- d. Flux: Non-toxic and non-corrosive, ASTM B-813.

2. Underground:

- a. Tubing: Soft-drawn, seamless ASTM B-88, Type "K".
- b. Fittings: Solder joint wrought copper ANSI B-16.22.
- c. Joints: Lead-free solder 410°, ASTM B-32, ASTM B-828.
- d. Flux: Non-toxic and non-corrosive, ASTM B-813.

B. Drainage and vent piping:

1. Aboveground:

- a. Tubing: Hard-drawn seamless ASTM B-88, ASTM B-75, Type "M" and DWV as pipe size permits.
- b. Fittings: Solder joint cast copper drainage type ANSI B-16.29.
- c. Joints: Soldered, 95/5 tin-antimony ASTM B-828, ASTM B-32.
- d. Flux: Non-toxic and non-corrosive, ASTM B-813.

C. Solder/Flux: See Paragraph 3.4 of this section for Soldering/Brazing.

**2.3 PVC GRAVITY SEWER PIPE (BELOW GROUND ONLY)**

- A. Pipe: Unplasticized polyvinyl chloride (PVC) with integral wall bell and spigot joints.
- B. Material: ASTM D-3034 for SDR 35, colored green for inground identification as sewer pipe.
- C. Joints: Two sections of pipe shall be assembled in accordance with manufacturer's recommendations and tested as per ASTM D 3212 for use with flexible elastomeric seals.
- D. Sizes: For site drainage systems 4" to 15".
- E. Additional compliances:
  - 1. Drop Impact Test - ASTM D-2444
  - 2. Pipe Stiffness - ASTM D-2412
  - 3. Temperature for Testing - Designed to pass all tests at 73 degrees F (+/- 3 degrees F).

**2.4 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS**

- A. Underground – Drainage & Vent (Sanitary) IPC Table 702.2
  - 1. ASTM D 2665
  - 2. ASTM D 2949
  - 3. ASTM F 891
  - 4. CSA CAN/CSA-B 181.2

- B. Building Sewer Pipe (Near Water Service) IPC Table 702.3 (DWV)
  - 1. ASTM D 2665
  - 2. ASTM D 2949
  - 3. ASTM D 3034
  - 4. ASTM F 891
  - 5. CSA B182.2
  - 6. CSA B 182.4 (Ribbed Sewer Pipe & Fittings)
  
- C. Fittings:
  - 1. ASTM D 3311
  - 2. ASTM D-2665
  - 3. ASTM F-1866
  
- D. Solvent Cement: (All Purpose on ABS, PVC and CPVC)  
Potable Water, Sewer, Drain Waste and Vent
  - 1. ASTM D-2564, D-2235 and F-493
  - 2. CSA B137.3
  - 3. CSA B181.2 or B182.1 (Sanitary Pipe only)
  - 4. ASTM D2855
  - 5. CSA B181.1
  
- E. Primers: (PVC and CPVC)
  - 1. ASTM F 656, purple color, SCAQMD Rule 1168 and OTC Regulations for VOC emission levels. NSF Standard 61 PW, DWV, Sewer.
  
- F. Uniformity: To insure installation uniformity, all piping components shall be of one manufacturer.

**2.5 VALVES (Copper Systems) – Solder ends of Threaded**

- A. Valves listed below shall be for domestic water systems and comply with the latest requirements of NSF 61-8. Refer to individual sections for gas valves.
  
- B. Ball Valves: NIBCO two piece, full port, 600 psi WOG rated, cold non-shock valve with reinforced TFE seals, 316 stainless steel ball, Eco-brass body, ASTM 584, Alloy C87850, solder ends, or threaded non-blowout stem design. Acceptable NIBCO figure numbers: T/S 685-80-66-LF; T/S 595-Y-66-LF (3 piece).
  
- C. Check Valves: NIBCO Class 125, Eco-brass body, ASTM 584, Alloy C87850, swing type, Y Pattern, threaded cap access. Acceptable NIBCO figure number: T/S 413-LF.
  
- D. Gate Valves: NIBCO Class 125, Eco-Brass body, ASTM 584, Alloy C87850, Rising Stem. Acceptable NIBCO figure number: T/S 113-LF.

- E. Balance Valves: All balance valves shall be provided with a memory stop feature with calibrated name plate to assure specific valve setting. Bronze body/brass ball, carbon filled TFE seat rings. NIBCO, Bell & Gosset, Accu-Flow, Taco or Flow Design "Accusetter". Acceptable NIBCO figure numbers: T/S 1710, F/G 737.
- F. Strainers:
1. Class 125 Bronze Y-Strainer, body to be ASTM B584 or B62 bronze with threaded, solder or female press end connections and .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. S/T-221, S/T-222, PF-221/222-A,B.
  2. Class 125 Flanged Cast Iron Y-Strainer, body to be ASTM A-126 Class B cast iron. End connections to be Class 125 flanged, tapped bolted bonnet with plug. Screen shall be .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. F 721-A.
  3. Class 250 Threaded Cast Iron Y-Strainer: Strainer body to be ASTM A-126 Class B cast iron. End connections to be Class 250 threaded, tapped screw-in bonnet with plug. Screen shall be .033 inch perforated type 304 stainless steel screen or 20 mesh type 304 stainless steel screen accessible without removing the strainer from the line. Acceptable Figure numbers: NIBCO Fig. T-751-A
- G. VALVES (Copper Systems) – Press Fit
1. Valves listed below shall be for domestic water systems and comply with the latest requirements of NSF-61-8.
    - a. 2 Inch and Smaller Ball Valves (On/Off):  
Ball Valves with male or female press to connect shall be rated at 200 PSI CWP to +225°F maximum. Valves shall be manufactured in accordance with MSS SP-110 and constructed of dezincification resistant cast bronze bodies. Brass with more than 15% zinc shall not be approved. Valve shall have reinforced PTFE Seats, Blow-out Proof Stem, Full Port Ball, Chrome/Nickel Plated or Stainless Steel Ball for aggressive water.
    - b. 2 Inch and Smaller Check Valves (Swing Type):  
Check valves shall be swing type Y pattern with male or female press to connect ends and shall be rated 200 PSI CWP to + 250°F maximum. Valves shall be manufactured in accordance with MSS SP-80. Body & cap shall be manufactured of dezincification resistant cast bronze ASTM B62 or ASTM B584 Alloy C8440. Valves shall have PTFE seat disc.
    - c. 2 Inch and Smaller Check Valves (Lift or Spring Type):  
Incline resilient disc, spring actuated, 250psi rating, non-shock cold working pressure, 2500F maximum working temperature, bronze ASTM B584 alloy C84400. Stainless steel stem and disc holder and spring, EDPM O-ring.

- H. Insofar as possible, all valves of the same type shall be of the same manufacturer.
- I. Valve Manufacturers: Subject to compliance with requirements, provide valves of one of the following:
  - Apollo/Conbraco
  - Stockham
  - Nibco
  - Milwaukee
  - Watts
  - Hammond
  - Webstone
- J. System Application:
  - 1. Domestic Water:
    - a. Check Valves - 2" & Smaller - threaded or soldered.
    - b. Ball Valves - 3" & Smaller - threaded or soldered.
    - c. Balance Valves - All sizes - threaded.
    - d. Butterfly Valves - 4" and larger - flanged.
    - e. Butterfly Valves – 3" and smaller – wafer type.

## **2.6 THERMOMETERS**

- A. Separable socket, inserted into fluid flow, adjustable, hermetically sealed, red mercury, die-cast, baked enamel finish, double strength glass lens, white scale and black graduations.
- B. Scale: Select range of thermometer to indicate normal operating temperature at mid-point of scale for domestic water systems.
- C. Manufacturer: U.S. Gauge, H.O. Trerice, Moeller, Duro.

## **2.7 GAUGES**

- A. Phosphor bronze bourdon tube, polypropylene case, gasketed glass crystal, aluminum dial, black graduations 4-1/2 inch diameter.
- B. Range: 0 to 150 psi, 5 pound intervals, 1/2 pound graduations.
- C. Manufacturers: Danton, U.S. Gauge, H.O. Trerice, Moeller.
- D. Install with bronze gauge cock.

## **2.8 ISOLATING FITTINGS**

- A. Furnish isolating fittings between all sections of dissimilar piping materials or piping, general supports, equipment and supports, including piping hanger and rack supports where one material is ferrous and the other is non-ferrous.

- B. Install copper or brass piping or tubing in such a way as not to touch or come in contact with ferrous metals.
- C. Where ferrous piping or equipment is connected to copper or brass piping, make connection with insulating or dielectric unions to prevent electrolytic action between the ferrous and non-ferrous metals.
- D. Where copper or brass piping, tubing or fittings are anchored to, supported by or may come in contact with ferrous metal construction, provide an insulating nonconductor spacer of rubber, fiber or equivalent material to assure prevention of electrolysis.
- E. Manufacturer: Epco Sales, Inc., or insulated unions by Central Plastic Co.

## **2.9 ANCHORS AND GUIDES**

- A. Anchors and guides shall be provided to support and maintain pipes in position and properly distribute expansion. The anchors and guides must be securely fastened to the building structure, and must be completely installed before the system is tested.
- B. Guides shall be as manufactured by J.J. McNally, Inc., Flexonics, Inc., Tube-Turns, American District Steam Co.

## **2.10 UNIONS**

- A. Up to and including 2 inch pipe size: Screwed pattern, bronze-to-bronze seat.
- B. Above 2 inch pipe size: 125 Class Flanged pattern, A.S.A. sweat copper fitting, with gaskets, bolts and nuts.
- C. Copper tubing unions shall have sweated type ends. Flanged unions on copper tubing may be soldered connections.
- D. Materials and pressure ratings shall be the same as specified for the respective pipe and fitting system unless otherwise specified.

## **PART 3 – EXECUTION**

### **3.1 PIPING SYSTEM INSTALLATION REQUIREMENTS**

- A. Drawings are generally diagrammatic and due to small scale, it is impossible to indicate all fittings, valves, gauges and specialties required. Provide complete operating systems and all necessary fittings, valves gauges and specialties whether or not indicated.
- B. Install all piping in accordance with the best practices of the trade and latest code requirements. Use uniform system materials throughout the building. All branch take-offs shall be off the top of the pipe.

- C. Pipe and fittings shall be clean from cutting burrs, foreign materials and defects in structure and threading. Make all cuts square. Ream after cutting. Clean off scale and dirt inside and outside, before assembly. Remove welding slag or other foreign material.
- D. Keep all piping as high as possible, consistent with proper pitch, to maintain maximum headroom. Cut piping accurately to measurements established at the building, work into place without springing, forcing or cutting of the building structure, and install as directly as possible between connecting points parallel with or at right angles to building construction, except as required to obtain pitch.
- E. Unless otherwise shown, run piping within the building, concealed in the walls, furred spaces, pipe spaces or above suspended ceilings. Unless otherwise noted, do not build in or bury horizontal piping in partitions. Install all exposed piping as closely as possible to walls, ceilings and columns, consistent with access and applicable insulation requirements.
- F. This project includes a return air plenum ceiling. Regardless of materials specified, all system piping and/or materials shall be non-combustible and shall be in full compliance with the requirements set forth in the IPC.
- G. All piping to drain to low points. Low points will be provided with drain valves with hose thread. All piping shall have high points vented with ball valve, nipple and threaded cap.
- H. Do not install trapped lines where water cannot be drained or air can accumulate without being vented.
- I. Piping shall run square with building lines.
- J. Piping shall not be insulated or covered until tested and until building is closed in.
- K. Necessary drains, off-sets, vents and drips shall be provided for coordination of the work as part of the contract.
- L. Piping shall not be installed over electrical transformers, panels, switchgear, substations, and control panels as per the National Electric Code. No piping shall be installed in elevator machine rooms unless it is directly related to the room's system equipment.
- M. Allow clearance for expansion and contraction.
- N. Install isolating fittings between sections of ferrous and non-ferrous pipe or connected equipment.
- O. Valves shall be installed with stems above horizontal.
- P. Valves shall be installed on all sides of equipment and control valves to allow isolation for repair.
- Q. Do not support piping from other piping, conduits or equipment. Provide additional bracing to prevent movement of trapeze piping, or any singular run of pipe to fixtures. Provide additional bracing on all piping through walls to flush valves to prevent movement during normal operation or performing maintenance on valves.

- R. Thermometers and gauges shall be installed where indicated on the drawings, required by equipment specifications and where indicated elsewhere in the specifications. Gauges shall be located at an elevation that can be readable.
- S. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.
- T. Ball valves to be installed with the proper clearance for operating the valve handle. A minimum clearance of 10" from center of valve to wall must be maintained for ease of operation.
- U. Thermometers are to be located so they can easily be seen from the floor in front of unit. Make final adjustment by tilting thermometer. Locate bulb in waterway with an oversized tee or elbow fitting.
- V. Install pressure gauges on incoming services both domestic water and fire services. Locate pressure gauge after main shut-off valve and ahead of water meter if one is provided within building.
- W. All pipe unions installed shall be accessible. Unions shall not be concealed or located in places where they cannot be maintained.
- X. Support and bracing of 4" and above pipe shall be in accordance with the CISPI Standards and IPC Chapter 3.

**3.2 TAGS, CHARTS, AND IDENTIFICATION**

- A. All piping shall be labeled in accordance with IPC 303.1 and 303.4.
- B. Identify each valve in all systems with black, numbered and stamped 1-1/2" brass or aluminum tags fastened to valve by brass chain and S-hook.
- C. Piping Identification: Provide identification and safety products, semi-rigid plastic, wraparound pipe markers with flow arrows and conforming to ANSI A13.1. Locate marker at each valve, changes in direction, where pipes pass thru barriers and every 25' of horizontal runs. Lettering on background shall be in accordance with the following colors:

Legend	Background	Lettering
1. Gas	- Yellow	- Black
2. Fire Protection	- Red	- White
3. Domestic Cold Water	- Green	- White
4. Domestic Hot Water (110° ^ 140°)	- Yellow	- Black
5. Domestic Hot Water Return (110° ^ 140°)	- Yellow	- Black
6. Sanitary Drainage	- Green	- White
7. Condensate Drainage	- Yellow	- Black
8. Vent	- Yellow	- Black
9. Storm Drainage	- Green	- White

- D. Provide 1/8" scale diagrams showing location, number and service or function of each tagged item.
  - 1. Frame diagrams in approved metal frames with clear acrylic front, hinges, and locks.
  - 2. Secure to wall in Mechanical Room.
  - 3. Provide two additional separate copies permanently covered and bound.
  
- E. Furnish and install color coded 1" diameter markers on ceiling tile grids to indicate system and valve locations.
  - 1. Domestic cold water: - Green
  - 2. Domestic hot water: - Yellow
  - 3. Domestic hot water return: - Yellow
  - 4. Gas - Yellow
  
- F. Available Manufacturers: Subject to compliance with requirements, manufacturer's offering identification markers which may be incorporated in the work are limited to the following:
  - Seton
  - Brimar
  - B-Line
  - Marking Services, Inc.

**3.3 SOLDERING/BRAZING**

- A. Connections between copper tubing and copper sweat fittings shall be made by soldering using Taramet Sterling or approved substitute. Flux shall be non-corrosive type "Nokorode" or approved substitute or as recommended by the manufacturer of the solder.
  
- B. All solder shall be "lead nickel and antimony free" in accordance with the Federal Safe Drinking Water Act Amendments of 1986 and 1996 as is ASTM B-32 Grade TC.

Composition:

Tin	95%
Copper	4.0 – 5.0%
Selenium	.04 - .2%
Tensile Strength	7,130 psi
Shear Strength	5,970 psi
Melting temperature	410°F

- C. Tubing shall be cut square and then reamed and deburred. End of tubing and inside of fitting cup shall be cleaned with steel wool and the flux shall be applied to the clean surface before soldering. After soldering, the excess solder shall be wiped off while still plastic.
  
- D. 410 solder shall be used for all joints in:
  - 1. Domestic cold water
  - 2. Domestic hot water

3. Domestic hot water return
  4. Copper drainage piping
- E. Lead-Tin (50-50) solder or any solder containing lead shall NOT be used or permitted for joint connections on this project.
  - F. Form continuous solder bead or brazing filler bead around entire circumference of joint.
  - G. Wipe excess solder from joint area while solder is still plastic.
  - H. Solder joints shall be in accordance with IPC Section 605.2, 605.14.3 and ASTM B838. Flux shall conform to ASTM B-813.

### 3.4 PRESS-FIT SYSTEM

- A. All new domestic water piping installed on this project shall be a solderless, press-fit, domestic water system. The system shall be Viega/Rigid copper press fitting system. Fittings shall be rated 0" to 250" at 200 psi and tested to 600 psi.
- B. Fittings shall meet ANSI/NSF 61, – ASME B-16.22 and ASTM B88. Elastomeric seals shall meet ASTM D-2000.
- C. Mechanical joining shall be recognized by:
  - IPC International Plumbing Code
  - SBCCI Standard Plumbing Code
  - IAPMO Uniform Plumbing Code
  - PHCC National Standard Plumbing Code
- D. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press end shall have SC (Smart Connect) feature design (leakage path). Smart Connect™ (SC Feature). In ProPress ½" to 4" dimensions, the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. This feature shall provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
- E. Press Connections: Copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.
- F. Installer shall be a qualified installer, licensed within the jurisdiction, and familiar with the installation of ProPress copper press joint systems. ProPress copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer. The installation of copper tubing for hot and cold water distribution systems shall

conform to the requirements of the ICC International Plumbing Code or IAPMO Uniform Plumbing Code.

- G. Note: Viega Press-fit installation shall only be permitted on this project. Push-on shark-teeth, or any type connection fittings that are not Press-Fit, shall NOT be approved.
- H. T-drill mechanically formed tee fittings shall be used in conjunction with the ProPress Copper System in accordance with the IPC Chapter 6 Section 605.5.1, 605.5.1.2 and 605.14.1. Use caution around combustible material and follow all safety guidelines for open flame during silver brazing.

END OF SECTION 22 00 10

**SECTION 22 00 30**

**INSULATION & COVERING - PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. This section includes insulation and covering furnished and installed on the following piping systems and equipment:
  - 1. Domestic cold water.
  - 2. Domestic hot water supply and return
  - 3. “Primary” Horizontal rainwater conductors including underside of roof drains. “Secondary” rainwater systems insulation is not required.
  - 4. Condensate waste piping from air conditioning units.
  - 5. Exposed waste, trap and wall supplies at all handicap lavatories.
  - 6. Branch waste lines from all chilled water fountains.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.
- B. Materials shall conform to the requirements of the NFPA Code.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

**1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
  - 1. Product data on all insulation and covering.

**1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**PART 2 – PRODUCTS**

**2.1 PIPE INSULATION MATERIAL**

- A. Closed Cell:

1. Material: Flexible elastomeric foamed plastic closed cell structure insulation 25/50 rated with a flame spread rating of 25 or less and a smoke developed rating of 50 or less.
2. Flexible pipe insulation shall be a foamed plastic closed cell structure material, with a thermal conductivity of not more than 0.27 Btu/Hr./Sq. Ft./Inch at a mean temperature of 75 degrees F. The insulation shall have an average density of at least 2 pounds per cubic foot, shall be self-extinguishing, and shall have a water vapor transmission rating of not more than 0.1 perms. Between temperature limits of -40 degrees F and plus 220 degrees F, the insulation shall not indicate any deviation from its original state.

3. Manufacturers: Armacel, Insul-Tube, Nomaco Insulation.

4. Specification Compliance: (Latest accepted Standards and Codes)

IECC 804.5:	Insulation thickness for domestic hot and recirculation mains.
ASTM-E-84	Flame spread and smoke developed.
NFPA 255:	Standard method of test of surface burning of building materials.
ASTM C177:	Thermal conductivity.
NFPA 90A, 90B:	Flame & smoke rating
ASTM-C-534 Type 1	Tubular Grade, Self-Sealing
UL 181	Factory made air ducts and air connectors. (Armacell UL181 has to do with mold growth)
UL723	Test for surface burning characteristics of building materials.
ASTM G21/C1338:	Fungi resistance
ASTM G2:	Bacterial Resistance
ASTM D1056, 2B1:	Standard spec for flexible cellular materials.
MIL-P-15280J, FORMT	
MIL-C-3133B (MIL STD 670B)	Grade SBE-3
MEA 96-85M	

- B. Covering of Pipe Insulation Outdoors:

1. Wrapping: Wrap insulation with embossed .016" aluminum jacket.
2. Fastenings: Cover shall be held in place with soft aluminum bands on 12" centers.
3. Valves and Fittings: Weatherproof all valves and fittings.
4. Manufacturers: Johns-Manville, Certain-Teed, Owens-Corning, Knauf.

- C. Protective cover for foam insulation in wet areas indoors:
  - 1. PVC heavy duty fitting covers and jacketing for kitchen wet areas.
  - 2. Fitting covers shall be glossy white, high impact, UV resistant PVC.
  - 3. Operating Temperature Limit: Up to 150°F.
  - 4. Flame Spread: 25 or less.
  - 5. Smoke Developed: 50 or less.
  - 6. Grade: Weatherable.
  - 7. Color: White
  - 8. Finish: Gloss
  - 9. Fitting covers and jacketing shall be "Zeston" 300 Series PVC, heavy duty covers and "Zeston" PVC jacketing.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. Do not install until systems have been tested and meet requirements.
- B. Heavy work which may damage insulation shall have been completed in the vicinity of the insulation work.
- C. All installations shall be made by skilled craftsmen regularly engaged in this type of work.
- D. Insulation shall be continuous thru-wall, ceiling and floors.
- E. Pipe and equipment to be clean and dry prior to insulating.
- F. Install all insulation in strict conformance with manufacturer's instructions.
- G. Where "Barrier-free" lavatory supplies and waste are covered with a protective covering or insulation, the insulation must be installed back to wall, flush with wall escutcheon. Escutcheon to be finished flush with wall and wall opening to be smaller than escutcheon plate through entire building.
- H. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armaflex 520 or 520 BLV Adhesive. If when using AP Armaflex SS, only the butt joints shall be adhered using Armaflex 520 or 520 BLV Adhesive, Armaflex HT 625 Adhesive shall be used with HT Armaflex.
- I. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.
- J. Tape the ends of the copper tubing before slipping the Armaflex insulation over the new pipes to prevent dust from entering the pipe.
- K. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp, non-serrated knives must be used.

- L. On cold piping, insulation shall be adhered directly to the piping at the high end of the run using a two-inch strip of Armaflex 520 or 520 BLV Adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with Armaflex 520 or 520 BLV Adhesive. All penetrations through the insulation and termination points must be adhered to the substrate to prevent condensation migration.
- M. Sheet insulation shall be used on all pipes larger than 6" IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12" IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe.
- N. Seams shall be staggered when applying multiple layers of insulation.

### **3.2 VALVES, FLANGES AND FITTINGS:**

- A. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with Armaflex 520 or 520 BLV Adhesive. Screwed fittings shall be sleeved and adhered with a minimum 1" overlap onto the adjacent insulation. Armaflex HT 625 Adhesive shall be used with HT Armaflex.
- B. Valves, flanges, strainers and Victaulic couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.

### **3.3 HANGERS**

- A. Support piping system using high density inserts with sufficient compressive strength. The pipe support insulation shall be elastomeric foam with the same or greater thickness than the pipe insulation. All joints shall be sealed with Armaflex 520 or 520 BLV adhesive.
- B. Standard and split hangers: Piping supported by ring hangers shall have hangers insulated with the same insulation thickness as the adjacent pipe. All seams and butt joints shall be sealed with Armaflex 520 or 520 BLV Adhesive. Armaflex HT 625 Adhesive shall be used with HT Armaflex. Ring hangers may be sleeved using oversized tubular insulation. On cold piping, insulation shall extend up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.
- C. Clevis Hangers or other pipe support systems: Saddles shall be installed under all insulated lines at unistrut clamps, clevis hangers or locations where the insulation may be compressed due to the weight of the pipe. All piping shall have wooden dowels or blocks of a thickness equal to the insulation inserted and adhered to the insulation between the pipe and the saddle.

It is highly recommended for continuous insulation protection to use hanger sizes equal to the outer diameter of the pipe plus insulation thickness

- D. Armafix IPH or Armafix NPH can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. To minimize the movement of Armafix, it is recommended that a pair of non-skid pads be adhered to the clamps. In addition, to prevent loosening of the clamps, use of an antivibratory fastener, such as a nylon-locking nut, is also recommended.

**3.4 PIPE COVERING (FOAMED PLASTIC TYPE)**

- A. All joints and seams shall be sealed with a compatible adhesive. Approved adhesives are as follows:

Armaceel No. 520 (Low VOC use 520 BLV)  
 Benjamin Foster Company No. 85-75 up to 200 degrees F.

Contractor may use self-sealing insulation in lieu of above.

- B. Fitting covers shall be fabricated from the foamed plastic pipe insulation or from sheet insulation of the identical material. The fabrication shall be in accordance with manufacturer’s instructions, and all seams mitered joints shall be joined using the adhesives described.

**3.5 PIPE INSULATION – TYPES & THICKNESSES**

- A. Flexible Closed Cell:

Piping System	Up to 3”	Over 3” to 6”	Over 6”
Cold Water	1/2”	1/2”	3/4”
Hot Water (120°)	1”	1”	1-1/2”
Hot Water Return (120°)	1”	1”	1-1/2”
Hot Water (140°)	1”	1”	1-1/2”
Hot Water Return (140°)	1”	1”	1-1/2”
Condensate Waste	1/2”	1/2”	-
Horizontal Storm (Primary)	1/2”	1/2”	3/4”
Horizontal Storm (Secondary)	-----Not Required-----		
Underside of Roof Drains	1/2”	1/2”	3/4”
Branch Waste From EWC’s	1/2”	---	---
Handicap Lav Waste & Water	1/2”	---	---
Soil/Waste Piping Above Ceiling	1/2”	1/2”	3/4”

END OF SECTION 22 00 30

**SECTION 22 01 10**

**DRAINAGE SYSTEMS – PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. This section includes:
  - 1. Soil and waste piping system work as indicated on drawings and schedules, and by requirements of this section.
  - 2. Applications for soil and waste piping systems include the following:
    - a. Above ground soil, waste and vent piping within buildings including soil stacks, vent stacks, horizontal branches, traps and connections to fixtures and drains.
    - b. Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, extension from the building, terminating at connection to site sewer.
  - 3. Insulation for soil and waste and storm water drainage as specified in Section 220030 is included as work of this section.
  - 4. Trenching and backfilling required in conjunction with underground building drainage and site drainage piping as specified in Section 220000 is included as work of this section. Refer to Division I.
  - 5. Installation of detectable metallic underground tape for all interior buried PVC drainage piping.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section, and a listing of all applicable codes.

**1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
  - 1. Product data on all systems equipment.
- C. See requirements for submission of cross referencing information.

**1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**PART 2 – PRODUCTS**

**2.1 PIPING UNDERGROUND**

- A. Interior:
  - 1. Sanitary, storm water and condensate waste drainage piping within the building and extending beyond the building wall, unless otherwise noted on the plans shall be an option selection of a, b, or c below:
    - a. Service weight hub and spigot pattern cast iron soil pipe and fittings with neoprene gaskets.
    - b. Hubless cast iron soil pipe and fittings with cast iron coupling clamps and gaskets or heavy duty 3.04-.016" thick stainless steel bands..
    - c. PVC Schedule 40 pipe and fittings with solvent cement joints.

**2.2 PIPING ABOVE GROUND (PLENUM RATED CEILING)**

- A. All above ground storm water, condensate, soil, waste and vent piping shall be:
  - 1. Hubless cast iron soil pipe with cast iron drainage fittings, couplings and stainless steel clamp bands for piping 2" and larger.
  - 2. Copper tubing, type DWV with wrought copper solder type drainage fitting for piping smaller than 2" in size.

**2.3 CONDENSATE WASTE PIPING SYSTEM**

- A. All aboveground condensate waste piping including connection to equipment shall be:
  - 1. PVC pipe and fittings type DWV with solvent cement joint connections.
  - 2. Copper tubing, type DWV with wrought copper solder type drainage fittings.

**2.4 FLASHING**

- A. All vents extending through the roof shall be flashed by the General Contractor. However, the Plumbing Contractor shall furnish and install the necessary counterflashing consisting of a Jay R. Smith Figure 1750 counterflashing fitting, or approved substitute as manufactured by Josam or Zurn. Vents shall terminate 18" above the roof.

**2.5 SYSTEMS EQUIPMENT**

- A. Refer to Plumbing Fixture and Equipment Schedule for type, number, size and manufacturer of all drainage equipment and accessories.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drainage equipment which may be incorporated in the work are limited to the following:

Floor Drains (all types)

Zurn  
Josam  
Wade  
Watts  
Smith  
MIFAB

Cleanouts

Zurn  
Josam  
Wade  
Watts  
Smith  
MIFAB

- C. Cross Reference Identification:
  - 1. If the Contractor selects a manufacturer of drainage equipment products other than as identified on the Schedule but is selected from the available manufacturers listed above, a cover sheet shall be included with the submission of shop drawings indicating the cross referenced manufacturer and model number.
  - 2. Shop drawings shall not be reviewed or accepted if not in compliance with this requirement.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF SOIL AND WASTE PIPING**

- A. The Plumbing Contractor shall install a complete system of sanitary drainage piping as shown on the drawings. All drainage lines shall be properly run, trapped and vented in accordance with the

local Plumbing Code and all dry vents, back vents, loop vents, revents or special vents required by the Code shall be furnished and installed by the Plumbing Contractor.

- B. Drainage lines of the sizes shown on the drawings shall be extended within the building with branches connecting to the base of all soil, waste and vent stack, etc., leaving outlets for connection to all fixtures, floor drains, as required.
- C. All changes in direction of drainage piping shall be installed with "Y" branches and 1/8 bends. All stacks shall be supported with concealed pipe clamps or hangers as required and the openings in the roof for the vent pipes will be provided by this Contractor.
- D. All drainage piping which will be located above suspended ceilings shall be checked for slope to assure positive drainage, prior to installation of the ceilings. Pressure tests for leaks, as hereinafter specified, shall also be performed prior to ceiling installation.
- E. Install soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.
- F. Vertical to horizontal change in direction to be made with long radius fittings.
- G. Support all soil and waste piping per IPC Section 308.5, 308.6 and 308.7.

### **3.2 INSTALLATION OF STORM WATER DRAINAGE PIPING**

- A. All changes in direction of drainage piping shall be installed with "Y" branches and 1/8 bends. All stacks shall be supported with concealed pipe clamps or hangers as required, and the openings in the roof for the vent pipes will be provided by this Contractor.
- B. All drainage piping which will be located above suspended ceilings shall be checked for slope to assure positive drainage, prior to installation of the ceilings. Pressure tests for leaks, as hereinafter specified, shall also be performed prior to ceiling installation.
- C. Install storm water drainage piping pitched to drain at minimum slope of 1/8" per foot (1%) for piping 4" and larger.
- D. Vertical to horizontal change in direction to be made with long radius fittings.

### **3.3 INSTALLATION OF CLEANOUTS**

- A. Cleanouts: Install in sanitary piping and storm conductor and building drain piping as indicated, and/or as required by International Plumbing Code; at each change in direction of piping greater than 45 degrees; at minimum intervals of 100' for all size straight run piping; and at base of each conductor. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.

### **3.4 INSTALLATION OF FLOOR DRAINS (ALL TYPES)**

- A. Install floor drains in accordance with manufacturer's written instructions and in locations indicated.

- B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- C. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.
- D. Position drains so that they are accessible and easy to maintain.
- E. All floor drains shall be provided with trap primer connections. All floor drains shall have a trap primer discharge line connected to the outlet.
- F. All exposed drainage piping shall be DWV copper pipe and fittings. All piping shall be rigidly supported off the wall with split ring clamps or uni-strut.

### **3.5 INVERTS AND ELEVATIONS**

- A. Indicated inverts and elevations of existing utilities are approximate and based on the best information available. Upon award of Contract, Contractor shall verify in the field all such information and report any discrepancies to the Engineer before proceeding with work.

### **3.6 PIPING INSTALLED IN FILLED GROUND**

- A. Piping located below floor slab in filled areas shall be supported either from the floor slab, or with masonry piers to undisturbed earth. Drainage piping shall be supported at each joint. Exterior piping located in filled areas shall be supported with piers.
- B. Details of supports and method of installation shall meet with the approval of the Engineer.

### **3.7 INSPECTION**

- A. The Plumbing Contractor shall, upon completion of the drainage systems, secure from the Inspector and/or the Municipality under which the installation was made and inspected, certificates or letters of approval indicating the system has been installed satisfactorily. The Plumbing Contractor shall certify that all inspection fees, permits and charges have been duly paid.

END OF SECTION 22 01 10

**SECTION 22 01 20**

**DOMESTIC WATER SYSTEMS – PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes:
  - 1. Domestic water piping systems work is indicated on drawings and schedules and by requirements of this section.
- B. Applications for water piping systems include the following:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.
  - 3. Domestic recirculating-water piping.
- C. Insulation for domestic water piping as specified in Section 220030 is included as work of this section.
- D. Trenching and backfill required in conjunction with exterior water piping as specified in Section 220000 is included as work of this section. Refer to Division 1.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

**1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
  - 1. Product data on all specialties and systems equipment.

**1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**PART 2 – PRODUCTS**

**2.1 DOMESTIC WATER PIPING MATERIALS AND PRODUCTS**

- A. Provide piping materials and factory fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in domestic water piping systems. Where more than 1 type of materials or products are indicated, selection is Installer's option.

**2.2 BASIC PIPE, TUBE AND FITTINGS**

- A. Provide pipe, tube, and fittings complying with Division 22 Basic Materials and Methods section "Pipe, Tube, and Fittings", in accordance with the following listing:

- B. Interior Domestic Water Piping:

Tube Size 4" and Smaller:	Copper tube.
Wall Thickness:	Type "L" hard-drawn temper.
Fittings:	Wrought-copper, solder-joints.

- C. Exterior Water Service Piping:

Pipe Size 3" and Smaller:	Copper tube.
Wall Thickness:	Type "K" Soft Temper
Fittings:	Wrought copper solder joint.

**2.3 BASIC PIPING SPECIALTIES**

- A. Provide piping specialties complying with Section 220010 Basic Materials and Methods in accordance with the following listing:

- Pipe escutcheons
- Dielectric unions
- Drip pans
- Pipe sleeves
- Sleeve seals

**2.4 SPECIAL PIPING SPECIALTIES**

- A. Water Hammer Arresters: Provide bellows or piston type water hammer arresters, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.

**2.5 BASIC VALVES**

- A. Provide valves complying with applicable Division 22 sections "Valves", in accordance with the following listing:
- B. Sectional Valves:
  - 2-1/2" and Smaller: Ball Valves.  
Gate Valves.
  - 3" and Larger: Ball Valves.  
Butterfly Valves.
- C. Shutoff Valves:
  - 2-1/2" and Smaller: Ball Valves.  
Gate Valves
  - 3" and Larger: Ball Valves.  
Butterfly Valves.
- D. Drain Valves:
  - All Hose End Threaded Gate or Ball Valves.
- E. Balancing Valves:
  - 2" and Smaller: Ball Valves (Circuit Setter Type).  
(with Memory Stop)
- F. Check Valves:
  - All Sizes: Swing Check Valves. Horizontal Installations  
Spring Check Valves. Vertical Installations

**2.6 SPECIAL VALVES**

- A. Special valves required for domestic water piping systems include the following types:
- B. Hose Bibbs: Threaded end, renewable composition disc, tee handle, 3/4" NPT inlet, 3/4" hose outlet with vacuum breaker.
  - 1. Finished Areas: Chrome plated.
  - 2. Unfinished Areas: Bronze finish.
- C. Wall Hydrants: Non-freeze, cast-bronze body, tee handle key, bronze casing, length to suit wall thickness, vacuum breaker, hinged locking cover, 3/4" inlet, hose outlet.

**2.7 SYSTEMS EQUIPMENT MANUFACTURERS**

- A. Refer to Plumbing Fixture and Equipment Schedule for type, number, size and manufacturer of all equipment and accessories.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering equipment which may be incorporated in the work are limited to the following:

Shock Absorbers:

Zurn  
Josam  
Wade  
Watts  
Smith  
PPP Inc.  
MIFAB

Automatic Trap Primers

PPP Inc.  
Sloan  
Sioux Chief  
MIFAB

Hose Bibbs

Nibco  
Tanner  
Central Brass  
Wolverine

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF BASIC IDENTIFICATION**

- A. Install mechanical identification in accordance with Section 220010 Basic Materials and Methods.
  
- B. Support vertical piping at floor levels using approved riser clamps. Clamp material shall be compatible with pipe material. Maximum vertical spacing shall be 10'-0". Domestic water piping shall be supported in accordance with the International Mechanical Code, Section 305 and Table 305.4 Spacing Intervals, or in accordance with MSS-SP-69. International Plumbing Code's latest edition, Section 308.5, accept as follows:
  - 1. Copper tubing 1/2" to 1-1/4" nominal size, not to exceed 6 ft. horizontal intervals.
  - 2. Copper tubing 1-1/2" and larger nominal size, not to exceed 10 ft. horizontal intervals.
  - 3. Copper tubing 1/2" to 1-1/4" nominal size, not to exceed 10 ft. vertical intervals.
  - 4. Copper tubing 1-1/2" and larger nominal size not to exceed 10 ft. vertical intervals.
  - 5. CPVC pipe or tubing 1/4" to 1" nominal size, not to exceed 3 ft. horizontal spacing.
  - 6. CPVC pipe or tubing 1-1/4" and larger nominal size not to exceed 4 ft. horizontal spacing.
  - 7. CPVC pipe or tubing 1/4" to 1" nominal size not to exceed 10 ft. vertical.
  - 8. CPVC pipe or tubing 1-1/4" and larger nominal size not to exceed 10 ft. vertical."

\*Mid-Story Guide.

**3.2 INSTALLATION OF PIPING SPECIALTIES**

- A. Install piping specialties in accordance with Section 220010 Basic Materials and Methods.

- B. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated.

### **3.3 INSTALLATION OF VALVES**

- A. Install valves in accordance with Division 22 Basic Materials and Methods section, "Valves".
- B. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more fixtures, equipment connections, and elsewhere as indicated.
- C. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
- D. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain domestic water piping system.
- E. Check Valves: Install on discharge side of each pump, and elsewhere as indicated.
- F. Balance Cocks: Install in main recirculating loop and in each branch hot water recirculating loop. Install a ball valve and check valve at each balance valve installation.
- G. Hose Bibbs: Install on exposed piping where indicated, with vacuum breaker.

### **3.4 EQUIPMENT CONNECTIONS**

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by International Plumbing Code.
- B. Equipment furnished by the Owner or Contractors other than this Contractor: After equipment has been set in place, this Contractor shall furnish all labor and material required to make final connections, between roughing-in and the equipment. Install valves, fittings, trim and appurtenances furnished with the equipment. All exposed piping in the kitchen areas shall be chrome plated. Piping in other areas shall be of the same material as the system to which it connects.

### **3.5 AUTOMATIC TRAP PRIMERS**

- A. Install units in accordance with manufacturer's written instructions.
- B. Cap-off all unused tube connections not to be used for discharge procedures.
- C. Units installed in Mechanical Room shall be surface mounted. All others shall be arranged for recessed installation and shall include a 14"x16" access door #D-1416SS.
- D. All discharge tubing from the tube connectors to the floor drain connection shall be minimum Type "M" copper for above floor slab installations. Where discharge piping runs below the floor slab, the piping may be PVC grade water piping. Ensure that all connections are properly made and leak-free.

- E. Shield copper from direct contact with concrete, stone and sharp edges below slab.

**3.6 SPARE PARTS**

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

**3.7 DOMESTIC HOT WATER RETURN**

- A. This Contractor shall install complete and operating hot water return system. The system shall be balanced and include a report as required in HVAC Specification Section 230950.
- B. Balancing Valves are required in the system as hereinbefore specified. The system shall also include the installation of “air bleed” or “burp” valves to remove any trapped air in the system.

END OF SECTION 22 01 20

**SECTION 22 01 30**

**GAS PIPING SYSTEMS – PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes:
  - 1. Natural gas piping system as indicated on drawings and schedules, and by requirements of this section.
  - 2. Applications for natural gas piping systems include the following:
    - a. Gas service from street main to building meter by Delmarva Gas Division.
    - b. Elevated pressure (psi) gas from meter location to interior gas-fired equipment or inside the building at 14” water column.
  - 3. Trenching and backfill required in conjunction with exterior gas distribution as specified in Section 220000 is included as work of this section. Refer to Division 1.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this Section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

**1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
  - 1. Product data on gas valves.

**1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**PART 2 – PRODUCTS**

**2.1 NATURAL GAS PIPING MATERIALS AND PRODUCTS**

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.2 where applicable, base pressure rating on natural gas piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match piping materials used in natural gas piping systems. Where more than 1 type of material or product is indicated, selection is Installer's option.

**2.2 BASIC IDENTIFICATION**

- A. Provide identification complying with Division 22 Sections and in accordance with the following listing:

Building Distribution Piping: Plastic pipe markers.

Gas Service: Underground type plastic line markers with detectable wire..

Gas Valves: Plastic valve tags.

**2.3 BASIC PIPE, TUBE AND FITTINGS**

- A. Provide pipe, tube and fittings complying with Section 220010 Basic Materials and Methods - Plumbing and in accordance with the following listing:

- 1. Interior Piping: Schedule 40 black steel ASTM A-53, A-106

Fittings: Malleable galvanized iron, threaded (WILM)

- 2. Exterior Exposed or Roof Top Piping: Schedule 40 black steel with weather coating.

Fittings: Wrought steel, butt welded.

**2.4 BASIC PIPING SPECIALTIES**

- A. Provide piping specialties complying with applicable Division 22 Sections and in accordance with the following listing:

Pipe escutcheons

Pipe sleeves

Sleeve seals

**2.5 SPECIAL VALVES**

- A. Valves required for gas piping systems on this project shall be the following types:

Gas Valves: (Up to 3”)

1. Apollo 80-100 Series bronze gas ball valve. Threaded, 600 PSIG WOG, cold non-shock. 250 PSIG LP-Gas. 150 PSIG saturated steam. Vacuum service to 29 inches Hg. Federal Specification: WW-V-35C, Type: II, Composition: BZ, Style: 3.
2. Features:
  - UL Listed for LP-Gas and natural gas.
  - Large ports to reduce pressure drop
  - Reinforced TFE seats and seals
  - Blow-out-proof stem design
  - Optional tee handle available
  - Quarter turn on-off
  - Adjustable packing gland
  - One piece bronze body
  - Chromium plated ball
3. UL Listings:
  - Guide YRPV: Gas shut-off valve for use with natural and manufactured gases.
4. This valve shall be used for all pipe sizes up to 3” in the system.

Gas Valves (4” and Larger)

1. Apollo 88A-100 Series carbon steel, ANSI Class 150 flanged standard port ball valves.

Standards of Compliance:

IFGC: Section 409 (Valves)  
ASME B16.5 – Pipe Fittings and Flanges  
ASME B16.33 – Manual Operated Metal Gas Valves up to 125 psig  
ASME B16.38 – Large Metal Valve Gas Distribution  
ASME B31.8 – Gas Transmission and Distribution Piping Systems  
UL 125

- B. Manufacturers: Subject to compliance with requirements, provide gas valves of one of the following:

Apollo/Conbraco  
Stockham  
Milwaukee  
NIBCO, Inc.  
Watts

**2.6 GAS METER**

- A. Provided by Delmarva Gas Division.

**2.7 GAS PRESSURE REGULATORS (IF APPLICABLE)**

- A. Regulator before meter by Delmarva Gas Division.
- B. ANSI Z21.18, single-stage, steel-jacketed, corrosion-resistant pressure regulators. Include atmospheric vent, elevation compensator, with threaded ends conforming to ASME B1.20.1 for 2 inch NPS and smaller and flanged ends for 2-1/2" NPS and larger. Regulator pressure ratings, inlet and outlet pressures, and flow volume in cubic feet per hour of natural gas at specific gravity are as indicated.
  - 1. Service Pressure Regulators: Inlet pressure rating not less than natural gas distribution system service pressure.
  - 2. Line Gas Pressure Regulators: Inlet pressure rating not less than system pressure.
  - 3. Appliance Gas Pressure Regulators: Inlet pressure rating not less than system pressure.
  - 4. Gas Pressure Regulator Vents: Factory or field installed corrosion-resistant screen in opening when not connected to vent piping.
  - 5. Regulators shall be as manufactured by Fisher (no equal substitute permitted).

**PART 3 – EXECUTION****3.1 INSTALLATION OF BASIC IDENTIFICATION**

- A. Install mechanical identification in accordance with applicable Division 22 Sections.

**3.2 INSTALLATION OF NATURAL GAS PIPING (INTERIOR)**

- A. Install natural gas distribution piping in accordance with Section 220010 Basic Materials and Methods - Plumbing and in accordance with applicable codes IFGC latest edition, and local Utility Company requirements.
- B. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.
- C. Remove cutting and threading burrs before assembling piping.
- D. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.
- E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.
- F. Install drip-legs in gas piping where indicated, and where required by code or regulation.
- G. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.

- H. Use dielectric unions where dissimilar metals are joined together.
- I. Install piping with 1" drop in 60' pipe run (0.14%) in direction of flow.
- J. Install piping parallel to other piping, but maintain minimum of 12" clearance between gas piping and steam or hot water piping above 200 degrees F (93 degrees C).
- K. For piping buried in building substrate, or below floor slabs, install in welded conduit, ventilated to outdoors on both ends, and tested to same requirements as gas piping.
- L. Gas valves shall not be installed above ceilings without access and signage.
- M. Supports:
  - 1. All pipe, fittings, valves, installation and testing shall be in accordance with the IFGC, Chapter 4.
  - 2. Gas piping shall be supported in accordance with the International Fuel Gas Code's latest accepted 2009 Edition, Section 407, as follows:
  - 3. Support intervals shall be in accordance with the IFGC listed above and in Section 415, Table 415.1 as follows:
    - a. Steel pipe ½" nominal size – not to exceed 6 ft.
    - b. Steel pipe ¾" to 1" nominal size – not to exceed 8 ft.
    - c. Steel pipe 1-1/4" and larger nominal size horizontal – not to exceed 10 ft.
    - d. Steel pipe 1-1/4" and larger nominal size, vertical not to exceed every floor.

### **3.3 GAS SERVICE**

- A. Arrange and coordinate with Utility Company to provide gas service and meter at indicated location with shutoff at terminus. Consult with Utility as to extent of its work, costs, fees and permits involved. Pay such costs and fees; obtain permits.
- B. Extend service pipe from Utility's terminus to distribution piping, in compliance with Utility's requirements.

### **3.4 INSTALLATION OF VALVES**

- A. Gas valves: Provide at connection to gas train for each gas-fired equipment item; and on risers and branches where indicated.
- B. Locate gas valves where easily accessible, and where protected from possible damage.

### **3.5 EQUIPMENT CONNECTIONS**

- A. Connect gas piping to each gas-fired equipment item, with drip leg, union and shutoff gas valve. Comply with equipment manufacturer's instructions. Drip legs shall **not** be installed on any exterior gas piping.

- B. Equipment furnished by the Owner, or Contractors other than this Contractor: After equipment has been set in place, this Contractor shall furnish all labor and material required to make final connections between roughing-in and the equipment. Install valves, fittings, trim and appurtenances furnished with the equipment. Piping shall be of the same material as the system to which it connects.

### **3.6 EXTERIOR GAS PIPING**

- A. All rooftop or exterior gas piping shall be weatherproof with and epoxy resin approved by the Gas Company.
- B. Uncoated, threaded or socket welded joints shall not be used in piping in contact with soil or where internal or external service corrosion is known to occur.
- C. Protective Coatings and Wrapping: Pipe protective coatings and wrappings shall be approved for the application and shall be factory applied.

END OF SECTION 22 01 30

**SECTION 22 01 40**

**FIXTURES – PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes:
  - 1. Plumbing fixtures and trim work as indicated by drawings and schedules, and by requirements of this section.
  - 2. Types of plumbing fixtures required for the project include the following:
    - Water Closets
    - Urinals
    - Lavatories
    - Countertop Sinks
    - Manual-Operated Flush Valves and Faucets
    - Manually Operated Flush Valves
    - Handicap Lavatory Insulation
    - Lavatory Shield Enclosure
    - Combination safety Shower and Eyewash
    - Utility Sink
    - Mop Receptor
  - 3. Refer to Section 220120 for domestic water piping systems used in conjunction with plumbing fixtures; not work of this section.
  - 4. Refer to Section 220110 for soil and waste piping systems used in conjunction with plumbing fixtures; not work of this section.
  - 5. Refer to Division 26 sections for electrical connections to water coolers and other plumbing fixtures; not work of this section.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

- B. **Manufacturers:** Firms regularly engaged in manufacture of plumbing fixtures of the type, style and configuration required, whose products have been in satisfactory use in similar service for not less than 3 years.
- C. **Plumbing Fixture Standards:** Comply with applicable portions of International Plumbing Code pertaining to materials and installation of plumbing fixtures.
- D. **ANSI Standards:** Comply with applicable ANSI standards pertaining to plumbing fixtures and systems.
- E. **ANSI & ADA Standards:** Comply with ANSI A171.1 Standard and the ADA Standard pertaining to plumbing fixtures and provisions for handicapped.
  - 1. Water closets shall be measured from the floor to the top of the seat. Bowls shall be elongated type. See Architectural details for all heights of fixtures.
  - 2. Flush valve mechanisms shall be on the wide side of the stall. See Architectural details for all heights of fixtures.
  - 3. Urinals shall be elongated wall-mounted. See Architectural details for all heights of fixtures.
  - 4. Lavatories shall be mounted no higher than allowed by Architect's details from the floor and provide knee clearance using an offset drain assembly with "P" trap set parallel to the fixture supporting wall. Trap and wall supplies shall be installed for clearance required for the installation of lavatory shield enclosures.
  - 5. Faucets shall be lever operated. See Fixture Schedule. All faucets shall operate on less than 5 pounds force and shall not require tight grasping, pinching or twisting of the wrist.
- F. **PDI Compliance:** Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.
- G. **Federal Standards:** Comply with applicable FS WW-P-541/- Series sections pertaining to plumbing fixtures.
- H. **UL Labels:** Provide water coolers which have been listed and labeled by Underwriters' Laboratories.
- I. **ARI Labels:** Provide water coolers which are rated and certified in accordance with applicable Air-Conditioning and Refrigeration Institute Standards.

## **1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.

B. Submit the following:

1. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished, roughing-in dimensioned drawings, templates for cutting substrates, fixture carriers, and installation instructions.
2. Color Selection Data: Submit charts or samples for color selection where applicable.
3. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in maintenance manual.

**1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**1.7 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver plumbing fixtures individually wrapped in factory-fabricated containers.
- B. Handle plumbing fixtures carefully to prevent breakage, chipping and scoring the fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

**PART 2 – PRODUCTS**

**2.1 PLUMBING FIXTURES**

- A. Provide factory-fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer and as required for a complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

**2.2 MATERIALS**

- A. Unless otherwise specified, comply with applicable Federal Specification WW-P-541/-Series sections pertaining to plumbing fixtures, fittings, trim, metals and finishes. Comply with the requirements of WW-P-541/-specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps, and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541/-.
- B. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, decoloration, or other surface imperfections on finished units are not acceptable.

- C. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.
- D. Stainless Steel Sheets: ANSI/ASTM A-167, Type 302/304, hardest workable temper. Finish: No. 4, bright, directional polish on exposed surfaces.
- E. Steel Sheets for Baked Enamel Finish: ANSI/ASTM A-591, coating Class C, galvanized-bonderized.
- F. Steel Sheets for Porcelain Enamel Finish: ANSI/ASTM A-424, commercial quality, Type 1.
- G. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes, and specks; glaze exposed surfaces, and test for crazing resistance in accordance with ANSI/ASTM C-554.
- H. Fiberglass: ANSI Z124 smooth surfaced, with color selected by Architect/Engineer.
- I. Aluminum: ANSI/ASTM B-209/B-221 sheet, plate and extrusions, as indicated; alloy, temper and finish as determined by manufacturer, except 0.40 mil natural anodized finish on exposed work unless another finish is indicated.
- J. Synthetic Stone: High quality free from defects, glaze on exposed surfaces, stain resistant.

### **2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES**

- A. Lavatory Protective Shield Covers:
  - 1. Fully molded enclosure "Lav Shields" as manufactured by Zurn or Truebro, Inc., complete with tamper-resistant stainless steel fasteners.
  - 2. Shield enclosure to meet A.D.A. #4.19.4, ANSI A117.1 and BOCA P- 1203.4.
- B. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated. Include manual shutoff valves and connecting system pipes to permit outlet servicing without shut- down of water supply piping systems.
  - 1. Vacuum Breakers: Provide with flush valves where required by governing regulations, including locations where water outlets are equipped for hose attachment.
- C. P-traps: Include removable P-traps where drains are indicated for direct connection to drainage system. All traps shall be minimum 17 gauge.
- D. Carriers: Provide cast-iron and/or steel supports for fixtures. Carriers shall be provided for all wall-hung fixtures, and/or the carrier shall be selected to support the fixture independently of the wall. Carriers shall be adjustable type, complete with all fittings and foot supports. Carrier shall be single or double, back-to-back, horizontal offset and vertical stack type. Carrier shall be selected and used as best suited within the pipe chases. Where noted or indicated, stud mount type carriers shall be used and installed within stud wall s 8" and less.

- E. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- F. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome plated sheet steel escutcheons with friction clips.
- G. Aerators: Provide aerators of types approved by Health Departments having jurisdiction.
- H. Comply with additional fixture requirements contained in fixture schedule attached to this section.

**2.4 FIXTURE LIST**

- A. Refer to the "Plumbing Fixture & Equipment Schedule" as indicated on the drawings.

**2.5 MANUAL-OPERATED LAVATORY SYSTEM FAUCETS**

- A. This Contractor shall furnish and install complete and operating operational faucets where so indicated and noted.
- B. The Contractor shall have a complete understanding of the manual operated equipment and system they are installing during the bid phase of the work.
- C. The Contractor shall install the system in strict conformance with the manufacturer's written instructions. The installation shall be executed with good workmanship and to be clear of any interference with the user including the installation of lavatory protective shield enclosures.

**2.6 AVAILABLE MANUFACTURERS**

- A. Subject to compliance with requirements, manufacturers offering fixtures, trim and carriers which may be incorporated in the work include, and are limited to the following:

Water Closets (Wall-Mounted Back Outlet – China)/Floor-Mounted Bottom Outlet

Crane  
American Standard  
Sloan  
Zurn

China/Enameled Fixtures

American Standard  
Eljer  
Crane  
ToTo  
Sloan  
Zurn

Stainless Steel Sinks

Elkay  
Acorn

Faucets/Trim (Non-Sensor Operated)

American Standard  
Delta  
Moen  
Elkay  
Speakman  
Chicago  
T&S Brass  
Zurn

Flush Valves

Sloan  
Coyne & Delany  
Delta  
Zurn  
ToTo

Wall Supplies/Traps

McGuire  
Brass-Craft  
Kohler  
American Standard  
Sanitary-Dash  
Teledyne  
Wolverine  
Pro-Flo  
Keeny

Fixture Carriers

Zurn  
Josam  
Wade  
Watts  
Smith  
MIFAB

Fixture Seats

Olsonite  
Sperzel  
Benke  
Bemis  
Church  
Kohler  
American Standard

Centoco  
Comfort Seat

B. Cross Reference Identification:

1. If the Contractor selects a manufacturer of drainage equipment products other than as identified on the Schedule but is selected from the available manufacturers listed above, a cover sheet shall be included with the submission of shop drawings indicating the cross referenced manufacturer and model number.
2. Shop drawings shall not be reviewed or accepted if not in compliance with this requirement.

**2.8 HANDICAP LAVATORY INSULATION**

- A. Fully molded "P" trap and angle valve insulation kit Handi-Lav Guard Truebro Model #101, 102 and 105 to suit.
- B. Insulation to meet A.D.A. #4.19.4, ANSI A117.1 and BOCA P- 1203.4.
- C. Self-extinguishing ASTM D635 burn characteristics, Thermal conductivity ASTM C177-K value 1.17.

**PART 3 – EXECUTION**

**3.1 FIXTURE CONNECTIONS**

- A. Connections to plumbing fixtures shall be of the sizes indicated on the "Plumbing Fixture & Equipment Schedule".
- B. The sizes indicated on the Schedule are for drainage and water piping serving an individual fixture; the sizes of the mains and branches shall be as indicated on the drawings.

**3.2 FIXTURE SETTING HEIGHTS**

- A. The plumbing fixtures shall be set in accordance with the heights established by the latest edition of codes and ADA requirements.

Note: Height indicated is established as follows:

Water Closets:	From finished floor to top of seat.
Urinals:	From finished floor to rim of fixture.
Lavatories & EWC:	From finished floor to rim of fixture.
Receptor Fitting:	From finished floor to center of fitting.
Shower:	From finished floor to center of shower head.

- B. Refer to Architectural drawings and sections for fixture elevations. Fixtures in various areas may be set at lower elevations. Confirm all rough-in elevations prior to any installation.

**3.3 LAVATORY PROTECTIVE SHIELD ENCLOSURES**

- A. Installation shall conform to manufacturer's written instructions.
- B. All items involved with wall-hung lavatory installations shall be roughed-in and installed within the enclosure. This includes the offset "P" trap assembly, thermostatic mixing valve, sensor faucet trim and accessories, electrical outlet. Coordinate all work required for complete concealment of all devices.
- C. Protective shield enclosures are required on the toilet room's countertop lavatories and are furnished by the Architect. Coordinate all trim and accessories to fit within this enclosure.

**3.4 INSPECTION AND PREPARATION**

- A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until satisfactory conditions have been corrected.
- B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and service intended purposes. Comply with applicable requirements of the International Plumbing Code pertaining to installation of plumbing fixtures.
- C. Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement.

**3.5 CLEAN AND PROTECT**

- A. Fixture shall be thoroughly cleaned after completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.

**3.6 FIELD QUALITY CONTROL**

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
- B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

END OF SECTION 22 01 40

**SECTION 22 01 50**

**EQUIPMENT – PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. This section includes:
  - 1. Plumbing equipment as indicated on drawings and provisions of this section, including schedules and equipment lists associated with either drawings or this section.
  - 2. Types of plumbing equipment required for project include the following:

- Recirculating Pumps-Domestic Water Return (110 degrees & 140 degrees)
    - Domestic Water Heater
    - Thermostatic Mixing Valve

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.
- B. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters' Laboratories and comply with NEMA Standards.
- C. NEC Compliance: Comply with National Electrical Code (ANSI/NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.
- D. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.
- E. AWWA Compliance: Comply with applicable American Water Works Association Standards pertaining to steel water tanks.
- F. CSA and NSF Labels: Provide water tanks which have been listed and labeled by CSA International and National Sanitation Foundation.
- G. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler & Pressure Vessel Code for construction and stamp with ASME Code Symbol:

- Packaged Domestic Water Heater

- H. All packaged equipment shall be independently third party, labeled as a system for its intended use by a nationally recognized testing laboratory (NRTL) in accordance with OSHA Federal Regulations 29CFR 1910.303 and .349 as well as NFPA Pamphlet #70 and NEC Article 90.7.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

**1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 220000.
- B. Submit the following:
  - 1. Product data on all equipment including roughing-in data.
  - 2. Connection diagrams for related piping and specialties.

**1.6 WARRANTY/GUARANTEED**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS

**PART 2 – PRODUCTS**

**2.1 EQUIPMENT**

- A. Refer to "Plumbing Fixture & Equipment Schedule" for type, numbers, size and manufacturer of all equipment accessories.

**2.2 HOT WATER CIRCULATING PUMPS**

- A. Provide and install where indicated on the drawings, domestic hot water circulating pumps complete with controls and piping as shown on the drawings. Each pump shall have a capacity of 5 gallons per minute against a total discharge head of 17 feet.
- B. Pumps shall be close coupled, centrifugal type, all low lead or lead free bronze with flexible connection to a 1/6 HP, 1750 RPM, 60 cycle, 120 volt, single phase motor.
- C. Pump shall be controlled by a manual starter, furnished and installed by the Electrical Contractor. Pumps shall run continuously and be wired into night setback operations.

**2.3 MASTER MIXING VALVE**

- A. Mixing valve shall be constructed entirely of lead free bronze and copper and hydrostatically tested to a pressure of 300 lb. Unit shall be provided with the following features.
  - 1. A long mixing chamber with vanes at an angle to the longitudinal axis of the valve which shall cause a thorough mixing of the hot and cold water.

2. The length of the hydraulic thermostatic element shall assure effective contact with the water.
  3. The thermostatic element shall be placed in the body of the valve where the hot and cold water mix. Unit shall be sensitive to any change in water temperature and make the proper correction by opening or closing the hot and cold water inlets in the valve.
  4. The sensitive parts of the thermostatic element shall be inside a heavy non-ferrous tube which shall protect them from any corrosive or scaling action caused by the continuous flow of water past them.
- B. Unit shall be as sized on the drawings.
- C. Temperature adjusting range shall be between 80 and 160 degrees F.

## **2.4 WATER HEATER**

- A. The water heater shall be Bradford White Model EF-100T-250-NA with a storage capacity of not less than 100 gallons, a minimum input of 250,000 BtuH, and a minimum recovery of 364 GPH at 100 deg. F. It shall be design certified by the CSA International Z21.10.3 for 180 deg. F application. The tank shall be lined with Vitraglas vitreous enamel. The tank shall have one extruded magnesium anode rod. The insulation shall be foam material of 1" nominal thickness. The entire installation shall be made in accordance with state and local codes and ordinances. Provide concentric vent system listed to UL-1738, ULC-S636 and CE-EN-14 471 Polypropylene.
- B. Vacuum Relief Valve: All bottom fed water heaters and bottom fed hot water storage tanks connected to water heaters shall be installed with a vacuum relief valve. The valve shall be installed on the (cold water) fed piping above the top of the water heater and/or storage tank and per the manufacturer's requirements. Vacuum relief valves shall comply with ANSI Z21.22.

## **2.5 MANUFACTURERS**

- A. Subject to compliance with requirements, manufacturers offering plumbing equipment shall be limited to the following:
1. Domestic Water Heaters
    - Ruud
    - Bradford-White
    - State
  2. Hot Water Circulating Pumps
    - Armstrong
    - Bell and Gossett
    - Taco
    - Aurora
    - Grundfos
    - Amtrol

3. Master Mixing Valve (Domestic Hot Water System)

Holby Valve Co.

4. Automatic Trap Primer

PPP, Inc.

5. Hot Water Circulating Pumps

Taco

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF WATER HEATERS**

- A. Install water heaters where indicated in accordance with manufacturer's installation instructions and in compliance with applicable codes.
- B. Set units where indicated, orient so controls and devices needing service and maintenance have adequate access. Level and plumb units. Each unit shall be set on a concrete housekeeping pad.
- C. Existing Mechanical Room: Reconnect existing gas hot and cold piping to new unit. Alter piping to suit new connections. Connect recirculating line to unit with check valve and shutoff valve. Extend relief valve discharge to nearest floor drain. Extend and connect new flue exhaust to existing breeching.
- D. New Mechanical Room: Connect gas, hot and cold and recirculating piping system and all associated equipment and devices as detailed on the drawing. Flue extension, roof penetration and weatherproof hood shall be by this Contractor.
- E. Start-up, test and adjust hot water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

**3.2 INSTALLATION OF THERMOSTATIC MIXING VALVE**

- A. Install mixing valve in accordance with manufacturer's installation instructions and in compliance with applicable codes.
- B. At startup of domestic hot water system, mixing valve outlet temperature shall be checked to insure proper setting and operation. Following adjustments, if required, the mixing valve, if not performing, check if factory required differential temperature in/out with a minimum of 20° Delta "T" is maintained.
- C. Provide minimum 27" (end of pipe to end of pipe) heat trap in accordance with manufacturer's recommendations and as detailed on the drawing.

- D. The temperature of the water delivered by the mixing valve shall be changed by turning the adjusting screw to the right or clockwise for lower temperature; and to the left or counter clockwise for higher temperatures. Maintain a uniform temperature regardless of temperature of incoming water. To facilitate adjustment, a thermometer shall be placed in the line beyond the Holby Tempering Valve as shown in the diagram and water shall be flowing through the Holby Tempering Valve while adjustment is being made.
- E. Check valves shall be installed on both inlet (hot and cold) to the unit. Include a full size bypass valve arrangement.
- F. The hot water return line shall always be piped through the cold water make-up side of the mixing valve.

### **3.3 INSTALLATION OF HOT WATER CIRCULATING PUMPS**

- A. Install pumps where indicated, in accordance with manufacturer's published installation instructions, with recommended clearances provided for service and maintenance.
- B. Install in-line pumps, supported from piping system, located for access to oil cups, service, and maintenance.
- C. Lubricate pumps before start-up. Start-up shall be in accordance with manufacturer's instructions.
- D. Install pump unit as detailed on the drawing. Include a check valve and thermometer at the pump unit. The pump shall run on continuous operation. The pump shall be wired into night setback by the ATC system installer.

### **3.4 AUTOMATIC TRAP PRIMER**

- A. The automatic trap primer units specified shall be recessed mounted and in the location indicated.
- B. Installation shall conform to manufacturer's written instructions. The Electrical Contractor shall provide 120 volt electrical power and final connection.
- C. The unit installation shall include a discharge line to each floor drain (F-8, F-9 and F-10) indicated and/or noted on the drawings. Any unused discharge line off the unit's discharge manifold shall be capped off within the panel.
- D. All discharge lines shall be minimum "M" copper tube or flexible polyethylene tubing. All tubing shall be protected during below floor slab construction.
- E. The unit shall be factory tested, assembled and prepiped and shall include a ¾" ball valve, shock absorber, vacuum breaker, copper distribution manifold, solenoid valve.

END OF SECTION 22 01 50

**SECTION 22 01 90**

**TESTING – PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. Extent of plumbing systems to be tested is indicated on the drawings and by requirements of this section.
- B. Applications of tests include the following:
  - 1. Interior Piping
    - a. Domestic cold, hot & hot water return piping
    - b. Sanitary and condensate waste drainage piping
    - c. Storm water drainage piping
- D. See Fire Protection Specifications for testing of Fire Protection Systems.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

**1.5 SUBMITTALS**

- A. Submit test reports in accordance with Section 220000.

**1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**PART 2 – PRODUCTS**

**2.1 PIPE & FITTING REPLACEMENTS**

- A. Refer to Section 220010 for replacement of any defective pipe or fittings. Replacement shall include all required uncovering, excavating, recovering and backfilling.

### **PART 3 – EXECUTION**

#### **3.1 GENERAL**

- A. All exterior or interior piping shall be tested and approved before backfilling or concealing. Failure to secure the approval of the Municipal Inspector, Utility Company's Inspector or the Inspector of the Architect/Engineer makes it mandatory for the Contractor to completely expose the piping for testing. All expense involved in the uncovering of the piping for the test and recovering shall be borne by the respective Contractor with no change in Contract.
- B. All equipment, material and labor required for testing a plumbing system or part thereof shall be furnished by the Plumbing Contractor responsible for installing the work.

#### **3.2 INTERIOR PIPING**

##### **A. Drainage Piping:**

Rough Plumbing: The piping of all plumbing storm, condensate waste, sanitary drainage and venting systems shall be tested upon completion of the rough piping installation by water or air and proved watertight. Where required by the code official, the cleanout plugs shall be removed to ascertain if the pressure has reached all parts of the system. Either of the following methods shall be used:

1. **Water Test:** The water test shall be applied to the drainage system either in its entirety or in sections after rough piping has been installed. If applied to the entire system, all openings in the piping shall be closed, except the highest opening, and the system filled with water to the point of overflow. If the system is tested in sections, each opening shall be plugged except the highest opening of the section under test, and each section shall be filled with water, but a section shall not be tested with less than a 10-foot head of water.

In testing successive sections, at least the upper 10 feet of the next preceding section shall be tested, so that a joint or pipe in the building (except the uppermost 10 feet of the system) shall not have been subjected to a test of less than a 10-foot head of water. The water shall be kept in the system or in the portion under test for a minimum of 15 minutes before inspection starts. The system shall then be tight at all points.

2. **Air Test:** The air test shall be made by attaching an air compressor testing apparatus to an opening, and, after closing all other inlets and outlets to the system, forcing air into the system until there is a gauge pressure of 5 pounds per square inch (5 psi) or a minimum of 10-inch column of mercury. This pressure shall be held without introduction of additional air for a minimum period of 15 minutes.

Precautionary Note: The compressibility of air and/or other gases result in tremendous amounts of stored energy, even at lower pressures. Over-pressurizing creates a substantial hazard to personnel and property near the area should a failure occur. Consult with the Plastic Pipe Institute (PPI) for statements and alerts, along with State and local safety offices.

Finished Plumbing: Where required by the code official, after the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proved gas and water-tight by one of the following test methods.

1. The final test for gas and water-tightness of the completed drainage and vent systems shall be made by a smoke test or other approved method. The test shall be made by filling all traps with water, and then introducing into the system smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a 1" water column shall be built and maintained for the period of the inspection.
2. After the plumbing fixtures have been set and their traps filled with water, their connections shall be tested and proven gas and water-tight by plugging the stack openings on the roof and building drain where the drain leaves the building and with air introduced into the system equal to the pressure of a 1-inch water column. This shall be accomplished by the use of a "U" tube or manometer inserted in the trap of a water closet. Such pressure shall remain constant for the period of inspection without the introduction of additional air.

Building sewer test: The building sewer shall be tested by insertion of a test plug at the point of connection with the public sewer or individual sewage disposal system. The building sewer shall then be filled with water under a head of not less than 10 feet. The water level at the top of the test head of water shall not drop for at least 15 minutes.

- B. Domestic Water Piping: All new, altered, extended or replaced interior water piping installed shall be tested at 100 psig maintaining the pressure for four hours with not more than 1% drop in pressure. The system shall be filled with water which shall remain in the system until the water and the piping are the same temperature. If water pipe testing is under the jurisdiction of the local inspector, his requirements shall be used; however, they shall be not less than specified herein. The tests shall be performed in the presence of the representative of the Architect/Engineer and to his satisfaction.

### **3.3 STERILIZATION**

- A. After final testing for leaks, all new potable water piping installed including water service piping, shall be flushed to remove foreign material.
- B. Before placing domestic water systems in service, a qualified service organization shall be engaged, to sterilize the entire building including the exterior water service piping in accordance with the following procedure:
1. Contractor shall provide a 3/4" hose connection somewhere in the main entering the building, or in the Mechanical Room and/or in the meter pit, pump in sufficient sodium hypochlorite to produce a free available chlorine residual of not less than 100 PPM.
  2. Proceed upstream from the point of chlorine application opening all faucets and taps until chlorine is detected. Close faucets and taps when chlorine is evident. Consult with the local code department for additional concentrations and durations.

3. When chlorinated water has been brought to every faucet and tap with a minimum concentration of 200 PPM chlorine, retain this water in the system for at least three hours.
4. At the end of the retention period, no less than 100 PPM of chlorine shall be present at the extreme end of the system.
5. Proceed to open all faucets and taps and thoroughly flush all new lines until the chlorine residual in the water is less than 1.0 PPM.
6. Obtain representative water samples from the system for analysis by a recognized Bacteriological Laboratory.
7. If all samples tested for impurities and organisms are negative, a letter and laboratory reports shall be submitted by the service organization to the contractor, certifying successful completion of the sterilization.
8. If any samples tested indicate the presence of harmful impurities and organisms, the entire sterilization procedure shall be repeated.
9. Plumbing Contractor shall provide plumbing connections and power for pumping chlorine solution into the system.

Warning: PVC and CPVC Pipe: Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introduction of granules or pellets of calcium hypochlorite with solvent cements and primers (including their vapors), may result in violent chemical reactions.

- C. Available Service Organizations: Subject to compliance with requirements, provide the sterilization service of one of the following:

Water Chem  
Arc Company, Inc.  
Nova Consultants  
Artesian Water Co.

END OF SECTION 22 01 90

**SECTION 22 01 91**

**BALANCING - PLUMBING**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the work specified in this Section.

**1.2 DESCRIPTION OF WORK**

- A. Extent of plumbing systems to be balanced is indicated on the drawings and by requirements of this section.
- B. Applications of tests include the following:
  - 1. Interior Piping
    - a. Domestic hot water and hot water return

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 220000 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 220010 for a general description of requirements applying to this section.

**1.5 SUBMITTALS**

- A. Submit balancing report in accordance with Section 220000.

**1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**PART 2 – PRODUCTS**

**2.1 PIPE & FITTING REPLACEMENTS**

- A. Refer to Section 220010 for replacement of any defective pipe or fittings. Replacement shall include all required draining of system, removal and replacement and uncovering, recovering.

**PART 3 – EXECUTION**

**3.1 GENERAL**

- A. All new hot water return piping installed or wherever system valves are being replaced, the system shall be tested, balanced and approved before concealing. Failure to secure the approval of the Municipal Inspector, A/E Inspector or the Inspector of the Owner makes it mandatory for the Contractor to completely expose the piping for balancing. All expense involved in the uncovering of the piping for the balancing and recovering shall be borne by the respective Contractor with no change in Contract.
- B. All equipment, material and labor required for balancing a plumbing system or part thereof shall be furnished by the Plumbing Contractor responsible for installing the work.

**3.2 INTERIOR PIPING**

- A. Domestic Hot Water Return System: Upon completion of the testing of the domestic hot water supply and recirculation systems, a final procedure is to be performed to obtain uniform circulation within each hot water loop of the domestic hot water system. At the ends of the hot water mains, or wherever a branch return line connects to the main return line, there shall be three (3) valves: ball valve, check valve and balancing valve. These valves are to be installed in an accessible space at/or above the ceiling or where indicated on the drawings.
- B. Based on an Accu-Flo balancing valve, the use of a differential pressure gauge Model No. 779 shall be used to achieve the greatest accuracy.

END OF SECTION 22 01 91

**SECTION 23 02 00**

**GENERAL PROVISIONS – HVAC**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to work of this Section.
- B. This specification or drawing and the design features or resulting construction disclosed, are the property of Furlow Associates, Inc., and shall not be reproduced without written permission.
- C. All Mechanical Systems shall be part of and included in all of the following: 230200 thru 230950.

**1.2 WORK INCLUDED**

- A. Provide labor, materials, equipment and supervision necessary to install complete operating HVAC Systems, including all work at the site and within the proposed construction areas to accomplish the required work.
- B. Wherever the term "provide" is used, it shall be understood to mean both "furnish" and "install".

**1.3 REGULATIONS, CODES AND STANDARDS**

- A. Work shall be performed in accordance with latest adopted codes, regulations and ordinances by authorities having jurisdiction. Observe all safety regulations.
- B. Obtain all permits and inspection certificates and pay all charges.
- C. Latest editions of any referenced standards shall govern.

**1.4 RELATED WORK**

- A. Refer to equipment shown or specified in sections of Division 1 thru 14 and 26 that will require Mechanical services and provide such service.
- B. Refer to work related to HVAC as shown on the following contract drawings:

Architectural & Structural  
Plumbing  
Electrical

- C. This Contractor shall coordinate with the work of Division 26 and the Fire Alarm System vendor for locations and mounting of all duct smoke detectors. These devices are shown on the Mechanical Drawings for reference only to show the intent of the work. All locations shall be

determined based on approved shop drawings from the Fire Alarm System vendor and the Contractor for the work of Division 26, Electrical.

### **1.5 COORDINATION**

- A. The Mechanical, Plumbing and Electrical Contractors are responsible to coordinate all manufacturer's recommended circuit breakers, starters, disconnects and fuse sizes for all equipment. Submission of a shop drawing will certify that this has been completed. Any necessary changes required will be included as part of this contract.
- B. Mechanical Contractor shall coordinate scheduling, submittals and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of independent work elements, with provisions to accommodate items that may be installed at a later time.
- C. Mechanical Contractor shall verify utility requirements and all characteristics of operating equipment are compatible with the building utilities. Coordinate the work of all sections related and required for installing, connection and placing in service of all equipment.
- D. Mechanical Contractor shall coordinate all space requirements, supports and installation of all mechanical, electrical, plumbing and fire protection work, which are indicated diagrammatically on the Drawings. Verify routing of all pipes, ducts, conduits and equipment connections. Maximize accessibility for other work, and service requirements for maintenance and repairs.
- E. Obtain written confirmation from all related trade Contractors and the Owner or his representative that requirements, conflicts and coordination issues have been discussed and resolved.
- F. Submit coordination drawings to verify access and clearances.

### **1.6 DEFINITIONS**

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, 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 in duct shafts.
- 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 installation within unheated shelters.

**1.7 SUBMITTALS****A. Shop Drawings:**

1. Shop drawings shall be submitted in accordance with Division 1 of these specifications except where herein modified.
2. Shop drawings comprising complete catalog cuts, performance test data for HVAC equipment as required by other sections of Division 23, shall be submitted for review checking. The Contractor shall review these shop drawings for conformance to contract documents prior to submission and affix contractor's signature to each submittal certifying that this review has been done. By approving and submitting shop drawings, product data, samples and similar materials, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction data that relates to the work, and has checked and coordinated this information with all of the requirements contained in the contract documents for the work of all trades.
  - a. The Contractor and equipment manufacturer shall clearly indentify in all submittals and shop drawings any and all applications standards which require additional work to accommodate this equipment and provide a complete and operational system as described in the contract documents.
  - b. The Contractor shall be completely responsible for any and all additional costs associated with the changes required by this and all other trades.
3. Submit a 1/4" scale layout of all mechanical equipment rooms. All equipment and pads shall be to scale of equipment being furnished. Obtain size information of any and all equipment from other trades and indicate on drawings. The drawings shall be fully coordinated with all trades prior to submission. Indicate coil pull areas, filter pull areas, maintenance clearances, and access as applicable.
4. All shop drawing submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto.
  - a. Project name.
  - b. Project number.
  - c. Sub-contractor's, vendor's and/or manufacturer's name and address.
  - d. Product identification.
  - e. Identification of deviation from contract documents.
  - f. Applicable contract drawings and specification section number.
  - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
5. Resubmit revised or additional shop drawings as requested.
6. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the contractor making the submission to identify by name, the contractor who is to do this work. If the contractor named is other than the contractor making the submission, the shop drawing submission must be reviewed by the

named contractor and bear his mark of approval, prior to submission to the Architect/Engineer.

7. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.
  8. The Contractor shall keep one copy of approved shop drawings at the job site,, filed in a suitable metal container. The shop drawings shall be cataloged and kept in good repair, and shall be available for use by the Owner, Architect and Engineer.
  9. No equipment shall be ordered, fabricated, etc., before approval of shop drawings.
- B. Contractor is responsible for the shop drawing coordination and interface with the work of other contracts and adjacent work. The relationship of Contractor's work shall be verified as it relates to adjacent and critical features of the work of this and all contracts and materials.
  - C. The Contractor shall submit a complete schedule of all shop drawings required for the scope of work covering all materials and equipment listed in all sections of Division 23, Mechanical, including all documents required for contract closeout, Owner instructions and training, and all turnover items at the completion of the work. This schedule shall be submitted for review and approval within thirty days of contract award and before any subsequent materials are provided for review.
  - D. The shop drawings provided by the Contractor will be reviewed only once and resubmittals will be reviewed only once. Any other submittals will be billed to the Contractor at the Engineer's standard rates.

## **1.8 SITE INSPECTION**

- A. The Contractor shall visit site, inspect, and become aware of all conditions which may effect the work during the estimation phase of his work prior to bid openings. Investigate utilities, protection requirements for adjacent facilities, storage locations, and access to the construction area.
- B. Submission of a bid will be deemed evidence of having complied with this requirement.

## **1.9 SUBSTITUTIONS**

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.
- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the Contractor or an equipment vendor to deviate from the written portion of the specifications unless so stated in the addendum.

- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.
- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to all: space requirements, code clearances, type-horsepower-capacities-number and size of services required from other trades including all auxiliary items provided by this Contractor and all other trades, and all manufacturer's specific equipment applications standards and requirements, for approved equipment including that which is basis of design or a substitution. The bidding related contractor and equipment manufacturers shall clearly identify in all submittals and shop drawings any and all applications standards which require additional work to accommodate this equipment and provide a complete and operational system as described in the contract documents. If the bidding contractor or manufacturer does not comply with these requirements then they shall be completely responsible for any and all additional costs associated with the changes required by this and all other trades.
- E. Substitutions:
1. Until a date no later than seven (7) days before the date Bids are due, Architect will consider written requests from bidders for substitution of Products. Architect will review requests and will notify Bidders in an Addendum if the requested substitution is acceptable.
  2. Submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:
    - a. Comparison of the qualities of the proposed substitution with that specified.
    - b. Changes required in other elements of the work because of the substitution.
    - c. Effect on the construction schedule.
    - d. Cost data comparing the proposed substitution with the Product specified.
    - e. Any required license fees or royalties.
    - f. Availability of maintenance service, and source of replacement materials.
  3. Architect shall be the judge of the acceptability of the proposed substitution.
  4. A request for a substitution constitutes a representation that Bidder:
    - a. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.
    - b. Will provide the same warranties or bonds for the substitution as for the Product specified.
    - c. Will coordinate the installation of an accepted substitution into the work, and make such other changes as may be required to make the work complete in all respects.
    - d. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.

**1.10 LUBRICATION**

- A. Provide and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

**1.11 EQUIPMENT START-UP**

- A. Verify proper installation by manufacturer or his representative.
- B. Advise General Contractor 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to General Contractor.
- D. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- E. The Mechanical Contractor shall own as part of his work, the following:

Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

**1.12 OPERATION & MAINTENANCE INSTRUCTIONS**

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
  - 1. Contractor to demonstrate all systems to Engineer for verification of operation prior to Owner's instruction period.
  - 2. Provide two (2) 4-hour sessions of training to School District Maintenance Staff.
- B. Insure that the Owner's personnel are familiar with all operations to carry on required activities.
- C. Such instruction shall be for each item of equipment and each system as a whole.
- D. Provide report that instruction has taken place. Include in the report the equipment and/or systems instructed, date, contractor, Owner's personnel, vendor, and that a complete operating and maintenance manual has been reviewed.
- E. Manual shall include all instructions on operation, maintenance, repair parts list, lubrication requirements, brochures, catalogue cuts, complete schedule of air filters for each unit type in Excel spreadsheet format, wiring diagrams, piping diagrams, control sequences, service

requirements, names and addresses of vendors, suppliers and emergency contacts. Three manuals shall be provided.

- F. Submit manuals for review prior to operating instruction period. Manuals shall be 8-1/2 x 11" with hard cover, suitably bound.
- G. Provide to the Owner any special tools necessary for operation and routine maintenance of any of the equipment.
- H. Upon completion of the project, the Mechanical Contractor shall provide a complete set of legible as-built drawings for the Owner.
- I. Furnish three (3) copies of a professionally taped video and three (3) copies of professionally prepared drawings demonstrating the following:
  - Locations of main shut-off valves.
  - Procedures for equipment start-up and seasonal shut-downs.
  - Procedures for maintenance.
  - Provide written version of all procedures included in video.

The above should cover all equipment/systems including, but not limited to, the following:

- Air handlers
- Fans
- Infrared Heating System
- D/X cooling units
- ATC System

### **1.13 TOOLS**

- A. All equipment furnished by the Mechanical Contractor which requires special tools or devices other than those normally available to the maintenance or operating staff shall be furnished in duplicate to the Owner, sufficiently marked, packed or boxed for staff usage. The tools provided shall be listed by the Mechanical Contractor identified as to their use or the equipment applicable in a written transmittal to the Owner.

### **1.14 CLEANING AND FINISHING**

- A. After equipment start-up and all operating tests have been made and the system pronounced satisfactory, each respective Contractor shall go over the entire project, clean all equipment, etc., installed by him and leave in a clean and working condition. Any surfaces found marred after this final cleaning shall be refinished or replaced by each Contractor at no cost to the Owner.
- B. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care shall be taken to provide protection for bearings, open connections, pipe coils, pumps, compressors and similar equipment.

- C. All fixtures, piping, finished surfaces and equipment shall have all grease, adhesive labels and foreign materials removed.
- D. Clean-up: Remove from the premises, all unused material and debris resulting from the performance of work under this section.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. All material and equipment shall be new and of present day manufacture, and shall conform to accepted standards of the trade where such a standard has been established for the particular type of equipment or material.
- B. Whenever equipment or material is referred to in the singular, such as "the fan", it shall be deemed to apply to as many such items as necessary to complete the work.

### **2.2 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. During loading, transporting and unloading exercise care to prevent damage to material.
- B. Store all materials in dry enclosures or under protective coverings out of way of work progress.
- C. Material shall not be allowed to be stored directly on ground.
- D. Deliver in manufacturer's original cartons or on skids.
- E. Handle and protect so as to prevent damage to product or any surrounding material.

### **2.3 CONCRETE**

- A. Concrete shall be in accordance with Section 033000.

### **2.4 WARRANTY**

- A. Wherever in the specification sections of this division, reference is made to a specific warranty period, this warranty shall be in addition to and not a limitation of other rights the Owner may have against the Mechanical Contractor under the contract documents.

## **PART 3 – EXECUTION**

### **3.1 PROTECTION**

- A. Plug or cap open ends of piping systems, conduit and ductwork.
- B. Stored materials shall be covered to prevent damage by inclement weather, sun, dust or moisture.
- C. Protect all installed work until accepted in place by the Owner.

- D. Plates, polished metal escutcheons, thermostats and other finished devices shall not be installed until masonry, tile, and painting operations are complete unless otherwise protected.
- E. Protect all work from operations which may cause damage such as hauling, welding, soldering, painting, insulating and covering.

### **3.2 WORKMANSHIP**

- A. Install all work neat, trim and plumb with building lines.
- B. Install work in spaces allocated.
- C. Cutting and patching shall be performed by skilled tradesmen normally employed for the work involved.
- D. This Contractor shall provide a complete weathertight seal to all new systems in the building including the necessary caulking, weather-stripping and insulation.

### **3.3 EQUIPMENT SETTING**

- A. Provide as a minimum, a 4 inch concrete pad beneath all floor-mounted equipment. Install anchor bolts in pour.
- B. Provide as a minimum, spring vibration isolation under any equipment 10 HP and over and rubber in shear vibration isolation on any equipment up to 10 HP. For further specifications and additional requirements, refer to other sections.
- C. Concrete shall be 3,000 psi, 28 day compressive strength in accordance with ACI-613. Reinforce with No. 4 rod 12" on centers both ways or as otherwise detailed.

### **3.4 FASTENERS, HANGERS AND SUPPORTS**

- A. Provide all hangers and supports required to suspend, mount, or hang the work.
- B. Provide all miscellaneous steel angles, channels, beams, clips, brackets and anchors necessary to hang or support the work. Provide submissions for review.
- C. Install concrete inserts before concrete is poured.
- D. Drilled inserts shall not be loaded more than 1/4 rated capacity.
- E. Power-driven fasteners shall not be allowed for piping larger than 2 inch, or equipment. When used they shall not be loaded more than 1/8 rated capacity or 200 pounds.
- F. All hangers, miscellaneous steel, braces and supports shall be galvanized, cadmium plated, or primed steel. Copper tubing shall be supported with copper hangers.

- G. Piping shall be supported from adjustable clevis type hangers with insulation pipe saddles or pipe shields in accordance with piping support spacing table on the drawings. Where hangers are 18" or longer provide lateral bracing at every fourth hanger.
- H. Support vertical piping at floor levels. Piping shall have split rings.
- I. Any lintels required for openings for this work if not indicated on Architectural or Structural drawings shall be provided under this Section.

### **3.5 SLEEVES**

- A. Provide each pipe, duct or conduit passing through a masonry or concrete wall, floor or partition with a sleeve made from standard weight steel pipe for pipe or conduit and No. 12 gauge galvanized steel for ducts, with smooth edges, securely and neatly cemented in place. Provide each pipe, duct or conduit passing through a frame or metal partition with a sleeve made from No. 22 gauge galvanized sheet metal, securely fastened in place.
- B. Be responsible for the proper location and alignment of all sleeves.
- C. Provide hydrostatic seals for sleeves passing through outside walls, either above or below grade, or through hydrostatically sealed slabs or floors on grade. Provide fire-rated seals for all sleeves which penetrate fire-rated walls.
- D. Install both piping and sleeve seals so as to maintain integrity of seals with expansion and contraction of piping.
- E. Set floor sleeves flush with floor surface in finished areas, 1" above the finished floor in kitchens, cafeterias, and similar service areas unless such areas are slab-on-grade; 1" above the floor in mechanical rooms, pipe chases, pipe spaces and other unfinished areas, unless otherwise indicated, and flush with the underside of slabs. Extend wall and partition sleeves through and cut flush with each surface unless otherwise indicated or specified.
- F. Select sleeves two pipe sizes larger than any pipe or conduit that is to remain uncovered, unless otherwise required by the sealing method specified. Where pipes are to be covered, provide sleeves large enough to allow the covering to pass through the sleeves with sufficient clearance for sealing as specified hereinafter. Size sleeves for branch piping from vertical risers large enough to permit vertical expansion at the riser.
- G. Place sleeves imbedded in concrete floors or walls in the forms before concrete is poured; sleeves shall have integral waterstop flanges, where they are to receive either watertight or hydrostatic seals.
- H. Install sleeves passing through above-grade floors of mechanical rooms, toilet rooms, kitchens or similar service areas where liquid leaks or spillover may occur in a watertight manner. Sleeves shall be such that waterproofing membrane can be flashed around and into the sleeve where necessary.
- I. Hydrostatic Sealing Method: Provide compressible synthetic rubber seals, equivalent to LINK SEAL, manufactured by the Thunderline Corporation, or THRUWALL manufactured by O.Z.

Gedney. Install seals in accordance with the manufacturer's recommendations to provide air tightness aboveground and hydrostatic sealing belowgrade. Caulking or other type mastic is not acceptable.

J. Fire-Rated Sealing Method:

1. Sleeves, openings and sealants shall comply with applicable codes, recommended practices and standards, and manufacturer's instructions. Fire sealants shall have ability to prevent spread of flame, smoke or water throughout the penetration and shall pass 3 hour test, UL test ASTM E814 and UL 1479.
2. Products: Chase Corporation CTC PR-855, O. Z. Gedney CRS/CAFS, 3M Electro-Products Division Putty 303 or Caulk CP25 penetration sealing kits, General Electric Company sealants type RTV-850, 6428 or 7403, Thunderline Corporation "Link-Seal Pyro-Pak". Installation and type of sealant to be used as recommended by the manufacturer.

### **3.6 PLATES**

- A. Provide chrome plated plates wherever piping passes into finished area.
- B. Plates shall be securely fastened to piping or building construction.
- C. Floor plates shall cover 1 inch sleeve extension.

### **3.7 OFFSETS, TRANSITIONS, MODIFICATIONS**

- A. Provide all offsets necessary to install the work and to provide clearance for other trades.
- B. Maintain adequate headroom and clearance.
- C. Incidental modifications necessary to the installation of the systems shall be made as necessary and as approved by the Architect.

### **3.8 RECESSES**

- A. Furnish information to the General Contractor as to sizes and locations of recesses required to install panels, boxes, and other equipment or devices which are to be recessed in walls.
- B. Make offsets or modifications as required to suit final locations.

### **3.9 LABELING**

- A. All HVAC equipment such as pumps, fans, air handling units, and devices requiring identification for operating procedures shall be provided with permanent black laminated micarta white core labels with 3/8 inch letters.
- B. This shall also apply to all controllers, remote start/stop pushbuttons and equipment cabinets.
- C. This shall not apply to individual room thermostats.

### **3.10 FLASHING AND COUNTERFLASHING**

- A. Roof curbs, etc., shall have counterflashing fittings. General Contractor shall provide flashing.
- B. Piping and conduit thru the roof shall be flashed by the General Contractor. Provide counterflashing.
- C. Provide curbs with base features required to match roof materials, finishes and configuration; e.g., flat, sloped, raised seam, etc.

### **3.11 ACCESS**

- A. Locate all equipment, valves, devices and controllers which may need service in accessible places.
- B. Where access is not available, access panels shall be provided. Furnish access panels to the General Contractor for installation.
- C. Access panels shall be Nailor-Hart Industries, Karp Co., or Controlled Air Manufacturing Limited, with 16 gauge frames and 14 gauge steel door, prime painted.
- D. Maintain access clearances for tube or fan removal, coil pulls, and filter removal.

### **3.12 WIRING AND MOTOR CONTROLS**

- A. Packaged equipment shall be furnished with disconnect switches, starters, overloads, factory furnished and wired by the unit manufacturer.
- B. Roof-mounted exhaust fans, except utility sets, rated less than 1/2 HP at 115 volts, single phase, shall be furnished with disconnect switches, factory furnished and wired by unit manufacturer.
- C. Rooftop equipment shall be furnished with starters, disconnect switches, overloads, factory furnished and wired by unit manufacturer.
- D. This Contractor shall furnish all information and assistance required for the Electrical Contractor to purchase all motor starters that are not specified to be part of the mechanical equipment.
- E. Control wiring shall be provided under this Division of the work.
- F. All wiring shall be in accordance with the National Electrical Code and as recommended by the equipment manufacturer.

### **3.13 UTILITIES**

- A. Do not interrupt any utility or service to the Owner without adequate previous notice and schedule.

**3.14 OPENINGS - CUTTING, REPAIRING**

- A. This Contractor shall cooperate with the work to be done under other sections in providing information as to openings required in walls, slabs and footings for all piping, ductwork and equipment, including sleeves where required.
- B. Any drilling or cutting required for the performance of work under this Section, shall be the responsibility of this Contractor and the cost thereof shall be borne by him.
- C. Holes in Concrete: Sleeves shall be furnished, accurately located and installed in forms before pouring of concrete. This Contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drilled or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling.
- D. It shall be the responsibility of this Contractor to ascertain that all chases and openings are properly located.

**3.15 PAINTING**

- A. The General Contractor shall be responsible for painting.

**3.16 GUARANTEE**

- A. All work shall be guaranteed to be free from defects for a period of one year of operation from date of acceptance by the Owner.
- B. Guarantee shall be extended on an equal time basis for all non-operational periods due to failure within the guarantee period.
- C. All materials and equipment provided and/or installed under this section of the specifications shall be guaranteed for a period of one year from date of acceptance of the work by the Owner unless otherwise specified in Division 1. Should any trouble develop during this period due to defective materials or faulty workmanship, the Mechanical Contractor shall furnish necessary labor and materials to correct the trouble without any cost to the Owner. Any defective materials or inferior workmanship noticed at time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner.
- D. In the event of occupancy by the Owner prior to final acceptance of the project, the guarantee date for equipment placed in operation shall be mutually agreed to by the Mechanical Contractor and the Owner's representative.

**3.17 DRAWINGS**

- A. The Mechanical Systems are indicated on the Contract Drawings. Certain pertinent information and details required by the Mechanical Work appear on the Architectural, Structural and Electrical Drawings; become familiar with all drawings, and incorporate all pertinent requirements.

- B. Drawings are diagrammatic and indicate the general arrangement of systems and requirements of the work. Do not scale drawings. Exact locations of fixtures and equipment, not specifically shown, shall be obtained before starting work.

**3.18 TESTING AND BALANCING OF MECHANICAL EQUIPMENT**

- A. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- B. The Mechanical Contractor shall own as part of his work, the following:

Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

END OF SECTION 23 02 00

**SECTION 23 02 10**

**BASIC MATERIALS AND METHODS – HVAC**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions.
- C. Refer to other sections in Division 23 for materials and methods not specified herein.

**1.2 DESCRIPTION OF WORK**

- A. Included in this Section are the following:
  - 1. Copper Tubing & Fittings
  - 2. Polyvinyl Chloride (PVC) Pipe and Fittings
  - 3. Motors

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Install work to meet the requirements of the following:
  - 1. New Castle County Dept. of License and Inspections
  - 2. International Mechanical Code
  - 3. Gas Utility Company
  - 4. NFPA
  - 5. OSHA
  - 6. ASHRAE
  - 7. Manufacturer’s Standardization Society (MSS) of the valve and Fittings Industry, Inc.:
    - SP-58 Pipe Hangers and Supports Materials, Design and Manufacture.
    - SP-69 Pipe Hangers and Supports Selection and Application
- C. Appliances and materials governed by UL requirements shall meet such requirements and bear the label.

**1.4 QUALITY ASSURANCE**

- A. Provide adequate supervision of labor force to assure that all aspects of the specifications are being fulfilled.

- B. Verify that all work and equipment is installed in accordance with manufacturer's warranty requirements.

## **PART 2 – PRODUCTS**

### **2.1 COPPER TUBING & FITTINGS**

- A. Refrigeration Piping:
  - 1. Copper tubing: Type ACR, hard drawn temper.
  - 2. Fitting: Wrought-copper, solder joints, ASME B16.22 or ASME B16.26.
  - 3. Joints: Brazed, American Welding Society (AWS) Class BCUP-5 for brazing filler metal.

### **2.2 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS**

- A. Pipe:
  - 1. ASTM D-1785 Schedule 40, Type 1, Grade 1.
- B. Fittings:
  - 1. ASTM D-2466 Schedule 40.
- C. Solvent Cement: ASTM D-2564 Schedule 40.
- D. Uniformity: To insure installation uniformity, all piping components shall be of one manufacturer.
- E. Flux shall be non-toxic type and non-corrosive.

### **2.3 MOTORS**

- A. All single phase and polyphase motors shall be manufactured to incorporate the latest NEMA standards.
- B. All single phase and polyphase motors shall have steel frames with ball bearings and copper windings. All motors to have a Class "F" insulation system with a service factor of 1.15.
- C. All motors shall be 1725 RPM, 4 pole design, unless otherwise noted on the drawings, or in the equipment specifications.
- D. Motors installed indoors and not exposed to moisture shall be open, dripproof, Class B temperature rise based on 40 deg. C maximum ambient temperature.
- E. Motors installed outdoors and exposed to moisture shall be totally enclosed, fan cooled, Class B temperature rise based on 40 deg. C maximum ambient temperature.
- F. Based on NEMA Standards, motors shall comply with the following minimum nominal efficiencies at full load.

Nominal Efficiencies for “NEMA Premium™” Induction Motors Rated 600 Volts or Less (Random Wound)						
	Open Drip-Proof			Totally Enclosed Fan-Cooled		
HP	3500 RPM	1800 RPM	1200 RPM	3500 RPM	1800 RPM	1200 RPM
1	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	86.5	84.0	87.5	86.5	84.0
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5
5	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10	91.7	91.7	89.5	91.0	91.7	90.2

G. Motor Characteristics: Refer to Equipment Schedules for specific data.

120/208 Volt System: Motors 1/2HP & Larger - 208V, 3 Phase, 3 Wire  
 Motors Less than 1/2HP- 120V, 1 Phase, 2 Wire

H. All motors rated less than 1/2HP shall have thermal protection of the auto-reset type as an integral part of the motor.

I. All motors rated 1/2HP and larger shall have thermal protection provided by an external device.

**PART 3 – EXECUTION**

**3.1 PIPING SYSTEMS**

A. All piping to drain to low points. Low points shall be provided with drain valves with hose thread.

B. All piping shall be arranged to have air vents at high points.

1. Air vents shall be automatic in operation when located in Boiler Rooms, Chiller Rooms and Mechanical Equipment Rooms. All air vents shall be provided with a PVC drain line which shall be routed to the nearest floor drain. Several air vents may be tied together.

2. Air vents shall be manual in operation in all other locations.

C. Do not install trapped lines where water cannot be drained or air can accumulate without being vented.

D. Piping shall run square with building lines.

E. Piping shall not be insulated or covered until tested and until building is enclosed.

- F. Necessary drains, off-sets, vents and drips shall be provided for coordination of the work as part of the contract.
- G. Running or close nipples are not permitted.
- H. Piping shall not be installed over electrical transformers, panels, switchgear, substations, and control panels.
- I. Exposed insulated piping risers in unfinished spaces shall be covered with 22 gauge galvanized steel sleeves from floor to ceiling. Refer to Section: Insulation & Covering – HVAC for additional requirements.
- J. Allow clearance for expansion and contraction.
- K. Install eccentric piping fittings where change in sizes occurs in piping systems. Tops of pipes to remain level.
- L. Install isolating fittings between sections of ferrous and non-ferrous pipe or connected equipment.
- M. Do not support piping from other piping, conduits or equipment.
- N. Unions shall be provided adjacent to all valves, at equipment connections, and where necessary to facilitate dismantling of the piping system.
- O. Material Requirements for Systems:
  - 1. Condensate Drain (including pumped condensate):
    - a. Schedule 40 PVC.
  - 2. Refrigerant Piping: Type ACR hard copper.

**3.2 TAGS, CHARTS AND IDENTIFICATION**

- A. See Paragraph "Labeling" in GENERAL PROVISIONS for equipment labeling.
- B. Piping Identification: Identify piping with Seton "Setmark" or Brimar, semi-rigid plastic, wraparound pipe markers with flow arrows and conforming to ANSI A13.1. Locate marker at each valve, changes in direction, where pipes pass thru barriers and every 25' of horizontal runs. Lettering on background shall be in accordance with the following colors:

Legend		Background	Lettering
1.	Gas	- Yellow	- Black
2.	Refrigerant Liquid	- Yellow	- Black
3.	Refrigerant Gas	- Yellow	- Black

### **3.3 SOLDERING/BRAZING**

- A. Connections between copper tubing and copper fittings shall be made with the appropriate filler metal. Flux shall be non-corrosive type as recommended by the manufacturer of the filler metal, and conforming to AWS A5.8.
- B. Tubing shall be cut square and then reamed and deburred. End of tubing and inside of fitting cup shall be cleaned with steel wool and the flux shall be applied to the clean surface before joining. After joining, the excess filler metal shall be wiped off while still plastic.
- C. Where the silver brazing is performed in a confined non-ventilated space, a non-toxic, cadmium-free brazing alloy such as braze 560 by Handy & Harman shall be used.
- D. Refrigerant piping shall be silver brazed using Harris Sil-Fos 15 or equivalent, with nitrogen purge.
- E. Bring joint to solder temperature or brazing temperature in as short a time as possible.
- F. Form continuous solder bead or brazing filler bead around entire circumference of joint.
- G. Wipe excess solder from joint area while solder is still plastic.

END OF SECTION 23 02 10

**SECTION 23 02 30**

**INSULATION & COVERING – HVAC**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes insulation and covering provided on the following piping and equipment:
  - 1. Condensate Drain Lines
  - 2. Refrigerant Piping.
  - 3. Exterior Piping
  - 4. Acoustic Duct Liner
- B. Insulation shall be installed on the following duct systems:
  - 1. All supply ductwork.
  - 2. All return ductwork.
  - 3. All outside air intake ductwork.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this section.
- B. Install insulation in accordance with manufacturer's recommendations.
- C. Provide adequate supervision of labor force to assure that all aspects of the specifications are being fulfilled.

**1.5 SUBMITTALS**

- A. Submit shop drawings, installation instructions, and manufacturer's literature of all materials specified in accordance with Section 230200.

- B. Submit fabrication instructions for pipe fitting and valve insulation.
- C. Submit manufacturer's joining recommendations for butt joints and longitudinal seams.

**1.6 WARRANTY/GUARANTEES**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

**PART 2 – PRODUCTS**

**2.1 PIPE INSULATION MATERIAL**

- A. Fiberglass:
  - 1. Material: Preformed fiberglass bonded with resin to form circular pipe sleeves with factory applied, white all service jacket bonded to reinforced foil vapor barrier jacketing. The jacket shall have factory applied double pressure-sensitive, self-sealing adhesive closure and vapor sealing of longitudinal joints. Thermal conductivity: 0.24 Btu/Hr./SF/inch at 100 degrees F. Flame spread of 25 and developed smoke of 50 or less.
  - 2. All Valves and Fittings:
    - a. Glass fiber insert and premolded PVC cover, Johns Manville Corp. "Zeston" and "Hi-Lo Temp Inserts" for fittings. Glass fiber must fill the entire space within the cover completely.
    - b. Factory molded fibrous glass fitting covering for fittings. Coat ends with Fosters 30-36 lagfast adhesive.
    - c. Mitered sections of pipe covering for valves.
  - 3. Manufacturers: Johns Manville Corp., Certain-Teed, Owens- Corning, Knauf.
- B. Closed Cell:
  - 1. Material: Flexible elastomeric foamed plastic closed cell structure insulation 25/50 rated with a flame spread rating of 25 or less and a smoke developed rating of 50 or less.
  - 2. Flexible pipe insulation shall be a foamed plastic closed cell structure material, with a thermal conductivity of not more than 0.27 Btu/Hr./Sq. Ft./Inch at a mean temperature of 75°F. The insulation shall have an average density of at least 2 pounds per cubic foot, shall be self-extinguishing, and shall have a water vapor transmission rating of not more than 0.1 perms. Between temperature limits of -40°F and plus 220°F, the insulation shall not indicate any deviation from its original state.
  - 3. Specification Compliance:
    - ASTM-E-84
    - ASTM-C-534 Type I – Tubular, Type II – Sheet.

ASTM-D-1056, 2B1 – Tubular, Sheet.  
MIL-C-3133B (MIL STD 670B) Grade SBE-3  
MIL-P-15280J, Form T, Form S.

4. Manufacturers: Armacell, Nomaco K-Flex, Halstead.

C. Covering of Pipe Insulation Outdoors:

1. Wrapping: Wrap insulation with embossed 0.016" aluminum jacket.
2. Fastenings: Cover shall be held in place with soft aluminum bands on 12" centers.
3. Valves and Fittings: Weatherproof all valves and fittings.

D. Manufacturers: Johns Manville Corp., Certain-Teed, Owens- Corning, Knauf.

## 2.2 DUCT INSULATION

A. Concealed Supply, Return, and Outside Air Ductwork: Fiberglass duct wrap bonded with resins, 3/4 pound density, aluminum foil facing reinforced with fiberglass scrim, laminated to Kraft, 2" thick.

1. Thermal Conductivity: 0.27 Btu/Hr./SF/Inch at 75°F. Min. installed "R" value w/25% compression shall be 5.6.
2. Duct wrap shall be cut to stretch-out dimensions as provided in manufacturer's instructions. Remove a 2" piece of insulation from the facing at the end of the piece of insulation to form an overlapping staple and tape flap. Install with facing outside so tape flap overlaps insulation and facing at other end. Insulation shall be tightly butted and not compressed excessively at duct corners. Seams shall be stapled 6" on center with outward clinching staples. All seams, tears, punctures and other penetrations of the insulation facing shall be sealed with foil tape or vapor proof mastic. Where rectangular ducts are 24" in width or greater, duct wrap shall be secured to the bottom of the duct with mechanical fasteners; i.e., stick pins spaced 18" on center.

B. Exposed supply, return, and outside air ductwork, shall be insulated in finished conditioned spaces, penthouse, mechanical rooms, mezzanine areas, equipment closets, and non-conditioned spaces with 2" thick rigid fiberglass board. Insulation shall be 6 P.C.F. density with a "K" value of 0.25 Btu/Hr./SF/Inch at 75 degrees F. mean temperature and shall be U.L. listed at 25 maximum for flame spread, and 50 maximum for smoke developed. Insulation shall be applied using Graham Pins or Stik-Clips and all seams, edges and breaks shall be sealed with 4" matching tape and sealed with Vicryl CP-10 to match ASJ jacket. Insulation shall be provided with all-service jacket facing.

C. Manufacturers: Johns Manville Corp., Certain-Teed or Owens- Corning, Knauf.

## 2.3 ACOUSTIC DUCT LINER

A. Duct liner shall be designed for use as an acoustical insulation to absorb air conditioning noise in sheet metal ducts and plenums operating at velocities up to 6000 fpm and temperatures up to 250 deg. F.

- B. Duct liner shall be a bonded mat of glass fibers coated with an EPA registered biocide and a black pigmented fire-resistant coating on the air stream side.
- C. Duct liner shall comply with the requirements of NFPA 90A and 90B. Surface burning characteristics shall comply with UL Standard 723 for 25/50 flame and smoke development.
- D. Duct liner shall comply with the property requirements of ASTM Specification C1071 Type 1. Material shall resist fungal and bacterial growth when subjected to ASTM G21 and G22 test methods.
- E. Material thickness, name of manufacturer and type shall be printed on the air stream side of the liner for ease of identification.
- F. Duct liner shall be 2" thick, unless otherwise noted on the drawings.
- F. Manufacturers: Owens Corning QuietR® AcousticR™ Duct Liner, Certainteed, Evonik Industries Solcoustic, Johns Manville Linacoustic® RC.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION – GENERAL**

- A. Do not install until systems have been tested and meet requirements.
- B. Do not install until building is enclosed.
- C. Heavy work which may damage insulation shall have been completed in the vicinity of the insulation work.
- D. Provide non-compressible insulation saddles at all piping hanger locations, and at all piping hanger locations where piping is insulated with flexible closed cell insulation.  
  
Option: Provide insulation coupling system as made by Klo-Shure Co.
- E. All installations shall be made by skilled craftsmen regularly engaged in this type of work.
- F. Insulation shall be continuous thru-wall, ceiling and floors.
- G. Metal shields, 16 gauge galvanized, shall be installed between hangers and pipe insulation.
- H. Pipe, ductwork and equipment shall be clean and dry prior to insulating.
- I. Install all insulation per manufacturer's instructions.
- J. To avoid undue compression of insulation, provide solid core inserts at all supports as recommended by the insulation manufacturer. Provide insulation shields between the insulation jacket and the hanger.

- K. Ductwork treated with internal acoustic duct liner does not require external insulation.

**3.2 PIPE INSULATION - TYPES & THICKNESSES**

- A. Provide fiberglass insulation of thickness specified on:
  - 1. Refrigerant Piping: Interior locations, exposed and concealed for suction lines. (NOTE: Insulate liquid line if metering device is mounted at the condensing unit.)  
  
1½" thick.
- B. Provide flexible closed cell insulation of thickness specified on:
  - 1. Refrigerant Piping: Exterior Locations for suction lines. (NOTE: Insulate liquid line if metering device is mounted at the condensing unit.)  
  
1" thick for piping 1½" and less.  
1½" thick for piping 2" and over.
  - 2. ½" thickness for condensate drain lines.

**3.3 PIPE COVERING (FOAMED PLASTIC TYPE)**

- A. All joints and seams shall be sealed with a compatible adhesive. Approved adhesives are as follows:  
  
Armstrong World Industries No. 520  
Benjamin Foster Company No. 85-75 up to 200 degrees F.  
  
Contractor may use Armstrong Self-Seal Armaflex 2000 insulation in lieu of the above wherever 1/2" is specified.
- B. Fitting covers shall be fabricated from the foamed plastic pipe insulation or from sheet insulation of the identical material. The fabrication shall be in accordance with manufacturer's instructions, and all seams mitered joints shall be joined using the adhesives described hereinbefore.
- C. Pipe insulation in concealed spaces shall require no finish coatings.
- D. Pipe insulation in all other areas shall receive two coats of finish of color selected by Architect. Approved finishes are as follows:  
  
Armstrong World Industries WB Armaflex Finish

**3.4 EXTERIOR PIPE COVERING**

- A. Wrapping: Wrap insulation with embossed 0.016" aluminum jacket, orient seam down.
- B. Fastenings: Cover shall be held in place with soft aluminum bands on 12" centers.

C. Valves and Fittings:

1. Weatherproof all valves and fittings.
2. Finish: Apply two coats of vapor resistant mastic reinforced with glass fabric over wrapping.

**3.5 INTERIOR PIPE COVERING**

- A. Provide premolded PVC cover on all interior insulated piping exposed in finished spaces. Orient seams up in overhead piping and toward the wall in vertical runs.
- B. Provide factory molded fitting covering for fittings and accessories, sealed and held in place by manufacturer's recommended sealing system.
- C. Provide mitered sections of covering for valves.

END OF SECTION 23 02 30

**SECTION 23 03 00**

**VIBRATION AND SOUND ISOLATION – HVAC**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes providing the following vibration and sound isolation material on items furnished and installed under HVAC work:
  - 1. Fans and AHU's

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this section.

**1.5 SUBMITTALS**

- A. Submit shop drawings, installation instructions, and manufacturer's literature of all materials specified in accordance with Section 230200.
- B. Submit the following:
  - 1. Shop drawings
  - 2. Product data

**1.6 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

**PART 2 – PRODUCTS****2.1 GENERAL**

- A. All vibration control apparatus shall be furnished by a single recognized manufacturer. The manufacturer shall submit to the Architect/Engineer evidence affirming that he has been a supplier of vibration control devices of the type required for the past five years.
- B. The vibration control apparatus manufacturer shall supervise, inspect, measure, and approve the installation and shall submit a report to the Architect/Engineer substantiating that all the equipment has been adequately isolated.
- C. Any requests for changes in the specifications must be submitted in writing in time for review and approval through a written addendum to the specifications prior to bid closing.
- D. Unless otherwise indicated or specified, all equipment mounted on vibration isolator bases shall have a minimum operating clearance of 1 inch between the base and the floor or housekeeping and beneath. Clearance space shall be checked to insure that no scrap, rubbish, hardware, etc., has been left to possibly short circuit isolated base.
- E. In connecting isolated HVAC equipment to rest of system, care must be exercised to insure proper installation.
  - 1. Air handling equipment such as centrifugal fans shall be erected on isolators and leveled with fan operating before flexible duct connection is made. Insure that duct position is in proper alignment and providing proper clearance in proportion to flexible duct connector length. When fan is shut off, misalignment with ductwork is allowable providing it does not strain or damage flexible duct connector. In cases of high static pressure, fans requiring position stabilizers are to be adjusted when fan is operating to achieve the results as described above with isolator adjustment.
- F. Vibration isolator sizes and location shall be determined by the vibration control products manufacturer or as specified herein.
- G. Model numbers of Amber/Booth Co., are given for identification. Products of specified manufacturers will be acceptable, provided they comply with all of the requirements of this specification.

**2.2 ISOLATOR TYPES**

- A. Fans and Air Handling Units:
  - 1. For slab on-grade installations, provide:
    - a. Type SP – NR = Double Deflection Neoprene: Shall include neoprene covered steel support plated (top and bottom), friction pads, and necessary bolt holes. Design isolators to support loads up to 50 pounds per square inch.

2. For floors above-grade, up to 40 ft. span, provide:
  - a. Type SW = Spring Isolators: Shall be free-standing, laterally stable and include acoustical friction pads and leveling bolts. Isolators shall have a minimum ratio of spring diameter-to-operating spring height of 1.0 and an additional travel to solid equal to 50 percent of rated deflection.
  - b. Type PBSRA - Combination Neoprene and Spring: Vibration hanger shall contain a spring and double deflection neoprene element in series. Spring shall have a diameter not less than 0.8 of compressed operating spring height. Spring shall have a minimum additional travel of 50 percent between design height and solid height. Spring shall permit a 15 degree angular misalignment without rubbing on hanger box.
  - c. Thrust Restraints: Restraints shall provide a spring element contained in a steel frame with neoprene pads at each end attachment. Restraints shall have factory preset thrust and be field adjustable to allow 1/4" maximum movement when the fan starts and stops. Restraint assemblies shall include rods, angle brackets and other hardware for field installation.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. Install in accordance with manufacturer's specifications and instructions.
  1. No metal-to-metal contact will be permitted between fixed and floating parts.
  2. Connections to Equipment: Allow for deflections equal to or greater than equipment deflections. Electrical, drain, piping connections, and other items made to rotating or reciprocating equipment (pumps, compressors, etc.) which rests on vibration isolators, shall be isolated from building structure for first three hangers or supports.
- B. Inspection and Adjustments: Check for vibration and noise transmission through connections, piping, ductwork, foundations, and walls. Adjust, repair or replace isolators as required to reduce vibration and noise transmissions to specified levels.

END OF SECTION 23 03 00

**SECTION 23 04 50**

**REFRIGERATION EQUIPMENT – HVAC**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes labor, material, equipment and supervision to for the following:
  - 1. Condensing Unit (Less than 10 Tons)
  - 2. Ductless Split System Cooling Unit
- B. Provide complete refrigeration system including chillers, cooling towers, underground pre-insulated pre-fabricated piping, aboveground piping and all required accessories.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Comply with applicable provisions of:
  - 1. International Mechanical Code
  - 2. ASME Codes for Pressure Vessels
  - 3. A.R.I. Capacity Ratings
  - 4. NFPA Pamphlets
  - 5. ASHRAE Standard 15
  - 6. ASHRAE Standard 90.1, Section 6, Table 6.8.1A thru J, minimum equipment efficiency.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

**1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 230200.

B. Submit the following:

1. Shop drawings and product data for all equipment in this section.
2. 1/4" = 1'-0" scale layout of all equipment in Mechanical Room.

**1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

**1.7 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements. In addition, the following special guarantee applies:
1. Manufacturer shall guarantee all refrigeration equipment including parts and labor, for five (5) years from start-up.

**PART 2 – PRODUCTS**

**2.1 CONDENSING UNIT (Less than 10 Tons)**

A. General:

1. Provide air-cooled condensers in accordance with the performance schedule shown on the plans.
2. Install them as shown on the plans in accordance with:
  - The manufacturer's recommendations and
  - All applicable national and local codes.
3. UL (CSA) approved.
4. Leak, pressure and functionally tested at the factory to assure a trouble-free start-up after installation.
5. In current production with published literature available to check performance, limitations, specifications, power requirements, dimensions, operation and appearance.

B. Condenser Coils:

1. Shall be draw-thru, with manufacturer's standard wire guards.

2. Shall be constructed of copper tubes arranged in staggered rows and mechanically expanded into aluminum fins.

C. Condenser Fan Motors:

1. Shall be directly connected to the condenser fans.
2. Shall have permanently lubricated ball bearings.
3. Shall have inherent overload protection.
4. Motors shall be of the permanent split-capacitor type.
5. Condenser fans shall be arranged for vertical discharge of the condenser air, with manufacturer's standard wire guards.

D. The wiring for each unit shall include:

1. A 24-volt temperature control circuit.
2. High and low pressure circuits.
3. Condenser fan motor controls to assure stable operation of ambient temperatures down to 0 degrees F.
4. Condenser fan and compressor contactor.

E. The refrigerant piping for each system shall include:

1. A strainer-drier,
2. A moisture indicating sight glass, and
3. Service access valves.

The strainer-drier and sight glass may be shipped separately for field installation.

F. Manufacturer: Carrier, Lennox, McQuay, Trane, York.

1. Any listed equivalent manufacturer and the Mechanical Contractor shall be completely responsible to comply with all requirements on the contract documents. This shall include, but not be limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades.

**2.2 DUCTLESS SPLIT SYSTEM COOLING UNIT**

- A. Air conditioning system shall be a Samsung split system. The system shall consist of a compact wall-mounted packaged evaporator section and matching outdoor air-cooled condensing unit. The units shall be listed by and bear the ETL label. All wiring should be in accordance with the National Electrical Code (N.E.C.). The units shall be rated in accordance with ARI Standard 240 and bear the ARI label. A full charge of refrigerant for 100 feet of refrigerant tubing shall be provided in the condensing unit. A dry nitrogen holding charge shall be provided in the evaporator. System SEER shall meet or exceed 1992 Federal Standards.
- B. The indoor unit shall be factory assembled and wired. The casing shall have a white finish. The evaporator fan shall be an assembly with line flow fans direct driven by a single motor. The fan shall be statically and dynamically balanced and run on permanently lubricated bearings. An adjustable guide vane shall be provided with the ability to change the air flow from horizontal to vertical. A motorized air sweep flow louver shall provide an automatic change in air flow by directing the air from side to side for uniform air distribution. Return air shall be filtered by means of an easily removable washable filter. The evaporator coil shall be nonferrous construction with smooth plate fins bonded to copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phosphor copper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. The unit electrical power shall be 208 volts, 1 phase, 60 hertz.
- C. The control system shall consist of two (2) microprocessors interconnected by a single non-polar two-wire cable as supplied. Wiring shall run from indoor unit to controller direct. When running longer lengths or more than one set of remote controller wires together, a double insulated, two-wire cable equivalent to that provided; e.g., Belden 9407 cable, is mandatory or use shielded two-wire cable. One microprocessor shall be factory wired and located within the indoor unit. It shall have the capability of sensing return air temperature and indoor coil temperature; receive and process commands from the remote controller; provide emergency operation; and control the outdoor unit. The microprocessor within the wall-mounted remote controller shall provide automatic cooling; display setpoint and room temperature; a 24-hour on/off timer so that automatic operation can be set on the timer at one hour intervals from one to twenty-four hours; have self-diagnostic function display; check mode for memory of most recent problem; control system shall control continued operation of the air sweep louvers; and provide on/off and system/mode function switching. Normal operation of the remote controller provides individual system control in which one remote controller and the indoor unit shall be 12 volts, D.C. The control voltage between the indoor unit and the outdoor unit shall be 12 volts D.C. Both 12 VDC shall be generated from the indoor unit microprocessor board. The system shall be capable of automatic restart when power is restored after power interruption. System shall include twenty function self-diagnostics including total hours of compressor run time.
- D. The outdoor unit shall be completely factory assembled, piped and wired. The casing shall be fabricated of galvanized steel, bonderized and finished with baked enamel. The unit shall be furnished with one (1) direct drive, propeller type fan arranged for horizontal discharge. The motors shall have inherent protection, be of the permanently lubricated type and resiliently mounted for quiet operation. The fans shall be provided with a raised guard to prevent contact with moving parts. The compressor shall be of the high-performance rotary type with crankcase heater, accumulator and internal thermal overloads. The compressor shall be mounted so as to avoid the transmission of vibration. The refrigeration system shall be equipped with high pressure

switch and have the capability to operate with a maximum height difference of 130 feet and overall refrigerant tubing length of 130 feet between indoor and outdoor sections without the need for line size changes, traps or additional oil. Refrigerant flow from the condenser shall be controlled by means of a capillary tube. The condenser coil shall be of non-ferrous construction with smooth plate fins bonded to copper tubing. The coil shall be protected with smooth plate fins bonded to copper tubing. The coil shall be protected with an integral metal guard. The unit shall be controlled by the microprocessor located in the indoor matching unit. A built-in, low-ambient controller will allow cooling to 0 deg. F outdoor temperature. The unit electrical power shall be 208 volts, 1 phase, 60 hertz.

- E. Manufacturers: Airdale, Carrier, EMI, LG HVAC, McQuay, Mitsubishi Electric, Sanyo A.C. Products, Samsung.

### **PART 3 – EXECUTION**

#### **3.1 REFRIGERATION EQUIPMENT**

- A. All equipment to be installed in accordance with manufacturer's recommendations.

#### **3.2 DUCTLESS SPLIT SYSTEMS**

- A. Install packaged and split system units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements. Do not proceed with equipment start-up until wiring installation is acceptable.

END OF SECTION 23 04 50

**SECTION 23 06 00**

**AIR DISTRIBUTION & ACCESSORIES - HVAC**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.
- D. This Contractor shall coordinate with the work of Division 26 and the Fire Alarm System vendor for locations and mounting of all duct smoke detectors. These devices are shown on the Mechanical Drawings for reference only to show the intent of the work. All locations shall be determined based on approved shop drawings from the Fire Alarm System vendor and the Contractor for the work of Division 26, Electrical. Mount smoke detectors in the supply and return air stream at each unit in accordance with NFPA 72.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes labor, material, equipment and supervision to provide a complete air distribution system as specified herein and as shown on drawings.
  - 1. Ductwork – Single Wall, Square and Rectangular
  - 2. Ductwork - Single Wall, Spiral Round
  - 3. Flexible Air Duct
  - 4. Flexible Connections
  - 5. Dampers
  - 6. Air Diffusers, Registers and Grilles
  - 7. Prefabricated Roof Curbs and Equipment Supports
  - 8. Louvers
  - 9. Control Dampers and Actuators

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Requirements established within the portions of the Project Manual titled Division 1, General Requirements, are collectively applicable to the work of this section.
- C. IMC (International Mechanical Code).
- D. SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.)

- E. American Society of Heating, Refrigerating and Air Conditioning Engineers' recommendations in ASHRAE Guide shall apply to this work.
- F. ARI Standard 885 - Standard for Estimating Occupied Sound Levels in the Applications of Air Terminals and Air Outlets.
- G. UL (Underwriter's Laboratories, Inc.)
- H. NFPA 90A and 96 (Designer choice) shall apply to this work.
- I. State Fire Prevention Regulations.

#### **1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

#### **1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 230200.
- B. Submit the following:
  - 1. Shop drawings of all sheet metal. Indicate all steel, piping, conduit, and Architectural/Structural features to demonstrate complete coordination. Scale shall not be less than 1/4".
    - a. Shop drawings shall indicate the sizes and lengths of each section of ductwork as well as all system components such as dampers, diffusers and register locations. Also indicate the type of joints used and where internal acoustic lining or insulation, if required, will be utilized.
    - b. The location of the duct runs and the air outlets shall be closely coordinated with all other trades by the sheet metal contractor to avoid interference. The shop drawings shall show the contact surfaces adjacent to the ducts or air outlets and the space assigned for concealment. The drawings shall indicate principal items of equipment, adjacent piping and conduit, etc., the location of which shall be secured from the contractors of other trades.
    - c. Sheet Metal Contractor to include resubmissions of the shop drawings to the Engineer. The resubmissions are to include all corrections to previous submissions.
  - 2. Manufacturer's literature and performance data of all equipment and devices.
  - 3. Samples: Furnish color samples, etc., at request of the Architect.

#### **1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents.

This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, they shall be responsible for any and all additional costs associated with the changes required by other trades.

## **1.7 WARRANTY GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

## **PART 2 – PRODUCTS**

### **2.1 DUCTWORK (SINGLE WALL, SQUARE AND RECTANGULAR)**

- A. All ductwork shall be fabricated in accordance with SMACNA "HVAC Duct Construction Standards - Metal and Flexible" latest Edition except as described below. The minimum thickness of metal ductwork is 26 gauge. Fabrication requirements shall be based on ductwork subjected to positive or negative pressures of 2" W.G. Ductwork systems shall be sealed to SMACNA "Seal Class C" Standards. Alternatively, "Ductmate" System 45 can be used in accordance with manufacturer's specifications. Drive slip joints are not permitted.

Exception: For ductwork smaller than 12" x 8", Contractor may provide slip and drive joints with all joints sealed with Hardcast tape and mastic system.

- B. Rectangular ducts for 2" W.G. or less, positive or negative pressure shall be per SMACNA Table 1-5. Longitudinal seams shall be Pittsburgh Lock Type L-1 per SMACNA Figure 1-5. Transverse joints shall be standing seam type T -15 per Figure 1-4.
  - 1. In the event that material size is not compatible with duct size and segmenting must be utilized to fabricate duct, use SMACNA Figure 1-5, seam L-4 (Standing Seam).
- C. Joints:
  - 1. Per SMACNA Transverse Joint Reinforcement Table 1-12, only joints T -22, T -25a, T -25b and Proprietary slip on flanges will be acceptable.
  - 2. Joints T -25a and T -25b that have stress fractures from bending will not be accepted.
  - 3. All joints will have butyl gasket 3/16" thick by 5/8" wide installed per manufacturer's -- installation instructions.
- D. Ductwork systems for this standard shall be galvanized sheet steel, commercial quality of lock - forming grade, conforming to ASTM coating standards A-525 or A-527 with coating of designation G-60.

1. Where the outer surface of the duct is exposed in finished spaces and is not scheduled for insulation, duct material shall be galvanized, suitable for field painting by the General Contractor.
- E. The size and configuration of each duct shall be indicated on design drawings. Where thicker sheets or different types of materials are required, they shall be specified on the design drawings or in the project specifications.

## **2.2 DUCTWORK (SINGLE WALL, SPIRAL ROUND)**

- A. Design Pressure: 2"
- B. Leakage: All ductwork shall meet SMACNA Class "A" leak standards.
- C. Fabrication:
  1. Gauges, reinforcing angles, seams, joints, fabrication methods, installation methods and practices, duct reinforcement, fabricated dampers and devices installed in duct system, fittings, etc., shall conform to the latest editions of SMACNA standards for construction in accordance with requirements indicated in these specifications.
  2. Minimum metal gauges shall be 26 gauge (.019). Follow SMACNA Table 3-2A for Positive pressure and Table 3-2B for Negative pressure.
  3. Where the outer surface of the duct is exposed in finished spaces and is not scheduled for insulation, duct material shall be galvanized, suitable for field painting by the General Contractor.
- D. Joints:
  1. Duct up to 36" diameter - Male/Female beaded slip joint similar to SMACNA Figure 3-2, joint RT-1 or RT-5, as long as it meets the criteria for the system design pressure. Fittings shall be undersized to fit into spiral duct. All joints shall be secured with a minimum of 4 screws on each duct section (equally spaced). Seal joint with an approved sealant compound, continuously applied prior to assembly of joint and after fastening, making certain that the majority of the sealant resides on the interior of the joint.

## **2.3 FLEXIBLE AIR DUCT**

- A. Insulated flexible air duct shall be non-metallic. Air duct shall comply with the latest NFPA Bulletin No. 90A and be labeled as Class 0 or 1 Air Duct, U.L. Standard No. 181.
- B. Air ducts shall be suitable for working pressure of not less than plus 10.0 and minus 0.5 inches of W.G.
- C. Non-metallic air duct shall be two element spiral construction composed of a corrosion resisting metal supporting spiral and a vinyl coated fiberglass base fabric and shall be mechanically interlocked together.

- D. Insulation shall be fiberglass flexible blanket with vapor barrier outer jacket of polyethylene or reinforced mylar. Maximum thermal conductance of 0.23 Btu/Hr./SF/Inch at 75° F temperature.
- E. Approved manufacturers shall include the Wiremold Company, Flexmaster Ducting Inc., Owens-Corning, Thermaflex Flex Vent.

#### **2.4 FLEXIBLE CONNECTIONS**

- A. Required between ductwork and suction and discharge connection of all fans and air handlers.
- B. Material: Woven fiberglass with mounting hardware tested in accordance with UL Standard 181, listed and labeled as Class 0 or 1.
- C. Manufacturer: Ventfabrics, Inc., Durodyne, Dynair, Ductmate Pro Flex.

#### **2.5 DAMPERS**

- A. Provide where indicated and required to control flow of air and balance system.
- B. Round dampers shall be single blade, molded synthetic bearings at each end, 20 gauge galvanized steel, adjusting quadrant and locking device. Round dampers shall be Ruskin Model MDRS25.
- C. Rectangular and square dampers shall be opposed blade within 16 gauge galvanized steel channel frame with corner brace, 16 gauge galvanized steel blades; molded synthetic bearings and hex steel shafts, exposed or concealed linkage, adjustable quadrant and locking device. Dampers shall be Ruskin Model MD35.
- D. Approved Manufacturers: Ruskin, Arrow, Nailor-Hart, Pottorff, Lloyd Industries, Inc., Cesco Products, Louvers & Dampers.

#### **2.6 AIR DIFFUSERS, REGISTERS AND GRILLES**

- A. Air diffusing terminals shall be provided in duct runs on drawings. The diffusers shall properly and uniformly distribute the design air quantity with no objectionable drafts, while maintaining not more than 50 F. P. M. velocity in the occupied portion of the space.
- B. Ceiling Diffusers:
  - 1. Square Louvered Diffuser Face:
    - a. Square housing, welded steel construction core of square concentric louvers, removable at face of diffuser, round duct connection, with borders suitable for lay-in ceiling tile application.
    - b. Diffuser Patterns: Fixed louver face for 1, 2, 3, or 4 direction air flow, direction indicated on drawings. Each diffuser shall be provided with adjustable control grids.

- c. Finish: Matte white finish.
- d. Manufacturers: Price Model SMD

C. Registers & Grilles:

1. Ceiling Return Register(CR):

- a. Ceiling registers shall have a perforated face with 3/16-inch diameter holes on 1/4-inch staggered centers and no less than 51 percent free area. Perforated face shall be aluminum according to the model selected. The back pan shall be one piece stamped heavy gauge steel of the sizes and mounting types shown on the plans and outlet schedule.
- b. The finish shall be #26 white. The finish shall be a baked on anodic acrylic paint, with a pencil hardness of HB to H. Inside of back pan shall be painted flat black.
- c. Price Model: PDDR

2. Return and Exhaust Grilles (RG & EG):

- a. Grilles shall be available parallel to the long dimension of the grille. Construction shall be of steel with a 1¼ inch wide border on all sides. Screw holes shall be countersunk for a neat appearance. Corners shall be welded with full penetration resistance welds.
- b. Deflection blades shall be firmly held in place by mullions from behind the grille and fixed to the grille by welding in place. Blade deflection angle shall be available at 35°.
- c. The finish shall be #26 white. The finish shall be a baked on anodic acrylic paint, with a pencil hardness of HB to H.
- d. Price Model 535 (RG, EG)

D. Manufacturers: Provide diffusers, registers and grilles of one of the following:

Anemostat	Price
Carnes Co.	Titus
Metalaire	Tuttle & Bailey
Nailor Industries	

**2.7 PREFABRICATED ROOF CURBS AND EQUIPMENT SUPPORTS**

- A. Factory fabricated by the manufacturer of the respective roof-mounted equipment when available and capable of meeting the following requirements:
  - 1. Thermally and acoustically insulated, rubber isolating pads.

2. Built to suit slope of roof and type of roofing; i.e. standing metal seam with integral cant strip and flashing extension.
  3. 8" to 11" height unless otherwise indicated.
  4. Support rails shall be aluminum, or sheet steel, with continuous wood nailer and removable counterflashing.
- B. Curbs shall be a product of a custom manufacture in the following cases:
1. Curbs as specified are not available from the respective equipment manufacturer.
  2. Piping or ducts penetrating roof.
  3. Prefabricated equipment supports are required.
  4. Step flashing assembly, EPDM for normal use and silicone for pipe temperatures above 200°F stainless steel clamp. Suitable for single or multiple pipes.
- C. Pipe supports shall be a product of a custom manufacture equal to Pipe Prop as made by JMB Industries.
- D. Manufacturers: Pate, Shipman, Custom Curb, Portals Plus, Lloyd Industries, Inc.

## **2.8 LOUVERS**

- A. All wall louvers for intake and exhaust shall be stationary stormproof type.
- B. Construction shall be of extruded aluminum with 0.081 inch thick blades and frames and all fastening shall be aluminum or stainless steel.
- C. An aluminum expanded metal bird screen with frame shall be secured to the rear face of the louver assembly.
- D. Depth of the louver frame shall be 6" unless otherwise indicated.
- E. The surface areas shall be factory anodized finish of color selected by Architect.
- F. Manufacturers: Airstream Products Co., Air Balance, Inc., Carnes Co., Arrow Co., Empco, Pottorff, Cesco, Lloyd Industries, Inc., Ruskin, Louvers & Dampers.

## **2.9 CONTROL DAMPERS AND ACTUATORS**

- A. Provide all the controlled dampers of the type and sizes indicated on the drawings for installation by the sheet metal Sub-contractor.
- B. All 2-position control dampers shall be parallel blade and sized for minimum pressure drop, at the specified duct size.

- C. Damper frames shall not be less than 16 gauge galvanized steel, formed with corner braces for extra strength, with mounting holes for enclosed duct mounting.
- D. All damper blades shall be of not less than 16-gauge galvanized steel formed for strength and high velocity performance. Blades on all dampers must not be over 8" in width. Blades shall be secured to 1/2" diameter zinc plated axles by zinc plated bolts and nuts. All blade bearings shall be nylon or oilite. Blade side edges shall be sealed off against spring stainless steel seals. Teflon coated thrust bearings shall be provided at each end of every blade to minimize torque requirements and insure smooth operation. All blade leakage hardware shall be constructed of corrosion resistant, zinc plated steel and brass.
- E. Dampers shall be suitable for operation between -40 and 200 degrees. The control manufacturer shall submit leakage and flow characteristics plus a size schedule for all controlled dampers.
- F. All blade edges shall have inflatable seal edging that shall be rated for leakage less than 10 cubic feet per minute per square foot of damper area at a differential pressure of 4" of water when the damper is being held by a torque not to exceed 50 inert lbs. Leakage shall not exceed 1/2 of 1% of total flow.
- G. Provide permanent mark or scribe end of drive shaft to align damper with actuator in closed position.
- H. Manufacturers: Johnson, Penn, Ruskin.
- I. ACTUATORS: Belimo
  - 1. Electronic actuators shall be sized to operate their appropriate dampers with sufficient reserve power to provide smooth modulating action or two-position action as specified.
  - 2. Powered at 120 or 24 VAC.
  - 3. Provide integral, auxiliary switches for direct coupled actuators to indicate when a desired position is reached or to interface additional controls for a specific sequence.

### **PART 3 – EXECUTION**

#### **3.1 DUCTWORK**

- A. Dimensions on drawings are inside dimensions.
- B. Ducts shall be concealed unless otherwise indicated.
- C. Changes in direction shall be made with radius bends or turning vanes.
- D. Supports shall be galvanized steel for steel.

- E. Locate ceiling air diffusers, registers, and grilles on "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling modules.
- F. Do not install ductwork directly above any electrical equipment.
- G. Ductwork shall be supported per SMACNA Standards except as follows:
  - 1. Rivet or screw to side of duct when using flat strap hangers. Rivet or screw to bottom of duct when using trapeze hangers.
  - 2. Extend hangers down the side of the duct at least 9"; pass hangers under ducts less than 9" deep.
  - 3. Space hangers not more than 8' on centers for ducts up to 18" wide and 4' on centers for ducts over 18" wide.
  - 4. Wire hangers are not acceptable.
  - 5. Support ductwork from building structure with expansion bolts, rods, steel angles or channels installed to meet existing or new building conditions.
  - 6. Drilling into the roof deck is not permitted.
  - 7. Driving nails into anchors is not permitted.
- H. Air Flow Control:
  - 1. Major take-offs: Install volume control dampers.
  - 2. Branches: Install volume control dampers in all branches and at tap in branch take-off connections.
  - 3. Elbows: Use unvaned elbows with throat radius equal to width of duct and full heel radius; provide turning vanes where full throat and heel radius are not possible.
  - 4. Transitions: Make transitions in ducts as required by structural or architectural interferences.
    - a. Proportion airways to compensate for any obstructions within duct.
    - b. Avoid dead ends and abrupt angles.
    - c. Do not exceed 15 degrees slope on sides of transitions.

### **3.2 LOUVERS**

- A. Locate and place louver units level, plumb and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible.

- C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers.
- D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alternations and refinish entire unit or provide new units.
- E. Protect galvanized and non-ferrous metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry or dissimilar metals.

### **3.3 FLEXIBLE AIR DUCT**

- A. When flexible duct is used for final connection between duct mains on branches and diffusers on registers. The maximum length of flexible ductwork shall be 5'-0" in length.
- B. Flexible ductwork shall be properly hung at the tap collar in order to prevent eventual wear and damage to the flexible duct.
- C. The ceiling tile system should not be considered a support on which to lay flexible duct. Refer to SMACNA Standards for proper installation.

### **3.4 DUCT SYSTEM LEAK SEALING**

- A. Joints in duct systems at duct heaters, air monitors, fire dampers, sound traps, supply air terminals including air handling light fixtures, shall be sealed to prevent air leakage.
- B. All duct joints and seams in medium pressure and high pressure duct systems shall be sealed to SMACNA Seal Class "A" Standards to prevent air leakage.
- C. In the event there is in excess of 5% air leakage indicated in low pressure duct systems, it shall be the Contractors responsibility to seal the duct system. The amount of sealing necessary shall be that required to obtain the design air quantity at each terminal.
- D. Duct sealing shall be by means of high velocity duct sealants such as Hardcast and/or Neoprene gaskets. Type of sealant and method of application shall conform to recommendations in SMACNA high velocity duct construction standards.

### **3.5 DUCTWORK TESTING**

- A. The following ductwork shall be pressure leak tested:
  - 1. Supply ductwork
  - 2. Return ductwork
  - 3. Exhaust ductwork
  - 4. Outside air intake ductwork
- B. All tests shall be conducted in accordance with AABC National Standards.

- C. Ducts to be tested at 100% maximum of static pressure before any duct is insulated externally and concealed in accordance with SMACNA Standards.
- D. Calculate the allowable leakage using leakage factor of 5% of Design Air Flow.
- E. Select a limited section of duct for which the estimated leakage will not exceed capacity of the test apparatus.
- F. Connect the blower and flow meter to the duct section and provide temporary seals at all openings of the ductwork.
- G. Start the blower motor with the inlet damper closed. Increase pressure until the required level is reached.
- H. Read the flow meter and compare the leakage in cfm. Reading should be 5% or less of design flow for the duct segment being tested.
- I. If reading is more than 5% of design flow, depressurize duct, repair all leaks and retest until 5% or less of design flow is obtained.
- J. Complete test reports and obtain Owner's witness signature.
- K. Remove all temporary blanks and seals.
- L. Warning: Do not overpressure duct.

### **3.6 EQUIPMENT**

- A. Test apparatus shall consist of an airflow measuring device, flow producing unit, pressure indicating devices and accessories necessary to connect the metering system to the test specimen.
- B. The Contractor conducting tests shall arrange for or provide all temporary services, all test apparatus, all temporary seals and all qualified personnel necessary to conduct the specified testing.
- C. Test apparatus shall be accurate within plus or minus 7.5% at the indicated flow rate and test pressure and shall have calibration data or a certificate signifying manufacture of the meter in conformance with the ASME Requirements for Fluid Meters. Verification of above to be supplied to Owner upon request.
- D. Pressure differential sensing instruments shall be readable to 0.05" scale division for flow rates below 10 cfm or below 0.5" w.g. differential. For flows greater than 10 cfm scale divisions of 0.1" are appropriate. U-tube manometers should not be used for reading less than 1" of water.
- E. Liquid for manometers shall have a specific gravity of 1 (as water) unless the scale is calibrated to read in inches of water contingent on use of a liquid of another specific gravity, in which case the associated gauge fluid must be used.

- F. Instruments must be adjusted to zero reading before pressure is applied.

### **3.7 TEST REPORT**

- A. Log the project and system identification data.
- B. Enter the fan CFM, the test pressure, and the leakage class specified by the designer.
- C. Enter an identification for each duct segment to be tested.
- D. Calculate the allowable leakage factor. Enter this number on the report for each test segment.
- E. Conduct and record the field tests. If the sum of the CFM measured is less than or equal to the sum of the allowable leakage, the test is passed. Record the date(s), presence of witnesses and flow meter characteristics.
- F. Maintain a mechanical duct plan of all tested duct segments. Plan to include duct segment identification and dates tested.
- G. Test reports shall be submitted as required by the project documents.

END OF SECTION 23 06 00

**SECTION 23 06 05**

**FANS**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes labor, material, equipment and supervision to provide a complete air distribution system as specified herein and as shown on drawings.
  - 1. Recessed Ceiling Fan
  - 2. Vertical Discharge Exhaust Fan
  - 3. Booster Fan

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Requirements established within the portions of the Project Manual titled Division 1, General Requirements, are collectively applicable to the work of this section.
- C. IMC (International Mechanical Code)
- D. SMACNA (Sheet Metal and Air Conditioning Contractors National Association, Inc.)
- E. American Society of Heating, Refrigerating and Air Conditioning Engineers' recommendations in ASHRAE Guide shall apply to this work.
- F. UL (Underwriter's Laboratories, Inc.)
- G. NFPA 90A shall apply to this work.
- H. State Fire Prevention Regulations.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

**1.5 SUBMITTALS**

- A. Submit shop drawings and product data in accordance with Section 230200.
- B. Submit the following:
  - 1. Shop drawings of all sheet metal. Indicate all steel, piping, conduit, and Architectural/Structural features to demonstrate complete coordination. Scale shall not be less than 1/4" = 1'-0".
  - 2. Manufacturer's literature and performance data of all equipment and devices.

**1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents and as described within the specifications. This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, they shall be responsible for any and all additional costs associated with the changes required by other trades.

**1.7 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

**PART 2 – PRODUCTS**

**2.1 RECESSED CEILING FAN**

- A. Recessed ceiling fan shall consist of a rectangular steel cabinet enclosing a true centrifugal fan directly driven by an electric motor.
- B. Cabinet shall be complete with a finished plastic ceiling grille and discharge collar equipped with a backdraft damper, metal or plastic, gravity or spring return.
- C. Motor and fan shall be conveniently removable with plug-in power chord.
- D. The casing shall be sound attenuated, with minimum 1/2" thick acoustic lining.
- E. Provide electronic speed controller, wall cap, metal grille, isolator package.
- F. Unit shall be AMCA certified.
- G. Manufacturers: Loren-Cook, Penn Ventilator, Acme, Carnes, Greenheck, Breidert.

**2.2 VERTICAL DISCHARGE EXHAUST FANS**

- A. The exhaust fan shall be a vertical discharge, roof-mounted, power ventilator with heat, vapor and fume resistant features.
- B. The casing shall consist of base curb cap, ventilated motor compartment, and upper and lower exterior wind bands. The casing shall be of mill finish aluminum of spun construction.
- C. Fan wheel shall be centrifugal backward curved type constructed of aluminum. Back plate of fan wheel shall be finned to provide forced cooling of the motor compartment.
- D. An insulated heat shield shall separate the ventilated motor compartment from the air stream, and a shaft seal shall prevent seepage of heat and fumes from around the shaft into the motor compartment.
- E. The fan shaft shall be motor driven through a V-belt drive which shall be adjustable by varying the pitch diameter of the motor pulley. The drive shall be provided with a safety factor equal to 150% of the motor ampere nameplate rating. Provision shall be made for adjusting the V- belt tension.
- F. A disconnect safety switch shall be mounted under the removable motor dome. The fan motor shall have copper windings.
- G. The fan shall be provided with a bird guard constructed of stainless steel expanded metal.
- H. Provision shall be made in the unit design for ready access for cleaning and for serving all components and accessories. Provide hinged curb cap with stay brace to fit onto curb.
- I. The fan shall be provided with multi-leaf, interconnected, aluminum roll formed, motor actuated backdraft dampers. Damper rods shall rotate in nylon bearings. Dampers shall operate with no chatter or vibration. Factory wired, Single Phase.
- J. Special motors for high heat and explosion-proof shall be provided where indicated in the schedule.
- K. The exhaust fan unit shall be AMCA certified and shall be as manufactured by Penn Ventilator Company, Loren Cook, Acme, Greenheck, American Coolair/ILG, Breidert, Hartzell.

**2.3 BOOSTER FAN**

- A. Booster fan shall consist of a round, high impact plastic housing enclosing a backward inclined wheel directly driven by an external rotor motor.
- B. Motor and fan shall be totally enclosed, permanently sealed bearings, variable speed adjustable.
- C. The casing shall be maintenance free.
- D. Provide electronic speed controller as scheduled on the drawings.

- E. Unit shall be U.L. listed.
- F. Manufacturers: Tjernlund, Fan Tech.

**PART 3 – EXECUTION**

**3.1 FANS, EQUIPMENT AND ACCESSORIES**

- A. Install in accordance with manufacturer's details and instructions.
- B. Mount fan speed control at the fan to facilitate mechanical balancing. Power wiring shall be part of the work of Division 26.
- C. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.
- D. Install units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- E. Support: Install and secure roof curb structure, in accordance with National Roofing Contractor's Association (NRCA) installation recommendations and shop drawings. Install and secure units on curbs and coordinate roof penetrations and flashing.
- F. The Mechanical Contractor shall own as a part of his work, the following:  
  
Provide one (1) additional drive set, if necessary, to obtain final design balancing requirements. The Mechanical Contractor shall coordinate with Balancing Firm and equipment manufacturer for drive selection, including belts and pulleys.

END OF SECTION 23 06 05

**SECTION 23 07 20**

**INDOOR FUEL-FIRED HEATERS**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes work necessary and/or required and materials and equipment for construction of a complete system. Such work includes, but is not limited to the following:
  - 1. High Efficiency, Gas-Fired Furnace

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Media type air filters shall comply with U.L. Standard 900.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

**1.5 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 230200.
- B. Submit shop drawings and descriptive data for all equipment specified in this section.

**1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

**1.7 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

**PART 2 – PRODUCTS**

**2.1 HIGH EFFICIENCY, GAS-FIRED FURNACE**

- A. Provide high efficiency, gas-fired furnace in accordance with the schedule shown on drawings.
  - 1. Install each furnace as shown on the plans in accordance with:
    - The manufacturer's recommendations and
    - All applicable national and local codes.
  - 2. In current production with published literature available to check unit performance, limitations, specifications, power requirements, dimensions, operation and appearance.
  - 3. Completely assembled for one-piece shipping and rigging.
  - 4. Insulated with aluminum-faced fiberglass for thermal and acoustical properties.
  - 5. A.G.A. tested and listed for its intended application and certified to FTC for both capacity and efficiency, in accordance with DOE test procedures. AFUE shall be 95.5.
- B. Casing:
  - 1. External panels of steel with a baked enamel finish, embossed for added strength.
  - 2. Lift-lock front panels which are easily removable, for maintenance, service and adjustment of all internal controls and components.
  - 3. A heat exchanger which shall be of continuous seam welded multi- section design with individually removable sections.
  - 4. Burners constructed of formed steel tube with multiple ports and connected by a lanced port carryover tube.
  - 5. A blower which shall be dynamically and statically balanced.
- C. Motor:
  - 1. All direct-drive motors must have three or more speed taps and have inherent internal overload protection.
  - 2. A standard cleanable filter for either bottom or side return application.
  - 3. Adjustable fan/limit control.
  - 4. Auxiliary limit control on counterflow and horizontal models.
  - 5. Provide control transformer as required.

6. Blower door interlock switch.
  7. Standard air conditioning blower relay.
- D. Spark Ignition:
1. Solid state ignition control for intermittent proven pilot operation.
  2. Matching redundant gas valve.
  3. Igniter and sensing functions provided through the same lead wire.
  4. Automatic spark ignition pilot.
- E. Provide programmable seven-day heating/cooling thermostat with automatic changeover. Provide remote sensors to accommodate zone averaging control.
- F. Provide concentric roof termination kit. Terminate in accordance with IFGC and all local code requirements.
- G. Manufacturers: Carrier, Lennox, York/Johnson Controls.

### **PART 3 – EXECUTION**

#### **3.1 INSPECTION**

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### **3.2 INSTALLATION OF HEATERS**

- A. Install heaters and in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- C. Hang units from building substrate. Mount as high as possible to maintain greatest headroom possible, unless otherwise indicated.
- D. Support units with rod-type hangers anchored to building substrate.
- E. Protect units with protective covers during balance of construction.
- F. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.

END OF SECTION 23 07 20

**SECTION 23 07 22**

**GAS-FIRED INFRARED HEATERS**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes work necessary and/or required and materials and equipment for construction of a complete system. Such work includes, but is not limited to the following:
  - 1. Gas-Fired Infrared Heaters

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

**1.5 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 230200.
- B. Submit shop drawings and descriptive data for all equipment specified in this section.
- C. Coordination Drawings: Plans, elevations and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved.
  - 1. Illustrations showing how equipment will be attached.
  - 2. Items penetrating roof.
  - 3. Vent and gas piping connections.

**1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall

include, but not limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

### **1.7 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

## **PART 2 – PRODUCTS**

### **2.1 GAS-FIRED INFRARED HEATER**

- A. Heater:

1. Two-stage infrared heaters shall be Re-Verber-Ray HL Series as manufactured by Detroit Radiant Products, Co-Ray-Vac, or Schwank, Weather-Rite.
2. Two-stage infrared tube heaters shall be design certified by the American Gas Association (AGA) and comply with current Occupational Safety and Health Act (OSHA) requirements.
3. The supplier shall provide a manufacturer's published warranty covering the heater's stainless steel burner assembly for a period of 10 years, combustion and radiant emitter tube assembly for a period of five (5) years and components utilized in the heater control assembly for a period of one (1) year.

- B. Two-Stage Infrared Tube Heater Burner Controls:

1. The two-stage infrared tube heater must be AGA design certified to operate at an input differential of 30% between the low-fire and high fire modes.
2. Heater shall be equipped with a direct silicone carbide ignition system. Power supplied to each burner shall be 120 vac, 60 hz, 1 phase.
3. Heater controls shall include two (2) safety differential pressure switches.
4. Heater control assembly shall include staging indicator lights that define the unit's operating input ranges.
5. Burners shall operate under a negative pressure with gauges pulled through the exchanger pipe to a common exhaust pump. Each burner shall receive its combustion air independently.
6. The thermostats shall be two-stage operating on 24 volts.
  - a. Digital programmable wall mounting type.
  - b. Control transformer shall be internally mounted.

- C. Two Stage Infrared Tube Heater Construction:
  - 1. Heater's control housing shall be totally enclosed with an enameled steel exterior.
  - 2. Heater's combustion chamber shall be 4 OD, 16 gauge Titanium alloy aluminum steel finished with a high emissivity rated, corrosion resistant, black coating.
  - 3. The condensate tail pipe shall be 4 inches, OD, 16 gauge 304 stainless steel.
  - 4. The heater's combustion chamber and radiant emitter tube shall incorporate a 4 slip fit connection held by a bolted clamp.
  - 5. The silicone carbide igniter shall be readily accessible and serviceable without the use of tools.
  - 6. Reflectors shall be of .025 polished aluminum with reflector end caps. Reflectors shall be rotatable from 0 to 45° when required. The reflector hanger system shall be designed to permit expansion while minimizing noise and rattles.
  - 7. The heaters shall utilize a downstream turbulator baffle for thermal efficiency.
  - 8. Heaters shall be equipped with a sight glass allowing a visual inspection of igniter and burner operation from the floor.
  - 9. The two-stage infrared tube heaters shall be designed such that outside combustion air may be supplied. An air intake collar shall be supplied.
- D. Gas Connections: Heater shall be supplied with stainless steel flexible gas connectors.
- E. Venting shall be per manufacturer's specifications.

### **PART 3 – EXECUTION**

#### **3.1 INSPECTION**

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### **3.2 INSTALLATION OF HEATERS**

- A. Install heaters in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- C. Hang units from building substrate. Mount as high as possible to maintain greatest headroom possible, unless otherwise indicated.

- D. Support units with rod-type hangers anchored to building substrate.
- E. Protect units with protective covers during balance of construction.
- F. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.

END OF SECTION 23 07 22

**SECTION 23 07 25**

**TERMINAL HEATING UNITS**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes work necessary and/or required and materials and equipment for construction of a complete system. Such work includes, but is not limited to the following:
  - 1. Electric Cabinet Heaters
  - 2. Electric Unit Heaters
  - 3. Electric Wall Heaters

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

**1.5 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 230200.
- B. Submit shop drawings and descriptive data for all equipment specified in this section.

**1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

**1.7 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

**PART 2 – PRODUCTS****2.1 ELECTRIC CABINET HEATERS**

- A. Provide cabinet heaters including chassis, heating elements, fan and motor designed for either recessed mounting within 2'x2' ceiling grid, or within wall construction.
- B. Chassis: Galvanized steel wraparound structural frame with edges flanged.
- C. Power disconnect switch, 30 AMPs, 600 volts, 3 phase.
- D. Cabinet: Horizontal recessed model, heavy gauge, four sided overlap front panel with stamped steel louver air openings. Clean cabinet parts, phosphatize and coat with baked-on enamel finish. Color: white.
- E. Coils: Steel fins, copper brazed, for a permanent bond to low watt density, steel sheathed tubular heating elements.
- F. Grilles: Intake and outlet grilles shall be integral, stamped 15 deg. Deflection in ceiling trim ring.
- G. Fans: Provide direct drive, five bladed aluminum.
- H. Motors: Provide single speed impedance protected, totally enclosed motor with integral overload protection and motor cords to junction box in unit.
- I. Provide built-in fan delay control and automatic thermal cutout. Provide wall-mounted, line voltage thermostat, single stage.
- J. Manufacturers: Q-Mark, Berko, Markel, Indeeco, Electromode.

**2.2 ELECTRIC UNIT HEATERS**

- A. Horizontal Unit: Construct casing of steel, phosphatized inside and out, and finished with baked enamel. Provide motor-mounted panel, minimum of 18 gauge steel. Fabricate casing to enclose heater, louvers and fan blades. Provide individually adjustable louvers for air diffusion.
- B. Construct fans of aluminum and factory balance.
- C. Metal sheath fin tube electric heating element.
- D. Provide totally enclosed motors, with built-in overload protection, having electrical characteristics as scheduled.

- E. Provide integral residual heat sensor to continue fan operation until element temperature fall below preset point. Provide line voltage thermostat, single stage.
- F. Manufacturers: American Air Filter, Electromode, Trane, Berko, Indeeco, Markel, Q-Mark.

### **2.3 ELECTRIC WALL HEATERS**

- A. Construct casing of steel, phosphatized inside and out, and finished with baked enamel. Provide motor-mounted panel, minimum of 18 gauge steel, fabricate casing to enclose heater, and fan. Front panel shall be tamperproof style with stamped louver grille. Suitable for recessed or surface mounting.
- B. Construct fans of aluminum and factory balance.
- C. Metal sheath fin tube electric heating element.
- D. Provide totally enclosed motors, with built-in overload protection, having electrical characteristics as scheduled.
- E. Provide integral residual heat sensor to continue fan operation until element temperature falls below preset point. Provide unit-mounted thermostat and disconnect.
- F. Manufacturers: Q-Mark, Berko, Markel, Indeeco, Electromode.

## **PART 3 – EXECUTION**

### **3.1 INSPECTION**

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### **3.2 INSTALLATION OF UNIT HEATERS**

- A. Install heaters in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- C. Hang unit from building substrate.
- D. Protect units with protective covers during balance of construction.

### **3.3 INSTALLATION OF ELECTRIC HEATERS**

- A. Install heaters in accordance with manufacturer's installation instructions.
- B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.

- C. Hang unit from building substrate.
- D. Protect units with protective covers during balance of construction.
- E. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.

END OF SECTION 23 07 25

**SECTION 23 07 30**

**TERMINAL HEATING AND COOLING EQUIPMENT**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the contract, including the conditions of the contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the work specified in this section.
- B. Refer to Section 230200 for HVAC General Provisions
- C. Refer to Section 230210 for HVAC Basic Materials & Methods.

**1.2 DESCRIPTION OF WORK**

- A. This Section includes work necessary and/or required and materials and equipment for construction of a complete system. Such work includes, but is not limited to the following:
  - 1. Evaporator Coils

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 230200 for a general description of requirements applying to this section.
- B. Media type air filters shall comply with U.L. Standard 900.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 230210 for a general description of requirements applying to this Section.

**1.5 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 230200.
- B. Submit shop drawings and descriptive data for all equipment specified in this section.

**1.6 SUBSTITUTIONS**

- A. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but not limited to, space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items provided by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, this Contractor shall be responsible for any and all additional costs associated with the changes required by other trades.

### **1.7 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, General Requirements.

## **PART 2 – PRODUCTS**

### **2.1 EVAPORATOR COILS**

- A. Casing: enclosure shall be 22-gauge steel with baked enamel finish.
- B. Coil:
  - 1. Evaporator coils shall be constructed of 3/8" OD copper tubes, mechanically expanded into aluminum fins.
  - 2. Condensate drain pan shall be constructed of galvanized steel.
- C. Refrigerant Piping:
  - 1. A factory piped capillary or thermal expansion valve shall control refrigerant flow.
  - 2. Suction and liquid refrigerant connections shall be equipped with brazed copper sweat connections.
  - 3. Coil shall be leak tested, dehydrated and shipped with a refrigerant holding charge.
- D. Warranty/Service: Manufacturers shall furnish each unit with the following warranty/service:  
One year full parts warranty.
- E. Manufacturer: Carrier, Lennox, York/Johnson Controls.

## **PART 3 – EXECUTION**

### **3.1 INSPECTION**

- A. Examine areas and conditions under which equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Install in accordance with manufacturer's recommendations. Unit and all component sections shall be properly supported and vibration isolated.

### **3.2 INSTALLATION**

- A. Verify that coils and other components are matched with the proper unit.

- B. Assemble unit components following manufacturer's instructions for handling, testing and operating. Repair damaged galvanized areas, and paint in accordance with manufacturer's written recommendations.
- C. Vacuum clean interior of units prior to operation.
- D. Repair air leaks from or into casing that can be heard or felt during normal operation.
- E. Perform field mechanical balancing in accordance with Section 230950: TESTING AND BALANCING OF MECHANICAL SYSTEMS.

END OF SECTION 23 07 30

**SECTION 23 09 50**

**TESTING & BALANCING OF MECHANICAL SYSTEMS**

**PART 1 – GENERAL**

**1.1 JOB CONDITIONS**

- A. Systems shall be completely installed and in continuous operation as required to accomplish the tests.
- B. Heating, ventilating and air conditioning equipment shall be completely installed and in continuous operation as required to accomplish the balance work specified.
- C. Adjust and balance shall be performed when outside conditions approximate design conditions indicated for heating and cooling functions.
- D. Make at least two inspections of the mechanical systems during construction to verify that balancing procedures may be accomplished. Report findings to the Architect/Engineer
- E. Balancing firm shall balance Mechanical System two (2) times. The first time shall be considered a rough balance. Any discrepancy in air flow shall be addressed to the Architect/Engineer. The final balancing will be accomplished after review of rough balance reports.
- F. The final balancing reports shall be submitted and approved prior to project's being considered complete; i.e., commencement of warranties.

**1.2 ENGINEER QUALIFICATIONS**

- A. The firm shall be an independent organization having no affiliation with construction contractors, equipment sales or design engineering.
- B. The firm shall specialize in balancing heating, ventilating and air conditioning systems.
- C. The firm shall show proof of having balanced and tested at least five projects of similar size and scope.
- D. All field work shall be under the direct supervision of a registered Professional Engineer who is a full-time employee of the balancing firm.
- E. The firm shall be certified by and a member of the AABC (Associated Air Balance Council) or NEBB (National Environmental Balancing Bureau).

**1.3 REPORT**

- A. Data Sheets:
  - 1. Submit data sheets on each item of testing equipment required.

2. Include name of device, manufacturer's name, model number, latest date of calibration and correction factors.
- B. Report Forms:
1. Submit specimen copies of report forms.
  2. Forms shall be 8-1/2 x 11 inch paper for loose-leaf binding, with blanks for listing of the required test ratings and for certification of report.
  3. Reports shall be on standard forms published by AABC or NEBB.

## **PART 2 – PRODUCTS**

### **2.1 AIR BALANCE INSTRUMENTS**

- A. Alnor Velometer with probes and alnor pitot tube.
- B. Rotating Vane Anemometer: 4 inch size.
- C. ASHRAE Standard Pitot Tubes, stainless steel 5/16 inch outside diameter, lengths 18 inches and 36 inches.
- D. Magnehelic Differential Air Pressure Gauges, 0 to 0.5 inches, 0 to 1.0 inch and 0 to 5.0 inches water pressure ranges, each arranged as a portable unit for use with a standard Pitot tube.
- E. Combination Inclined-Vertical Portable Manometer, range 0 to 5.0 inches water.

### **2.2 SYSTEM PERFORMANCE MEASURING INSTRUMENTS**

- A. Insertion Thermometers, with graduation at 0.5 degrees F for air and 0.1 degrees F for water.
- B. Sling Psychrometer.

## **PART 3 – EXECUTION**

### **3.1 GENERAL REQUIREMENTS**

- A. Arrange and pay for all tests.
- B. Notify Architect/Engineer at least three working days in advance of test and conduct in presence of Architect/Engineer.
- C. Tests to be performed prior to insulation, covering or concealment.
- D. Provide signed report of completion of test with signature of witnesses. Report shall indicate:

1. System Tested
  2. Date
  3. Specified test requirements and actual testing results
- E. The balancing firm shall report to and review the work required with the Architect/Engineer before beginning field balance work. The balancing firm shall make at least two inspections of the air systems during construction and shall report his findings in writing to the Architect/Engineer.
- F. The balancing firm shall cooperate with the Architect/Engineer and the Mechanical Contractor to effect smooth coordination of the balancing work with the job schedule.
- G. The balancing firm shall be responsible for getting the various systems into proper operation. They shall enlist the aid of the equipment suppliers and Mechanical Contractor as may be required to effect proper operation consistent with the contract plans and specifications.
- H. When the balancing firm cannot balance a belt-driven piece of equipment with the supplied belts and sheaves, inform the Mechanical Contractor that the Mechanical Contractor shall provide additional sheaves as spelled out in other Division 23 Sections.

### **3.2 DUCTWORK TESTING**

- A. Witness testing conducted by the Mechanical Contractor per Section 15600, PART 3: EXECUTION.

### **3.3 BALANCING PROCEDURE**

- A. Air System Balance:

1. With the fan supply system set to handle normal minimum outdoor air, the balancing firm shall perform the following tests and compile the following information:

#### Air Handling Equipment

- a. Design Conditions:

- (1) CFM Supply Air
- (2) Static Pressure
- (3) CFM Fresh Air
- (4) Fan RPM

- b. Installed Equipment:

- (1) Manufacturer
- (2) Size/Model Number
- (3) Motor HP, Voltage, Phase, Full Load Amperes

## c. Field Test:

- (1) Fan Speed
- (2) No Load Operating Amperes
- (3) Fan Motor Operating Amperes
- (4) Calculated BHP

## d. Test for Total Air:

- (1) Size of discharge, return air and outside air ducts.
- (2) Number and locations of Velocity Readings taken.
- (3) Duct Average Velocity
- (4) Total CFM
- (5) Outside Air CFM
- (6) Return Air CFM

## e. Individual Outlets (Diffusers, Registers and/or Grilles):

- (1) Identify each outlet or inlet as to location and area and fan system
- (2) Outlet, manufacture and type
- (3) Outlet size
- (4) Outlet free area, core area, or neck area
- (5) Required FPM and test velocity found for each outlet.
- (6) Required CFM and test results for each outlet

2. Testing and adjusting of individual outlets shall be performed under procedures recommended by the manufacturers of the outlets. All outlets shall be set for air pattern required and all main supply air and return air dampers to be adjusted and set for design CFM indicated. Any required changes in air patterns, settings, etc., necessary for achieving correct air balance, shall be provided by this Contractor. Total CFM of all outlets shall agree with total CFM of all branches and the grand total shall agree with the air volume for the fan(s).

- D. In addition to the above work, the Balancing Firm shall check the operation of all automatic temperature control equipment; verify all thermostat, aquastat, etc., set-points and operations; and enlist the aid of the Mechanical Contractor and the Control Subcontractor to make necessary adjustments where required.

END OF SECTION 23 09 50

**SECTION 26 00 00**

**GENERAL PROVISIONS – ELECTRICAL**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the work of this Section.
- B. The specification or drawing and the design features or resulting construction disclosed, are the property of Furlow Associates, Inc., and shall not be reproduced without written permission.

**1.2 DESCRIPTION OF WORK**

- A. Provide all materials, equipment, labor, services and all appurtenances required to completely install and satisfactorily operate the various systems. The items listed below are for general guidance only and do not necessarily include the entire requirements for the project.
  - 1. Coordination with other trades
  - 2. Electrical service
  - 3. Interior feeders
  - 4. Lighting and power panels
  - 5. Lighting branch wiring
  - 6. Power wiring
  - 7. Lighting fixtures and lamps
  - 8. Wiring devices
  - 9. Connections for electrically operated equipment
  - 10. Fire alarm and detection system
  - 11. Telephone/Data raceway system
  - 12. Related work as herein described or otherwise defined under the heading "Related Work".
- B. Wherever the term "provide" is used, it shall be understood to mean both "furnish" and "install".

**1.3 RELATED WORK**

- A. Equipment specified in sections of Divisions 1 thru 23 that require electric power supply.
- B. Work related to this trade as defined on the following contract drawings:
  - Architectural/Structural
  - HVAC
  - Plumbing

**1.4 SITE CONDITIONS**

- A. Attention of all bidders is called to the necessity for a careful inspection of the site, its present condition and encumbrances, the extent of the work, the protection to be afforded to adjacent

properties or structure, availability of utilities, the extent and nature of the material required to be excavated and the amount of fill and removal. He shall also determine local or site limitations which will affect construction.

### **1.5 PERMITS, INSPECTIONS AND ORDINANCES**

- A. All work shall be executed and inspected in accordance with local and state ordinances, rules and regulations and the requirements of public utilities having jurisdiction. The contractor shall secure and pay for all permits, inspections and connections required.
- B. The Electrical Contractor shall furnish a certificate of inspection to the Owner at the time of completion.
- C. Requirements of the following organization shall be considered minimum:
  - 1. National Electrical Code
  - 2. National Electrical Safety Code
  - 3. OSHA
  - 4. Local City and County Codes
- D. Reference to technical societies, trade organizations and governmental agencies are in accordance with the following:
  - 1. ANSI - American National Standards Institute
  - 2. ASTM - American Society for Testing Materials
  - 3. IEEE - Institute of Electrical and Electronics Engineers, Inc.
  - 4. NEC - National Electrical Code
  - 5. NEMA - National Electrical Manufacturer's Association
  - 6. NFPA - National Fire Protection Association
  - 7. MSS - Manufacturer's Standardization Society
  - 8. IES - Illuminating Engineers Society
  - 9. ETL - Engineering Testing Laboratories
  - 10. EIA - Electronic Industries Association
  - 11. OSHA - Occupational Safety and Health Administration
  - 12. Federal Specifications
  - 13. UL - Underwriters Laboratories, Inc.

### **1.6 QUALITY ASSURANCE**

- A. Provide adequate supervision of labor force to assure that all aspects of the contract documents are fulfilled.
- B. Contractor to provide manufacturer's written certification that the following equipment has been installed and will operate correctly and in accordance with the manufacturer's warranty requirements.

Fire Alarm and Detection System

C. Testing:

1. After completion of the work, the entire wiring system shall test entirely free from grounds, short circuits, opens, overloads and improper voltage.
2. The grounding system shall be tested for a resistance of 25 ohms or less.
3. Perform testing as follows: Arrange and pay for all tests, provide all equipment, materials and labor to perform test. Notify Engineer and Owner three (3) working days before tests are to be made. Conduct tests in the presence of the Engineer or authorized representative. Repeat tests after defects are corrected.

- D. Special Engineering Services: In the instance of complex specialized electrical power and signaling systems, and other similar systems, the installation and final connections of these systems shall be made by and/or under the supervision of a competent installation and service engineer who shall be a representative of the respective equipment manufacturer. Any and all expenses of these installation and service engineers shall be borne by this Contractor.

**1.7 COORDINATION**

- A. As a requirement of this project, the Electrical Contractor shall furnish coordination for his equipment and layouts with other subcontractors furnishing equipment and services for Divisions 1 thru 23. Any and all contractors who install their equipment or furnish services prior to coordination, any contractor who changes their equipment or services after coordination has occurred, without notifying associated subcontractors, shall be held responsible for making all required changes with no additional cost to the Owner. Or delay in construction time. This coordination will include conduit layout to allow access to equipment for maintenance.
- B. The Mechanical, Plumbing and Electrical Contractors are responsible to coordinate all manufacturer's recommended circuit breakers, starters, disconnects and fuse sizes for all equipment. Submission of a shop drawing will certify that this has been completed.
- C. The drawings and specifications reflect the type, number and size of services required for the equipment the design is based upon. Should the supplying subcontractor elect to furnish an alternate piece of equipment requiring difference services and/or space conditions, he shall inform the subcontractor furnishing those services and be held responsible to pay for all required changes as part of this contract.

**1.8 SUBMITTALS**

- A. Shop Drawings:
1. Shop drawings shall be submitted in accordance with Division 1 of these specifications except where herein modified.

**NOTE: Submittals will only be reviewed once and resubmittals will be reviewed once. Any other submittals will be billed to the Contractor at the Engineer's standard rates.**

2. Shop drawings comprising complete catalog cuts, performance test data for electrical equipment as required by other sections of Division 26 shall be submitted for review checking. The Contractor shall review these shop drawings for conformance to contract documents prior to submission and affix contractor's signature to each submittal certifying that this review has been done. By approving and submitting shop drawings, product data, wiring diagrams and similar materials, the Electrical Contractor represents that he and/or his subcontractor has determined and verified materials, field measurements and field construction data that relates to the work, and has checked and coordinated this information with all of the Divisions 1 thru 23 subcontractors.
3. All shop drawing submittals shall have the following identification data, as applicable, contained therein or permanently adhered thereto:
  - a. Project name
  - b. Project number
  - c. Sub-Contractor's, Vendor's and/or manufacturer's name and address.
  - d. Product identification.
  - e. Identification of deviation from the contract documents.
  - f. Applicable contract drawings and specification section number.
  - g. Shop drawing title, drawing number, revision number, and date of drawing and revision.
  - h. Resubmit revised or additional shop drawings as requested.
  - i. Wherever shop drawings or vendor's standard data sheets indicate work to be done "by others", it shall be the responsibility of the Contractor making the submission to identify by name, the Contractor who is to do this work. If the Contractor named is other than the Contractor making the submission, the shop drawing submission must be reviewed by the named Contractor and bear his mark of approval, prior to submission to the Architect/Engineer.
  - j. Where equipment proposed differs from that shown on the drawings or specified, he shall submit for approval drawings showing the manner in which the layout is affected by the substitution.
  - k. The Contractor shall keep one copy of approved shop drawings at the job site, filed in a suitable metal container. The shop drawings shall be cataloged and kept in good repair, and shall be available for use by the Owner, Architect and Engineer.
  - l. No equipment shall be ordered, fabricated, etc., before approval of shop drawings.

**1.9 SUBSTITUTIONS**

- A. Whenever a material, article, piece of equipment or system is identified in the following specification or indicated on the drawings by reference to manufacturers' or vendors' names, trade names, catalog numbers or the like, it is so identified for the purpose of establishing the basis of the Bid.
- B. Substitution approval must be obtained and included as an addendum item prior to the submission of the bid. An approved substitution shall not be considered as an approval for the contractor or an equipment vendor to deviate from the written portion of the specifications unless so stated in the addendum.
- C. The drawings illustrate the space allocated for equipment and the Contractor shall install the equipment accordingly. If changes are required in the building or arrangement due to substitution of equipment, the Contractor making the substitution must pay for the necessary modifications.
- D. The listed equivalent or substituted manufacturers along with the bidding related contractor shall be completely responsible to comply with all requirements on all contract documents. This shall include, but shall not be limited to space requirements, code clearances, the type, horsepower, capacities, number and size of services required from other trades, including all required ancillary items furnished and installed by other trades. If the manufacturer or related bidding contractor does not comply with these requirements, then they shall be responsible for any and all additional costs associated with the changes required by other trades.

**1.10 LUBRICATION**

- A. Furnish, install and maintain all required lubrication of any equipment operated prior to acceptance by the Owner. Lubrication shall be as recommended by the equipment manufacturer.
- B. Provide one year's supply of lubricants to Owner at date of acceptance.
- C. Verify that required lubrication has taken place prior to any equipment start-up.

**1.11 ADJUSTMENT & CLEANING**

- A. Adjust and clean equipment to be placed in proper operation condition.

**1.12 EQUIPMENT START-UP**

- A. Verify proper installation by manufacturer or his representative.
- B. Advise General Contractor 2 days prior to actual start-up.
- C. Verify proper operation. Obtain signed statement by manufacturer or his representative that equipment is operating within warranty requirements. Submit statement to General Contractor.

**1.13 OPERATION AND MAINTENANCE INSTRUCTIONS**

- A. Properly and fully instruct Owner's personnel in the operation and maintenance of all systems and equipment.
- B. Insure that the Owner's personnel are familiar with all operations to carry on required activities.
- C. Such instruction shall be for each item of equipment and each system as a whole.
- D. Provide report that instruction has taken place. Include in the report the equipment and/or systems instructed, date, contractor, Owner's personnel, vendor, and that a complete operating and maintenance manual has been reviewed.
- E. Manual shall include all instructions on operation, maintenance, repair parts list, lubrication requirements, brochures, catalogue cuts, wiring diagrams, piping diagrams, control sequences, service requirements, names and addresses of vendors, suppliers and emergency contacts. Three manuals shall be provided.
- F. Submit manuals for review prior to operating instruction period. Manuals shall be 8-1/2 x 11" with hard cover, suitably bound.
- G. Video Documentation: Furnish three (3) copies of a professionally taped video and three (3) copies of professionally prepared drawings demonstrating the following:
  - Security System
  - Fire Alarm System
  - Integrated Access Control

**1.14 TOOLS**

- A. All equipment furnished by the Contractor which requires special tools or devices other than those normally available to the maintenance or operating staff shall be furnished in duplicate to the Owner, sufficiently marked, packed or boxed for staff usage. The tools provided shall be listed by the Contractor identified as to their use or the equipment applicable in a written transmittal to the Owner.

**1.15 CLEANING AND FINISHING**

- A. After equipment start-up and all operating tests have been made and the system pronounced satisfactory, each respective Contractor shall go over the entire project, clean all equipment, etc., installed by him and leave in a clean and working condition. Any surfaces found marred after this final cleaning shall be refinished or replaced by each Contractor at no cost to the Owner.

**1.16 OPERATING AND MAINTENANCE MANUALS**

- A. Three complete sets of instructions containing the manufacturer's operating and maintenance instructions for each piece of equipment shall be furnished to the Architect. Each set shall be furnished before the contract is completed. The following identification shall be inscribed on the covers: the words "OPERATING AND MAINTENANCE INSTRUCTIONS", the name and

location of the building, the name of the Contractor and the name of the Architect and Engineer. Flysheet shall be placed before instructions covering each subject. The instruction sheets shall be approximately 8-1/2 by 11 inches, with large sheets of drawings folded in. The instructions shall include, but shall not be limited to, the following:

Approved wiring and control diagrams, with data to explain the detailed operation and control of each component.

A control sequence describing start-up, operation and shutdown.

Operating and maintenance instructions for each piece of equipment, including lubrication instructions.

Manufacturer's bulletins, cuts and descriptive data.

Parts lists and recommended spare parts.

#### **1.17 SERVICE INTERRUPTION**

- A. All service interruptions to the electric or related systems, whether during regular working hours or at any other time, must be coordinated with the Owner. All such interruptions shall be so scheduled and planned as to require a minimum of time and shall occur only during a mutually satisfactory period.

#### **1.18 INTERPRETATION OF SYSTEMS**

- A. The interpretation of the Architect will be final in the event there is a lack of understanding of the full scope or requirements of the systems under this contract.

#### **1.19 LAYOUTS**

- A. On small scale drawings, i.e., 1/8" - 1'-0", the approximate location of the electrical branch circuit items such as receptacle, telephone, grounding and equipment outlets are shown to indicate their existence. The exact location of these items and their related raceways are governed by structural conditions, coordination with the work of other trades and the Architect's final decision. By accepting a contract, the Contractor agrees to install the work in accordance with the above statement and within the contract price.

### **PART 2 – PRODUCTS**

#### **2.1 MATERIAL**

- A. All material shall be new and of good quality. Material shall conform to all accepted trade standards, codes, ordinances, regulations, or requirements governing same, and shall be approved before being installed.
- B. The Architect reserves the right to require the Contractors to submit samples of any or all articles or materials to be used on the project.

- C. Where any device or equipment is herein referred to in the singular number, such as "the panel", this reference shall be deemed to apply to as many such devices or equipment as are required to complete the installation as shown on the drawings or specified.
- D. All materials and equipment used in the work shall comply with the standards of recognized authorities such as UL, NEMA, IEEE, ETL, IES and EIA in every instance where such standards have been established for the particular type of materials to be installed.
- E. All similar pieces of equipment or materials of the same type or classification used for the same purpose shall be of the same manufacturer.
- F. All manufactured equipment shall have factory applied finishes.

## **2.2 WARRANTY**

- A. Wherever in the specification sections of this division, reference is made to a specific warranty period, this warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the contract documents.

## **PART 3 – EXECUTION**

### **3.1 INSPECTION**

- A. Prior to performing the work, examine areas and conditions; check and verify all dimensions, under which the work is to be installed and notify the Architect in writing of conditions and dimensions detrimental to the proper and timely completion of the work. Do not proceed until authorization is given by the Architect.

### **3.2 LAYING OUT WORK**

- A. The Contractor is responsible for the accuracy of all lines, elevations, and measurements, grading and utilities and must exercise proper precaution to verify figures shown on drawings before laying out work and will be held responsible for any error resulting from his failure to exercise such precaution.

### **3.3 WORKMANSHIP**

- A. Install all work neat, trim, parallel and plumb with building lines in accordance with standard trade practice acceptable to the Architect.

### **3.4 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Protect all equipment and materials from damage during transportation, storage and installation.

### **3.5 PROTECTION**

- A. Protect all work, equipment and materials during construction up to the time of acceptance by the Owner.

Arrange and design the protection to prevent damage from infiltration or dust, debris, moisture, chemicals and water. Cap or plug electrical raceways.

- B. Protect all surfaces against damage from welding, cutting, burning, or similar construction functions. This protection shall be accomplished by care in operations, covering and shielding. Special care is directed to exposed finished masonry, metal or wood surfaces and painted surfaces. Corrective measures required shall be accomplished by the trade which made the original installation when and as directed by the Architect at the expense of the Contractor.
- C. Cover and protect all lighting fixtures as may be necessary until completion of the work. Replace damaged fixtures or damaged fixture parts as directed by the Architect at no cost to the Owner.
- D. Do not install devices, polished metal fittings or parts until adjoining tile or masonry work is completed.
- E. Maintain and replace protective covering when so directed by the Architect until the work is ready for acceptance.

### **3.6 CUTTING & PATCHING**

- A. Furnish information to the General Contractor as to sizes and locations of recesses required to install panel boxes and other equipment or devices. If the information is late or incorrect, this Contractor shall, at his own expense, have the trade which originally installed the work do the required cutting and patching.
- B. Perform all cutting of concrete or other material for passage of raceways as required to install the work.
- C. Close all such openings around raceways with material as specified under the heading "SEALING".
- D. Install concealed work in place for the mason to wall-in as he carries up the walls; otherwise, this Contractor will be responsible as stated in the first paragraph.

### **3.7 SEALING**

- A. Where raceways pass through fire-rated walls and floors, seal opening with RTV foam.
- B. Seal raceways entering the building to conform to the requirements of the NEC.

### **3.8 OFFSETS AND MODIFICATIONS**

- A. Furnish and install all offsets necessary to install the work and to provide clearance for the work of other trades.
- B. Maintain adequate clearance as directed by the Architect/Engineer.
- C. Incidental modifications necessary to the installation shall be made as necessary and at the direction and/or approval of the Architect.

**3.9 SLEEVES**

- A. Furnish and install sleeves for all raceways passing through floors and walls. Sleeves shall be Schedule 40 galvanized steel pipe and shall extend 1" above finished floor surface. Where sleeves are set in interior walls, they shall finish flush with the wall.
- B. Furnish and install watertight sleeves for all raceways extending through foundation walls into crawl spaces, mechanical rooms or basement areas from building exterior or from unexcavated areas to building interior. Sleeve shall consist of extra heavy pipe sleeve with anchor flange. Space between raceway and the sleeve shall be sealed with modular wall and casing seal similar to Thunderline Corporation "Link-Seal", Metraseal or approved substitute. Install seal in strict accordance with the manufacturer's recommendations.

**3.10 ITEMS RECESSED IN MASONRY CONSTRUCTION**

- A. Wherever boxes, electric panels, equipment, devices, access panels, and similar items of electrical construction are installed in exposed masonry construction, the Contractor shall utilize and submit for approval items of such size, height, and arrangement to conform to the corresponding masonry unit. The Contractor shall include as part of this contract, the necessary offsets, adjustments and relocations necessary to conform with the instructions of the Architect as to the final location of the equipment item in the exposed masonry.
- B. As part of his contract and before the purchase of the items hereinbefore mentioned, the Contractor shall notify the Architect of such modifications in the building arrangement that will be necessary to accommodate the proposed equipment.

**3.11 ROOF FLASHINGS**

- A. All conduit extending through roofs shall be provided with watertight flashing and counterflashing as hereinafter described.
- B. Furnish and install standard counterflashing fittings on the conduit or properly designed clamped counterflashing with caulking as directed by the Architect/Engineer.

**3.12 PAINTING**

- A. Refinish all factory applied finishes that have been damaged to match the original finish as directed by the Architect.
- B. Prime coat all steel furnished under this Division with material and methods as described in another Section under the heading "PAINTING".

**3.13 EQUIPMENT CONNECTIONS**

- A. Provide required wiring, raceways and final connections for all equipment provided by this Division and Divisions 1 thru 23.

- B. Make final connections in accordance with wiring diagrams obtained from equipment manufacturer.
- C. Rough-in in accordance with approved shop drawings from the manufacturer or supplier of the equipment. Rough-in prior to shop drawing approval will be subject to change without adjustment to contract cost.

**3.14 BALANCING**

- A. The system of feeder and branch circuits for power and lighting shall be connected to panel busses in such a manner as to electrically balance the connected load as close as is practicable. Should the Owner disclose any unfavorable conditions reacting on the service, this Contractor shall make such changes as may be suggested to balance the load.

**3.15 GUARANTEE**

- A. All work shall be guaranteed to be free from defects for a period of one year of operation from date of acceptance by the Owner unless otherwise specified in Division 1.
- B. Guarantee shall be extended on an equal time basis for all non- operational periods due to failure within the guarantee period.
- C. Contractor to include an 11 month “walk-thru” of the building system with representatives of the School District, Architect, Engineer and the Construction Manager. The purpose is to establish a list of corrective work that relates to operational issues, material/installation deficiencies.

END OF SECTION 26 00 00

**SECTION 26 00 10**

**INFRARED SCANNING OF EXISTING ELECTRICAL EQUIPMENT**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The General Provisions of the Contract, including the conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the work of this section.

**PART 2 – DESCRIPTION**

**2.1 GENERAL**

- A. The electrical contractor shall furnish all labor, materials, equipment and supervision as may be required to completely disassemble, clean, inspect and test the existing distribution boards, panels and transformers as specified herein and as shown on the drawings. The items listed below are for general guidelines only and do not necessarily include the entire requirements for the project:
  - 1. The electrical contractor and the owner's representative shall visually inspect the equipment and furnish a written schedule as to the date, time and length of interruption for each piece of equipment. This schedule shall be mutually agreed to by both parties prior to work beginning.
  - 2. The electrical contractor shall remove all cover plates and panels required to expose the interior parts and sections of the equipment. At this time the contractor shall visually inspect all wire and components for missing parts, broken parts, loose connections, burned or damaged connections, as well as loose, broken or missing support devices. All molded case circuit breakers shall be fully inspected for cracked, broken or burned cases and lugs. Upon completion of this inspection the contractor shall furnish a list of all damaged components which require replacement, this list shall include the cost of labor to remove and replace the component, the cost of the new component, the date, time and length of interruption for each component replacement. This list shall be submitted to the owner for their review and direction.
  - 3. The electrical contractor, at this time is not responsible for replacing any components beyond missing nuts and bolts for the cover plate and panels.
  - 4. The electrical contractor shall clean and wipe down all components, wire and cables with an electrical cleaning solvent used for the purpose. During the cleaning phase any additional components found to be damaged shall be added to the list outlined under item 2.
  - 5. Upon completing the cleaning phase of the work, the electrical contractor shall go through the entire switchboard or switchgear and tighten all mounting supports and cable

terminations. Contractor shall check to make sure there are no broken, stretched or strained terminations.

6. Upon completing the tightening phase of the work, the electrical contractor shall take infrared snap shot of each termination to determine if a hot-spot exists. Should a hot-spot be found the contractor shall retighten that termination and retake the snap shot. If the hot-spot persists the component shall be added to the component replacement list.
7. Prior to replacing the cover plates and panels on the boards or gear the owner shall inform the electrical contractor as to his intentions on the component replacement list and give direction to the contractor as how to proceed.
8. Upon completing the infrared testing and any component replacement the owner has directed, the electrical contractor shall replace all covers and panels. All the old labeling shall be removed, all factory finishes which have rusted or been marred shall be refinished to match existing.
9. Upon completing the cover and panel replacement and finish touchup the electrical contractor shall renumber and label each device as to the load served. All labeling shall be in accordance with section 16055 "Electrical Identification".
10. Upon completion of all mentioned work above, the Electrical Contractor shall organize all snap shots and lists and turn two (2) copies, bound in 3-ring binders, over to the Owner. Lists shall be typed.

END OF SECTION 260010

**SECTION 26 00 55**

**ELECTRICAL IDENTIFICATION**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. This section is a Division 26 Basic Materials and Methods Section, and is part of each Division 26 Section making reference to electrical identification specified herein.

**1.2 DESCRIPTION OF WORK**

- A. Types of electrical identification specified in this section include the following:

- Cable conductor identification.
- Operational instructions and warnings.
- Danger signs.
- Equipment/system identification signs.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. Subject to compliance with requirements, provide products of one of the following (for each type of marker):

- W. H. Brady Co.
- Ideal Industries, Inc.
- Seton Name Plate Co.
- 3M Electrical Products

**2.2 ELECTRICAL IDENTIFICATION MATERIALS**

- A. Provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

**2.3 COLOR-CODED PLASTIC TAPE**

- A. Provide manufacturer's standard vinyl tape not less than 7 mils thick by 3/4" wide.
- B. Colors: Unless otherwise indicated or required by governing regulations, provide tape color as indicated in Paragraph 3.2.B.
- C. Tape shall be of Type 3M Scotch 35 for color coding, Scotch Super 33+ for splices and Tem Flex 1700 for general use.

**2.4 CABLE/CONDUCTOR IDENTIFICATION BANDS**

- A. Provide manufacturer's standard vinyl cloth, self-adhesive cable/conductor markers of wrap-around type; either pre-numbered, plastic-coated type, or write-on type with clear plastic, self-adhesive cover flap; numbered to show circuit identification.

**2.5 BAKED ENAMEL DANGER SIGNS**

- A. Provide manufacturer's standard "DANGER" signs of baked enamel finish on 20-gage steel; of standard red, black and white graphics; 14" x 10" size except where 10" x 7" is the largest size which can be applied where needed, and except where larger size is needed for adequate vision; with recognized standard explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).

**2.6 ENGRAVED PLASTIC-LAMINATE SIGNS**

- A. Provide engraved stock melamine plastic laminate, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
- B. Thickness: 1/16" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
- C. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

**2.7 LETTERING AND GRAPHICS**

- A. Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

**PART 3 – EXECUTION****3.1 APPLICATION AND INSTALLATION**

- A. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
- B. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

**3.2 CABLE/CONDUCTOR IDENTIFICATION**

- A. Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where wires of more than one circuit or communication/signal system are present. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.

B. Conductor Color Coding:

1. All conductors used in all systems shall have insulation that is inherently colored. All conductors of a system performing the same function shall be colored alike throughout the project.
2. Equipment Grounding Conductors:
  - a. Standard and/or general feeders or circuits shall be green.
  - b. Isolated feeders or circuits shall be green with yellow stripe.
3. On larger conductors, where colored insulation is not available, colored tape adhesive vinyl bands 3/4" width may be installed 6" maximum from the end of the conductors. Where passing through pull boxes without splice, each conductor shall be banded.
4. Power system conductor colors shall be as follows:
  - a. 120/208 Volt System
    - Phase A - Black
    - Phase B - Red
    - Phase C - Blue
    - Neutral - White or Gray

**3.3 DANGER SIGNS**

- A. In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by Installer of electrical work as constituting similar dangers for persons in or about project.
- B. High Voltage: Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power voltages higher than 110-120 volts.

**3.4 EQUIPMENT/SYSTEM IDENTIFICATION**

- A. Install engraved, plastic laminate sign on each major unit of electrical equipment in building, including central or master unit of each electrical system including communication/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawing. Provide signs for each unit of the following categories of electrical work:
  1. Panelboards, electrical cabinets and enclosures.
  2. Access panel/doors to electrical facilities.
  3. Major electrical switchgear, main and feeder circuit breakers and/or disconnects..
  4. Fire Alarm Master Station and Annunciator.
  5. Security Control Panels and Annunciator.

- B. Install signs at locations for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrate.

### **3.5 JUNCTION AND PULL BOX IDENTIFICATION**

- A. Emergency Systems: Each junction and pull box cover shall be painted orange. Use black indelible liquid marker to label "EMERG." in 3/8" letters minimum.
- B. Fire Alarm System: Each junction and pull box cover shall be painted red. Use black indelible liquid marker to label "F.A." in 3/8" letters minimum.
- C. Feeders Shown on Single Line Diagram: Each junction and pull box shall be marked with black indelible liquid marker with the assigned feeder number "FDR #38" in 3/8" letters minimum.

END OF SECTION 26 00 55

**SECTION 26 01 10**

**RACEWAYS**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.
- B. Refer to Section 260000 for General Provisions - Electrical.

**1.2 DESCRIPTION OF WORK**

- A. Types of raceways in this section include the following:
  - Rigid metal conduit
  - Intermediate metal conduit
  - Electrical metallic tubing.
  - Flexible metal conduit.
  - Liquid-tight flexible metal conduit.
  - Wireways.

**1.3 REFERENCE STANDARDS**

- A. Refer to Section 260000 for a general description of requirements applying to this Section.

**1.4 QUALITY ASSURANCE**

- A. Refer to Section 260000 for a general description of requirements applying to this Section.

**1.5 WARRANTY/GUARANTEE**

- A. All work and materials are subject to the general warranty as described in the General Conditions of the Contract and in Division 1, GENERAL REQUIREMENTS.

**1.6 COORDINATION**

- A. The drawings and details there upon are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate, with other Division Subcontractors, the installation of all raceways, raceway supports, junction boxes and required fittings. This coordination will include conduit layout to allow access to equipment for maintenance.
- B. This coordination shall be carried out prior to actual installation; this shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of construction.

- C. Should the coordination not be carried out prior to installation, and a conflict exists, the installing contractor shall remove and reinstall the equipment as required to clear the conflict at no additional cost to the Owner and no delay in project completion.

**PART 2 – PRODUCTS**

**2.1 MATERIALS AND EQUIPMENT**

A. Rigid Metal Conduit:

- 1. Raceway: Full weight, heavy wall rigid steel with zinc coating conforming to ANSI-C80.1.
- 2. Fittings: Cast malleable iron fittings with threaded hubs, insulated throat and zinc protective coating.
- 3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corporation  
LTV Steel Tubular Products Co.  
Wheatland Tube

B. Intermediate Metal Conduit:

- 1. Raceway: Light weight, rigid steel, hot dipped galvanized manufactured in accordance with UL1242.
- 2. Fittings: Cast malleable iron fittings with threaded hubs, insulated throat and zinc protective coating.
- 3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corporation  
LTV Steel Tubular Products Co.  
Wheatland Tube

C. Electrical Metallic Tubing:

- 1. Raceway: Light weight, thin wall, rigid steel, hot dipped galvanized manufactured in accordance with ANSI C80.3.
- 2. Fittings: Raintight, insulated throat, compression type with zinc protective coating.
- 3. Subject to compliance with requirements, provide products of one of the following:

Allied Tube and Conduit Corp.  
LTV Steel Tubular Products Co.  
Wheatland Tube Co.

D. Flexible Metal Conduit:

1. Raceway: Construct of single strip, flexible, continuous, interlocked, and double-wrapped steel, galvanized inside and outside.
2. Fittings: Steel, insulated throat, with zinc protective coating.
3. Subject to compliance with requirements, provide products of one of the following:

AFC  
Alflex Corp.  
Electri-Flex Company

E. Liquid-Tight Flexible Metal Conduit:

1. Raceway: Construct of single strip, flexible, continuous, interlocked, and double-wrapped, galvanized inside and outside, coat with liquid-tight jacket of flexible polyvinyl chloride.
2. Fittings: Steel, water and oiltight, insulated throat, with zinc protective coating.
3. Subject to compliance with requirements, provide products of one of the following:

AFC  
Alflex Corp.  
Electri-Flex Company

F. Wireways:

1. Furnish electrical wireways of the type, size, and style for each service indicated. Wireway shall be a complete assembly including but not necessarily limited to, couplings, offsets, elbows, adapters, hold-down clips, end-caps and other components and accessories as needed for a complete system.
2. System shall fulfill wiring requirements as indicated in contract documents, and shall comply with applicable portions of Article 362 of the National Electrical Code.
3. Subject to compliance with requirements, provide products of one of the following:

Circle AW Products Co.  
The EMF Company, Inc.  
Hoffman Engineering Company  
Square "D" Company

- G. The above items shall include the statement "Approved Equal" and/or "Approved Substitute". This statement requires that the product or item be in compliance with the written intent of this specification and the submission meets the requirements of Section 260000.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF ELECTRICAL RACEWAYS**

- A. Install electrical raceways in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and complying with recognized industry practices.
- B. Coordinate with other work as necessary to interface installation of electrical raceways, wireways and required components.
- C. Raceways used for distribution, feeders, or branch circuits shall be a minimum size of 3/4" or equal equivalent cross-sectional area. Raceways used for control and signal shall be a minimum size of 1/2" or equal equivalent cross-sectional area.
- D. All raceways shall be concealed within the building construction, where indicated on the floor plans surface raceway shall be installed. Should it be impossible or impracticable to install a raceway concealed and surface raceway is not indicated, the Contractor shall consult with the Architect or Engineer for approval prior to installation.
- E. All raceways installed in ceiling cavities and exposed within mechanical spaces shall be run parallel with building lines and installed level and square at the proper elevation/height.
- F. Complete the installation of electrical raceways before starting the installation of cables/wires within the raceway.
- G. Furnish and install one (1) nylon or fiberglass pull cord in each empty raceway. Each empty raceway shall be cleaned, capped, and tagged as to its termination location.
- H. Install liquid-tight flexible metal conduit for connections to motors and for other electrical equipment when subject to movement and vibration, and also where subjected to one or more of the following conditions:
  - 1. Exterior locations.
  - 2. Moist or humid atmosphere when condensation can be expected to accumulate.
  - 3. Corrosive atmosphere.
  - 4. Subjected to water spray.
  - 5. Subjected to dripping oil, grease or water.
- I. Install Electrical Metallic Tubing for building interior electrical work except:
  - 1. Underground
  - 2. In gravel, cinder, concrete or other sub-base floor construction.
  - 3. Horizontal runs in concrete floor slabs.
  - 4. Where exposed to the elements.
  - 5. In masonry construction below finished grade.
  - 6. Vertically in poured concrete walls.

- J. Refer to Section 260000 for excavation, shoring and pumping, concrete and backfilling requirements.
- K. Where and whenever possible, install horizontal electrical raceways as tight to building construction as possible and above water, drain and steam piping. A separation of at least six (6) inches shall be maintained between electrical conduits and hot water and steam piping.
- L. In accordance with NEC requirements, install Rigid or Intermediate Metal Conduit where Electrical Metallic Tubing is not permitted.
- M. In all instances where recessed type panelboards are installed, furnish and install one (1) one inch raceway for each two (2) future circuits for which "space" or "spare" provisions have been made in the panelboard. These raceways shall extend between the panelboard cabinet and a convenient location above an access panel or a removable tile ceiling construction and capped.

### **3.2 CLEANING**

- A. Upon completion of installation of raceways, inspect interiors of raceways; remove burrs, dirt and construction debris.

END OF SECTION 26 01 10

**SECTION 26 01 20**

**WIRES AND CABLES**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. This section is a Division 26 Basic Materials and Methods section and is part of each Division 26 Section making reference to wires and cables specified herein.

**1.2 DESCRIPTION OF WORK**

- A. Electrical wire and electrical cable work is indicated by drawings and specifications.
- B. Types of wire, cable and connectors in this section include, but not limited to the following:  
  
Copper conductors.  
Tap type connectors.  
Split-bolt connectors.
- C. Refer to other sections of Division 26 for, but not limited to, raceways, connections used in conjunction with wire and cable work.
- D. Applications for wire, cable and connectors required for project are as follows unless otherwise indicated:
  - 1. Primary Service Circuitry.
  - 2. Power Distribution Circuitry.
  - 3. Appliance and Equipment Circuitry.
  - 4. Motor Branch Circuitry.
  - 5. Control Circuitry.
  - 6. Signal/Communication Circuitry.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURERS**

- A. Wire and Cable  
Anaconda Wire and Cable Co.  
Advance Wire and Cable, Inc.  
American  
Cerro Wire and Cable Co.  
Electrical Conductors, Inc.  
General Cable Corp.  
Rome Cable Corp.  
Southwire Company  
Triangle PWC,, Inc.  
General Electric Co.

Connectors

Burndy Corp.  
Eagle Electric Mfg. Co., Inc.  
Gould, Inc.  
Ideal Industries, Inc  
Joslyn Mfg. and Supply Co.  
O-Z/Gedney Co.  
Pyle National Co.  
Thomas and Betts Co.

**2.2 WIRE, CABLE AND CONNECTIONS**

- A. Except as otherwise indicated, provide wire, cable and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, and as required for the installation. Minimum wire and cable size is #12 AWG for power and branch circuits and #14 AWG for control and signal/communication circuits unless otherwise indicated.
  
- B. Wire: Provide factory fabricated wire of sizes, ratings, materials and types indicated for each service. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements and NEC standards. Select from the following types, materials, conductor configurations, insulation and coverings:

UL Type: THHN  
UL Type: TW  
UL Type: THW  
UL Type: THWN  
UL Type: TF  
UL Type: XHHW  
UL Type: MC (Metal Clad) Concealed Work Only

Material: Copper

Conductors: Solid (AWG 14 to AWG 10 only).  
Conductors: Concentric-lay-stranded (standard flexibility)

Outer Covering: Nylon  
Outer Covering: Thermoplastic

- C. Connectors: Provide factory fabricated metal connectors of sizes, ratings, materials, types and classes as required for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and NEC standards. Select from the following types, classes, kinds and styles.

Type: Pressure  
Type: Crimp  
Type: Threaded

Class: Insulated  
Class: Non-insulated

Kind: Copper (for CU to Cu connection).

Style: Butt connection  
Style: Elbow connection  
Style: Combined "T" and straight connection  
Style: "T" connection.  
Style: Split-bolt parallel connection  
Style: Tap connection  
Style: Pigtail connection

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION**

- A. Install electrical cables, wires and connectors, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface. Pull conductors together where more than one is being installed in a raceway. Use pulling compound or lubricate, where necessary; compound must not deteriorate conductor or insulation. Use pulling means including fish tape, cable or rope which cannot damage raceway. Rope must be used as pulling means when pulling wires or cables into plastic conduit and duct. Keep conductor splices to a minimum and install in junction boxes only. No splices shall be permitted within conduit. Install splices and tapes which have mechanical strength and insulation rating equivalent or better than conductor. Use splice and tape connectors which are compatible with conductor material.

#### **3.2 FIELD QUALITY CONTROL**

- A. Prior to energization, test cable and wire for continuity of circuitry and also for short circuits. Correct malfunctions when detected.
- B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 26 01 20

## **SECTION 26 01 21**

### **WIRE CONNECTIONS AND DEVICES**

#### **PART 1 – GENERAL**

##### **1.1 RELATED DOCUMENTS**

- A. This section is a Division 26 Basic Materials and Methods Section and is part of each Division 26 Section making reference to connectors and termination devices specified herein.

##### **1.2 DESCRIPTION OF WORK**

- A. Extent of electrical connectors and termination work is indicated by drawings and specifications.
- B. Types of connectors and termination devices in this section include, but are not limited to the following:
  - 1. Tap type connectors.
  - 2. Split-bolt connectors.
- C. Refer to other sections of Division 26 for, but not limited to, raceways, wires and cables used in conjunction with connectors and termination devices.
- D. Applications for connectors and termination devices required for project are as follows unless otherwise indicated:
  - 1. Primary distribution circuitry
  - 2. Branch circuitry
  - 3. Equipment circuitry
  - 4. Control circuitry

##### **1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on electrical connectors, high voltage termination to the Engineer.

#### **PART 2 – PRODUCTS**

##### **2.1 MANUFACTURERS**

- A. Subject to compliance with requirements, provide connectors, high voltage terminations of one of the following manufacturers for each item used:

Burndy Corp.  
Eagle Electric Mfg. Co., Inc.  
Gould, Inc.  
Ideal Industries, Inc.  
Joslyn Mfg. and Supply Co.

O-Z/Gedney Co.  
Pyle National Co.  
Thomas and Betts Co.  
Cooper Power Systems

## **2.2 CONNECTORS**

- A. Provide factory fabricated metal connectors of sizes, ratings, materials, types and classes as indicated for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and NEC standards.

Type: Pressure  
Crimp  
Threaded

Class: Insulated  
Non-Insulated

Kind: Copper (for CU to Cu connection).

Style: Butt Connection  
Elbow connection  
Combined "T" and straight connection  
"T" connection  
Split-bolt parallel connection  
Tap connection  
Pigtail connection

## **PART 3 – EXECUTION**

### **3.1 600 VOLT CABLE CONNECTOR INSTALLATION**

- A. Install electrical connectors, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Coordinate cable, wire and connector installation work with electrical raceway and equipment installation work, as necessary for proper interface. Pull conductors together where more than one is being installed in a raceway. Use pulling compound or lubricate, where necessary, compound must not deteriorate conductor or insulation, and must be in accordance with wire and cable manufacturer's recommendations. Use pulling means including fish tape, cable or rope which shall not damage raceways including plastic conduits and ducts.

### **3.2 HIGH VOLTAGE TERMINATION INSTALLATION**

- A. Install high voltage terminations in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.

- B. Coordinate terminations with cable, raceway and equipment installation work, as necessary for proper interface. Contractor shall coordinate termination kits with the size, type and style of high voltage cable being installed, in accordance with cable and termination manufacturer's written instructions and recommendations.

**3.3 FIELD QUALITY CONTROL**

- A. Prior to energization, test cable and wire for continuity of circuitry and also for short circuits. Correct malfunctions when detected.
- B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

END OF SECTION 26 01 21

**SECTION 26 01 35**

**ELECTRICAL BOXES & FITTINGS**

**PART 1 – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. This section is a Division 26 Basic Materials and Methods section, and is a part of each Division 26 section making reference to electrical wiring boxes and fittings specified herein.

**1.2 DESCRIPTION OF WORK**

- A. Types of electrical boxes and fittings in this section include the following:

- Outlet boxes.
- Junction boxes.
- Pull boxes.
- Conduit bodies.
- Bushings.
- Locknuts.
- Knockout closures.

**PART 2 – PRODUCTS**

**2.1 INTERIOR METALLIC OUTLET BOXES**

- A. Provide galvanized flat rolled sheet steel interior outlet non-gangable wiring boxes, of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.
- B. Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations. Choice of accessories is Installer's option.
- C. Manufacturer: Subject to compliance with requirements, provide interior outlet boxes of one of the following:

- Appleton Electric Co.
- Bell Electric/Square D Co.
- Pass and Seymour, Inc.
- RACO, Inc.
- Steel City/Midland-Ross Corp.

**2.2 WEATHERPROOF OUTLET BOXES**

- A. Provide corrosion resistant cast-metal weatherproof outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners.
- B. Manufacturer: Subject to compliance with requirements, provide weatherproof outlet boxes of one of the following:
  - Arrow-Hart Div., Crouse-Hinds Co.
  - Bell Electric/Square D Co.
  - Harvey Hubbell, Inc.
  - O-Z/Gedney Co.
  - Slater Electric Co.

**2.3 JUNCTION PULL BOXES**

- A. Provide galvanized code-gauge sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- B. Manufacturers: Subject to compliance with requirements, provide junction and pull boxes of one of the following:
  - Adalet-PLM Div., Scott and Fetzer Co.
  - Appleton Electric Co.
  - Arrow-Hart Div., Crouse-Hinds Co.
  - Bell Electric/Square D Co.
  - GTE Corporation
  - Keystone Columbia, Inc.
  - O-Z/Gedney Co.
  - Slater Electric Co.
  - Spring City Elect. Mfg. Co.

**2.4 CONDUIT BODIES**

- A. Provide galvanized cast-metal conduit bodies, of types, shapes, and sizes, to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.
- B. Manufacturers: Subject to compliance with requirements, provide conduit bodies of one of the following:
  - Appleton Electric Co.
  - Crouse-Hinds Co.
  - Gould, Inc.
  - Killark Electric Mfg. Co.
  - O-Z/Gedney Co.
  - Spring City Electrical Mfg. Co.

## **2.5 BUSHINGS, KNOCKOUT CLOSURES AND LOCKNUTS**

- A. Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and insulated malleable iron conduit bushings, offset connectors, of types and sizes to suit respective uses and installation.
- B. Manufacturers: Subject to compliance with requirements, provide bushings, knockout closures, locknuts and connectors of one of the following:
  - Appleton Electric Co.
  - Burndy Corp.
  - Crouse-Hinds Co.
  - Gould, Inc.
  - O-Z/Gedney Co.
  - RACO, Inc.
  - Steel City/Midland-Ross Corp.
  - Thomas and Betts Co., Inc.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS**

- A. Install electrical boxes and fittings, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
- C. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
- D. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- E. Install boxes and conduit bodies in those locations to ensure ready accessibility of electrical wiring.
- F. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surface.
- G. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.
- H. Provide electrical connections for installed boxes.
- I. Pull boxes and junction boxes shall be furnished and installed in all conduit runs at intervals not exceeding 100 feet maximum.
- J. Identify each circuit in all pull boxes and junction boxes whether the box contains one or more circuits.

END OF SECTION 26 01 35

**SECTION 26 01 40**

**WIRING DEVICES**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. The extent of wiring device work is indicated by drawings, schedules and specifications. Wiring devices are defined as single discrete units of the electrical distribution system which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
  - Receptacles.
  - Switches.
  - Device plates.
  - Time Clocks
  - Contactors
  - Energy Control Devices

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on electrical wiring devices.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of wiring device):
  - Legrand Co.
  - Hubbell, Inc.
  - Leviton Mfg. Co.
  - Lutron Electronics Co., Inc.
  - Cooper Wiring Devices
  - Square D Co.
  - Eaton Corp.
  - Siemens
  - Tork
  - Grasslin
  - Paragon

**2.2 FABRICATED WIRING DEVICES**

- A. Provide factory fabricated wiring devices, in types, styles, colors, and electrical ratings for applications indicated and complying with NEMA Standards Pub. No. WD 1. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring

requirements, and complying with NEC and NEMA Standards for wiring devices. Provide ivory/brown color devices and wall plates except as otherwise selected; color selection to be verified by Contractor with Architect/Engineer.

### **2.3 RECEPTACLES**

- A. Heavy-Duty Simplex: Provide single-duty type receptacles, 2 pole, 3 wire grounding, with green hexagonal equipment ground screw, 20 amperes, 125 volts with metal plaster ears, side wiring, NEMA configuration 5-20R unless otherwise indicated.
- B. Heavy-Duty Duplex Standard Style: Provide extra heavy-duty industrial series duplex receptacles, 2 pole, 3 wire grounding type with green hexagonal equipment ground screw, 20 amperes, 125 volts with metal plaster ears, side wiring, NEMA configuration 5-20R unless otherwise indicated. Similar to Hubbell Series HBL Series, or approved substitute.
- C. Special Purpose Receptacles: Provide polarized grounding type special purpose receptacles of the required amperage and voltage ratings for the duty intended. Device shall include a green hexagonal equipment ground screw.
- D. Ground Fault Receptacle: Provide hospital grade heavy duty duplex receptacle, 2 pole, 3 wire grounding type with green hexagonal equipment, ground screw and integral ground fault circuit interrupter, UL rated Class A, Group 1, 20 amperes, 125 volts, 60 Hertz with metal plaster ears, side wiring, NEMA Configuration 5-20R. Device shall include solid state ground-fault sensing and signalling, with a 5 milliampere ground fault trip level, plus or minus 1 milliampere. Similar to Hubbell Cat. No. GFR8300H Series, or approved substitute.
  - 1. Whether indicated or not on the floor plans, the Electrical Contractor shall furnish and install GFI protected devices in commercial kitchen areas next to lavs, on rooftop equipment, on exterior walls; and as indicated by the N.E.C., it shall be the discretion of the Electrical Contractor to provide GFI receptacles or GFI circuit breaker.

### **2.4 SWITCHES**

- A. Toggle Switch: Provide extra heavy duty, industrial series flush toggle, 1 pole, 2 pole, 3-way, 4-way AC quiet switch rated 20 amperes @ 120/277 volts with green hexagonal equipment ground screw, metal plaster ears, and side wired screw terminals. Similar to Hubbell Series HBL Series or approved substitute.
- B. Toggle Switch with Pilot Light: Provide extra heavy duty industrial series, flush toggle, single pole, AC quiet switch rated 20 amperes @ 120 volts with green hexagonal equipment ground screw, metal plaster ears, side-wired screw terminals and 1/25 watts, 125 volt neon pilot light, designed to mount within a single gang outlet box. Similar to Hubbell HBL or approved substitute.
- C. Three Position Switch: Provide extra heavy duty industrial series, flush toggle, single pole, three position, momentary contact, center position OFF, AC quiet switch rated 20 amperes @ 120/277 volts, with green hexagonal equipment ground screw, metal plaster ears, and side-wired screw terminals. Similar to Hubbell Series HBL or approved substitute.

- D. Key Switch: Provide extra heavy duty, industrial, 1 pole, 2 pole, 3-way, 4-way barrel key locking switch rated at 20 AMPs @ 120/277 volts with green grounding screw, metal plaster ears and side wired screw terminals. The tumbler shall be a six-point cylinder type. All project keyed switches to be keyed alike. Similar to Hubbell 122\*RKL series.

## 2.5 DEVICE PLATES

- A. Provide switch and receptacle outlet wall plates for wiring devices, of types, sizes, and with ganging and cut outs required by the devices being installed. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates; plates colored to match wiring devices to which attached. Provide device plates possessing the following additional construction features: **Receptacle outlet plates to be permanently marked with panel designation and circuit number on back side of plate.**
1. Metal Plates to be stainless steel of non-corrosive and non-magnetic 302 alloy, .032" nominal thickness. Plates shall have brushed satin finish.
- B. Weatherproof device plates shall have spring-hinged waterproof cap suitably configured for each application, including face plate gaskets and corrosion-resistant fasteners. Provide device plates possessing the following construction materials and finishes:
1. Cast Aluminum Plates shall be die-cast, copper-free aluminum construction with a baked-on lacquer finish.

## 2.6 CONTACTORS

- A. Electrically Held Power Lighting Contactor: Shall be rated 30 to 200 AMPs for 2 thru 5-pole versions and 300 to 800 AMPs for 2 and 3 pole versions, as indicated on the Floor Plan. Contactor shall have factory wired control and clearly marked termination points, designed for mixed load ratings with a UL listed short-circuit rating up to 100,000 amperes. Contactor shall be housed in a NEMA Type I, general purpose enclosure and be similar to Square D Company, Type "S", Class 8903 or approved substitute.
- B. Mechanically Held Power Lighting Contactor: Shall be rated 30 to 200 AMPs for 2 thru 5 pole versions and 300 to 800 AMPs for 2 and 3 pole versions, as indicated on the Floor Plan. Contactor shall have factory wired control with coil clearing contacts and clearly marked termination points, designed for mixed load ratings with a UL listed short-circuit rating up to 100,000 amperes. Contactor shall be housed in a NEMA Type I, general purpose enclosure and be similar to Square D Company, Type "S", Class 8903 or approved substitute.
- C. Multiple Lighting Contactor: Shall be an electrically or Mechanically held device with 2 thru 12 poles rated 30 AMPs ballast and 20 AMPs tungsten, as indicated. Mechanically held contactor shall have factory wired control with coil clearing contacts and clearly marked termination points. Contactor shall be housed in a NEMA Type I, general purpose enclosure and be similar to Square D Company Types "L" and "LX", Class 8903 or approved substitute.
- D. General: All contactor control setups shall include all required interface relays needed to function with maintained or momentary contact switches, time clocks and photocell controls. Control circuits and coil voltages shall be 120 volts A.C. single phase.

**2.7 ENERGY CONTROL DEVICES (Occupancy Sensors)**

A. Line Voltage:

1. Combination wall switch and sensor shall be Dual Technology Passive Infrared and Ultrasonic with a coverage of 180° for 20 feet. Device shall be suitable for 120/277 dual voltage operation. Device shall be similar to Sensor Switch Cat. No. WSD-PDT or approved substitute.
2. Ceiling sensor shall be Dual Technology Passive Infrared and Ultrasonic 360° coverage. Self Contained Relay Device shall be suitable for 120/277 Dual Voltage operation. Device shall be similar to Sensor Switch Cat. No. CMR-PDT or approved substitute.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF WIRING AND CONTROL DEVICES**

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other work, including painting, electrical box and wiring work, as necessary to interface installation of wiring devices with other work.
- C. Install wiring devices only in electrical boxes which are clean, free from building materials, dirt and debris.
- D. Provide electrical connections for wiring and control devices.
- E. Delay installation of all wiring and control devices until wiring work is completed.
- F. Isolated Ground Receptacle Devices shall be connected to the system ground by way of an insulated ground conductor color coded green with a yellow stripe.

**3.2 PROTECTION OF WALL PLATES AND RECEPTACLES**

- A. At time of Substantial Completion, replace those items which have been damaged, including those burned and scorched by faulty plugs.

**3.3 GROUNDING**

- A. Provide electrically continuous, tight grounding connections for wiring and control devices.

**3.4 TESTING**

- A. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections. After energizing circuitry, test wiring devices to demonstrate compliance with requirements.

- B. After energizing circuitry, the Electrical Contractor shall test and adjust all control devices to provide optimum operation and performance.

END OF SECTION 26 01 40

**SECTION 26 01 55**

**MOTOR STARTERS**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Extent of motor starter work is indicated by drawings, schedules and specifications.
- B. Refer to sections of other divisions of these specifications for driven equipment specified without motor starters. Motor starters for such equipment are the work of this section.
- C. Types of motor starters in this section include the following:
  - Manual.
  - Magnetic Full Voltage, Non-Reversing.
  - Combination Disconnect Switch and Magnetic Starter.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on motor starters and accessories.

**1.3 COORDINATION**

- A. The drawings and details there upon are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate with other Division subcontractors, the installation of all motor starters, the need for control devices including the wiring and conduit, to and from the device.
- B. This coordination shall be carried out prior to actual installation. This shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of coordination.
- C. During the coordination phase of the project, the Electrical Contractor shall consult with Division 1 thru 23 subcontractors with regard to base design equipment characteristics. Any differences from the electrical plans and specifications shall be considered a change. The trade's contractor making the change at no additional cost to the Owner or delay in project completion shall handle these additional costs.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type and rating of motor starter):

Allen-Bradley Co.  
 Cutler Hammer Products  
 Furnas Electric Co.  
 General Electric Co.  
 Square D Co.  
 Siemens

**2.2 MOTOR STARTERS**

- A. Provide motor starters and ancillary components; of types, sizes, ratings and electrical characteristics indicated which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installations.
- B. Fractional HP Manual Motor Starters: Provide manual, single phase, fractional HP motor starters for each motor rated less than 1/2 HP, of types, ratings and electrical characteristics indicated. Equip unit with thermal overload relay for protection of 120 volt AC motors. Provide starters with quick-make, quick-break, trip free toggle mechanisms, selector switches for hand-off-automatic control; mount starter in NEMA Type 1 or Type 4 enclosure as indicated or required by the NEC.
- C. Magnetic Motor Starter: Provide magnetic full voltage, non-reversing starters for each motor rated 1/2 HP and more of types, ratings and electrical characteristics indicated; equip with solid state overload relays, control transformers with 120V secondary, with one secondary fuse and one grounded secondary lead, two normally open and two normally closed auxiliary contacts, hand-off- automatic selector switch, red and green pilot lights wired and mounted through front of the enclosure. Mount starter in NEMA Type 1 or Type 4 enclosure as required by the NEC.
- D. Combination Disconnect Switch Magnetic Starter: Provide full-voltage, non-reversing, combination non-fused disconnect switch and magnetic starter for each motor rated 1/2 horsepower and more, of types, ratings and electrical characteristics indicated; equip with solid state overload relays, control transformer with 120 volt secondary, one secondary fuse and one grounded secondary lead, two normally open and two normally closed auxiliary contacts, hand-off- automatic switch, red and green pilot lights wired and mounted through the front of the enclosure. Mount starter in NEMA Type 1 or Type 4 enclosure as required by the National Electrical Code (NEC).
- E. Three (3) phase, full voltage, non-reversing magnetic motor starters, horsepower rating with minimum NEMA size #0 shall be as follows:

NEMA Size	Continuous Rating	Maximum Horsepower	
		208 Volt	480 Volt
0	18 AMPs	3HP	5HP
1	27 AMPs	7-1/2HP	10HP

2	45 AMPs	10HP	25HP
3	90 AMPs	25HP	50HP
4	135 AMPs	40HP	100HP
5	270 AMPs	75HP	200HP

Motor full-load current shall not exceed continuous ampere rating of starter.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF MOTOR STARTERS**

- A. Install motor starters in accordance with manufacture's written instructions, applicable requirements of NEC, NEMA Standards, and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. The Electrical Contractor shall consult and cooperate with the Control Contractor in assisting him in making control connections to the automatic position of the selector switch and to the auxiliary contacts.
- C. Motor Data: Before installing wiring for motors and starters, the Electrical Contractor shall consult the respective parties furnishing the equipment and obtain from them all data necessary to properly connect the apparatus, and for selection of thermal overload relays in accordance with motor nameplate. Any variance in loads or electrical characteristics from the contract drawings should be reported to the Engineer before proceeding with the work.
- D. When packaged equipment is furnished, all unit starters shall be furnished, mounted and wired by the installing contractor. The Electrical Contractor shall furnish and install a disconnect switch, as specified in Section 260170, and wire between unit's main terminal block and the disconnect switch.
- E. When packaged rooftop equipment is furnished, the unit disconnect switch and all starters shall be furnished, mounted and wired by the installing contractor. The Electrical Contractor shall wire between the line side of the disconnect switch and the building system.
- F. Provide connections for motor starters.

**3.2 ADJUST AND CLEAN**

- A. Inspect operating mechanisms for malfunctioning and where necessary adjust units for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

**3.3 FIELD QUALITY CONTROL**

- A. Subsequent to wire/cable hookup, energize motor starters and demonstrate functioning of equipment in accordance with requirements.

END OF SECTION 26 01 55

**SECTION 26 01 60**

**PANELBOARDS**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Extent of panelboard load-center and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules.
- B. Types of panelboards and enclosures in this section include the following:  
  
Lighting and Appliance Panelboards.  
Distribution Panelboards.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data including specifications, installation instructions and general recommendations, for each type of panelboard required. Include data substantiating that units comply with requirements.
- B. Shop Drawings: Submit dimensioned drawings of panelboards and enclosures showing layouts of enclosures and required individual panelboard devices, including by not necessarily limited to, circuit breakers, contactors, and accessories, including wiring diagrams of contactors.

**1.3 COORDINATION**

- A. The drawings are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate, with other Division Subcontractors, the installation of all raceways, raceway supports, junction boxes and required fittings. This coordination will include conduit layout to allow access to equipment for maintenance.
- B. This coordination shall be carried out prior to actual installation; this shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of construction.
- C. Should the coordination not be carried out prior to installation, and a conflict exists, the installing contractor shall remove and reinstall the equipment as required to clear the conflict at no additional cost to the Owner and no delay in project completion.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of panelboard and enclosure):

Cutler Hammer, Inc. (Eaton)  
General Electric Company  
Square D Company  
Siemens

## **2.2 PANELBOARDS**

### **A. General:**

1. Panelboards shall comply with the following industry standards:
  - a. UL Listing/Approval
  - b. UL Standards:  
Panelboards - UL67  
Cabinet & Boxes - UL50
  - c. National Electric Code
  - d. NEMA Standard -PBI
2. Interiors:
  - a. All interiors shall be completely factory assembled. They shall be so designed that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machining, drilling and tapping.
  - b. Branch circuits shall be arranged using double row construction. A nameplate shall be provided listing panel type and rating.
  - c. Unless otherwise noted, full size insulated neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection. A ground bus will be included in all panelboards.
3. Boxes: Boxes shall be a minimum 20 inches wide and manufactured from galvanized steel. Provide minimum gutter space in accordance with the National Electric Code.
4. Trim:
  - a. Switching device handles shall be accessible. Panel access doors shall not uncover any live parts. Doors shall have flush type cylinder lock and catch except doors over 48" in height shall have auxiliary fastenings top and bottom of door in addition to the flush type cylinder lock and catch. Panelboard trim clamps shall be of the indicating type. Upon removal of screws behind door, the panel interiors become service accessible via piano hinged trim front.
  - b. Panel access door hinges shall be concealed. All locks shall be keyed alike; directory frame shall be welded metal and having a transparent cover shall be furnished with each door.

- c. All exterior and interior steel surfaces of the trim shall be properly cleaned, primed with a rust inhibiting phosphatized coating and finish with a gray ANSI 61 paint. Trims for flush panels shall overlap the box for a least 3/4 inch all around. Surface trims shall have the same width and height as the box. Trims shall be mountable by a screwdriver and without the need for special tools.
5. Main Bus and Branch Circuits: All main bus bars shall be full size aluminum, sized in accordance with U.L. standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C above an ambient of 40 degrees C maximum.
- B. Distribution Panelboards:
1. Panels shall be provided with molded case circuit breakers tested and U.L. labeled per U.L. 489.
  2. Circuit breakers 100 ampere through 400 ampere frame sizes shall be thermal-magnetic trip with inverse time current characteristics.
  3. Where multiple pole circuit breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Molded case circuit breakers shall have a minimum 22,000 symmetrical RMS interrupting capacity at 240 volts.
- C. Lighting and Appliance Panelboards:
1. Provide switching and protective devices in quantities, ratings, types indicated, with anti-turn solderless pressure type lug connectors approved for copper conductors. Circuit breakers shall be the bolt-on, molded case, thermal magnetic type, with toggle handles that indicate when tripped. Where multiple pole circuit breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously.
  2. Panelboards for use at 240 volts AC maximum shall incorporate circuit breakers as shown rated at 10,000 A.I.C. symmetrical at 240 volts.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF PANELBOARDS**

- A. Install panelboards and enclosures where indicated in contract documents and, in accordance with the equipment manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secure.
- C. Provide all required electrical and grounding connections within the panelboards and enclosures.

- D. The Electrical Contractor shall furnish and install on the door within each enclosure, a circuit labeling identification system for all electrical panelboards. The system must satisfy the NEC Article No. 110-22. The directories shall be typed, NOT handwritten.

END OF SECTION 260160

**SECTION 26 01 70**

**MOTOR AND CIRCUIT DISCONNECTS**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Extent of motor and circuit disconnect switch work is indicated by drawings and schedules.
- B. Types of motor and circuit disconnect switches in this section include the following:

- Equipment disconnects.
- Appliance disconnects.
- Motor-circuit disconnects.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data including specifications, installation instructions and general recommendations, for each type of motor and circuit disconnect switch required.

**1.3 COORDINATION**

- A. The drawings are scheme and/or diagrammatic in nature, and indicate the need and intent of the design. These are to be used for general guidance only. It shall be the responsibility of the Electrical Contractor to coordinate, with other Division Subcontractors, the installation of all motor and circuit disconnect switches, supporting hardware, including wiring and conduit, to and from the equipment. This coordination will include conduit layout to allow access to equipment for maintenance.
- B. This coordination shall be carried out prior to actual installation; this shall be done to eliminate the possibility of conflicts between trades on items such as access, clearances and maintenance issues that may arise after completion of construction.
- C. Should the coordination not be carried out prior to installation, and a conflict exists, the installing contractor shall remove and reinstall the equipment as required to clear the conflict at no additional cost to the Owner and no delay in project completion.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following (for each type of switch):

- Cutler-Hammer, Inc. (Eaton)
- General Electric Co.
- Square D Company
- Siemens

**2.2 FABRICATED SWITCHES**

- A. Safety Switches: Safety switches shall be of sizes noted on the drawings, fusible or non-fusible and contained in a general purpose enclosure. All switches shall be type HD and have quick-make, quick-break operation. All switches shall be of proper horsepower rating as applicable and have dual interlocks designed to interlock the switch box door with the switch operating mechanism. Unit shall be provided with a suitable means of interlock release. An arrangement shall be provided for locking the operating handle in the "ON" or "OFF" position. Safety switches shall have the proper type metal enclosure, i.e., standard, weatherproof, etc., to suit their specific location as required by the National Electrical Code.
- B. Fuses: Provide fuses for safety switches, as recommended by switch manufacturer, of classes, types and ratings needed to fulfill electrical requirements for service indicated.
- C. When packaged rooftop equipment is furnished, the unit disconnect switch shall be furnished, mounted and wired by the installing contractor.
- D. When rooftop exhaust fans rated less than 1/2 HP at 120 volts, single phase, are furnished, except utility sets, the unit disconnect switch shall be furnished, mounted and wired by the installing contractor.

**PART 3 – EXECUTION****3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES**

- A. Install motor and circuit disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Install disconnect switches used with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.
- C. Provide electrical connections for motor and circuit disconnect switches.

END OF SECTION 26 01 70

**SECTION 26 01 80**

**OVERCURRENT PROTECTIVE DEVICES**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Extent of overcurrent protective device work is indicated by drawing schedules and specifications.
- B. Types of overcurrent protective devices in this section include the following:
  - 1. Service entrance rated disconnect.
  - 2. Molded case circuit breaker.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on overcurrent protective devices, including: voltages and current ratings, interrupting ratings, current limitations, internal inductive and non-inductive loads, time-current trip characteristic curves, and mounting requirements.
- B. Shop Drawings: Submit layout drawings of overcurrent protective devices, showing spatial relationships of units to associated electrical equipment, and connections to electrical power supplies.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
  - 1. Circuit-Breakers
    - Cutler-Hammer, Inc. (Eaton)
    - General Electric Co.
    - Square D Co.
    - Siemens

**2.2 CIRCUIT BREAKERS**

- A. Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, as required for a complete installation.

- B. Service Entrance Rated Disconnect: The 208V service disconnect device shall be a molded-case circuit breaker totally front accessible and front connectable. The circuit breaker shall be a three pole device suitable for operation on a 60 Hertz system. Circuit breaker shall have 25,000 RMS symmetrical amperes interrupting rating, and shall be UL approved for Service Entrance equipment.
- C. Molded-Case Circuit Breakers: Provide factory assembled, molded-cased circuit breakers of frame size indicated; 120/208 volts, 60 Hertz, one, two, or three poles with a short circuit symmetrical ampere interrupting rating as indicated by the panel schedule and/or as shown by the single line riser diagram. Provide circuit breakers with permanent thermal instantaneous magnetic trips in each pole with ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Construct devices for mounting and operating in any physical position and operating in an ambient temperature of 40 degrees C. Provide circuit breakers with mechanical screw type connector lugs, AL/CU rated.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES**

- A. Install overcurrent protective devices as indicated in contract documents, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC Standards for Installation of overcurrent protective devices.
- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.
- C. Fasten circuit breakers without causing mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

#### **3.2 ADJUST AND CLEAN**

- A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

#### **3.3 FIELD QUALITY CONTROL**

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 26 01 80

**SECTION 26 01 90**

**SUPPORTING DEVICES**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Types of supports, anchors, sleeves and seals specified in this section include the following:

Hangers.  
Riser Clamps.  
C-clamps  
I-beam clamps.  
One-hole conduit straps.  
Two-hole conduit straps.  
Round steel rods.  
Lead expansion anchors.  
Toggle bolts.  
U-Channel Strut Systems.

**PART 2 – PRODUCTS**

**2.1 MANUFACTURED SUPPORTING DEVICES**

- A. Provide supporting devices, complying with manufacturer's standard materials, design and construct in accordance with published product information, and as required for a complete installation, and as herein specified.
- B. Supports: Provide supporting devices of types, sizes and materials having the following construction features:

Hangers: For supporting EMT conduit, electro-galvanized steel, with 1/4" minimum diameter hole for round steel rod; approximately MSS types 5, 7, 9 or spring steel conduit clips.

Reducing Couplings: Steel rod reducing coupling, 1/4" minimum black steel.

C-Clamps: Black malleable iron, 1/4" minimum rod size.

I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approx. 52 pounds per 100 units.

One-Hole Conduit Straps: For supporting EMT conduit, electro- galvanized steel.

Two-Hole Conduit Straps: For supporting EMT conduit, electro-galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.

Hexagon Nuts: For 1/4" rod size; galvanized steel.

Round Steel Rod: Black steel; 1/4" min. dia.

Offset Conduit Clamps: For supporting rigid metal conduit; black steel.

- C. Anchors: Provide anchors of types, sizes and materials indicated; and having the following construction features:

Lead Expansion Anchors: 1/4" - 20 Minimum .

Toggle Bolts: Springhead; 3/16 x 4".

- D. Manufacturer: Subject to compliance with requirements, provide anchors of the following:

Ackerman Johnson Fastening Systems, Inc.  
Elcen Metal Products Co.  
Ideal Industries, Inc.  
Rawlplug Co., Inc.  
Star Expansion Co.  
U.S. Expansion Bolt Co.  
Erico Products, Inc. (Caddy)

- E. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 16-gauge hot dip galvanized steel, construct with 9/16" dia. holes, 8" o.c. on top surface, with standard hot dip galvanized finish, and with the following fittings which mate and match with U-channel.

Beam clamps.  
Thinwall conduit clamps.  
Conduit hangers.  
U-bolts.

- F. Manufacturers: Subject to compliance with requirements, provide channel systems of one of the following:

B-Line Systems, Inc.  
Elcen Metal Products Co.  
Power-Strut Div.; Van Huffel Tube Corp.  
Unistrut Div.; GTE Products Corp.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF SUPPORTING DEVICES**

- A. Install hangers and anchors in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.

- B. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with maximum spacings.

END OF SECTION 26 01 90

**SECTION 26 01 95**

**POWER SYSTEM STUDIES**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Short circuit studies, protective device evaluation studies and protective device coordination studies shall be performed by the switchboard manufacturer. The studies shall be submitted to the Engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment for manufacture.
- B. The studies shall include all portions of the electrical distribution System. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.

**PART 2 – DATA ACQUISITION**

**2.1 DATA COLLECTION FOR THE STUDIES**

- A. The Contractor shall provide the required data for preparation of the studies. The switchboard manufacturer shall furnish the contractor with a listing of the required data immediately after award of the contract.
- B. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to release of the equipment for manufacture.

**2.2 SHORT CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY**

- A. The short circuit study shall be performed with the aid of a digital computer program and shall be in accordance with ANSI C37.5-1969 (R1975), IEEE Std. 320-172 and IEEE Std. 141-1976.
- B. The study input data shall include the Power Company's short circuit contribution, resistance and reactance components of the branch impedances, the X/R ratios, base quantities selected, and other source impedances. This data shall be obtained by the contractor from Delmarva Power.
- C. Short circuit close and latch duty values and interrupting duty values shall be calculated on the basis of assumed three-phase bolted short circuits at each switchgear bus, medium voltage controller, switchboard, low voltage motor control center, distribution panelboard, pertinent branch circuit panel and other significant locations through the system. The short circuit tabulations shall include symmetrical fault currents and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contribution from each connected branch, shall be listed with its respective X/R ratio.
- D. A protective device evaluation of circuit breakers, disconnect switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating

standards shall be applied. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the Engineer's attention.

### **2.3 PROTECTIVE DEVICE COORDINATION STUDY**

- A. A protective device coordination study shall be performed to provide the necessary calculations and logic decisions required to select the protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings.
- B. The coordination study shall include all medium and low voltage classes of equipment from the building service protective devices down to and including the largest rated device in the MCC low voltage motor control center and panelboard. The phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices.
- C. The time-current characteristics of the specified protective devices shall be drawn on Keuffel and Esser Log - log paper. The plots shall include complete titles, representative one-line diagram and legends, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breaker trip curves and fuses. The coordination plots shall indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves shall be maintained. The coordination plots for phase and ground protection devices shall be provided on a system basis. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.
- D. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios and connection, manufacturer and type, range of adjustment and recommended settings. Any discrepancies, problem areas, or inadequacies shall be promptly brought to the Engineer's attention.

### **2.4 STUDY REPORT**

- A. The results of the Power System Study shall be summarized in a final report. Submit six (6) bound copies of final report.
- B. The report shall include the following sections:
  - 1. Description, purpose, basis and scope of the study and a single line diagram of that portion of the power system which is included within the scope of the study.
  - 2. Tabulations of circuit breakers, and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
  - 3. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, and commentary regarding same.

4. Fault current calculations including a definition of terms and guide for interpretation of computer printout.

### **PART 3 – EXECUTION**

#### **3.1 PROTECTIVE DEVICE TESTING, CALIBRATION AND ADJUSTMENT**

- A. The equipment manufacturer shall provide the services of a qualified field Engineer any necessary tools and equipment to test, calibrate and adjust the protective relays and circuit breaker trip devices as recommended in the Power System Study.

END OF SECTION 26 01 95

**SECTION 26 04 52**

**GROUNDING**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Types of grounding in this section include the following:

Grounding:

Underground metal piping.  
Underground metal water piping.  
Grounding rods.  
Service equipment.  
Enclosures.  
Systems.  
Equipment.  
Building Structural Steel (Bonding)

**PART 2 – PRODUCTS**

**2.1 GROUNDING**

- A. Except as otherwise indicated, provide each electrical grounding system indicated, with assembly of materials including, but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), and other items and accessories needed for complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA, and established industry standards for applications indicated.
- B. Provide conduit, tube, duct, cable and fittings complying with Division 26 Basic Materials and Methods section, "Raceways", in accordance with the following listing:

Rigid steel conduit.  
Electrical metallic tubing.  
Flexible metal conduit.  
Liquid-tight flexible metal conduit.  
Rigid metal conduit fittings.  
EMT fittings.  
Flexible metal conduit fittings.  
Liquid-tight flexible metal conduit fittings.  
Manufactured Cabling Systems

**2.2 ELECTRICAL GROUNDING CONDUCTORS**

- A. Unless otherwise indicated, furnish a green insulated equipment grounding conductor for all feeders and branch circuits, matching power supply wiring materials and sized according to NEC.

**2.3 BONDING PLATES, CONNECTIONS, TERMINALS & CLAMPS**

- A. Provide electrical bonding plates, connectors, terminals and clamps as recommended by bonding plate, connector, terminal and clamp manufacturers for applications.

**2.4 GROUND RODS & PLATES**

- A. Ground Rods: Steel with copper welded exterior, 3/4" dia. x 10'.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF GROUNDING SYSTEMS**

- A. Install electrical grounding systems in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding complies with requirements. Comply with requirements of NEC, NESC, NEMA and UL standards for installation of grounding systems.
- B. Coordinate with other electrical work as necessary to interface installation of grounding system with other work.
- C. Clamp cable connections to ground rods.
- D. Install bonding jumpers with ground clamps on water meter piping to electrically bypass water meter.
- E. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

**3.2 FIELD QUALITY CONTROL**

- A. Upon completion of installation of electrical grounding system, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, take appropriate action to reduce resistance to 25 ohms or less by driving additional ground rods and/or by chemically treating soil encircling ground rods with sodium chloride, calcium chloride, copper sulphate, or magnesium. Then retest to demonstrate compliance.

END OF SECTION 26 04 52

**SECTION 26 04 70**

**DISTRIBUTION CIRCUITS**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Distribution circuit work is indicated by drawings and schedules.
- B. The distribution circuits shall include furnishing and installing a complete wire and conduit system between distribution panelboards and branch circuit panelboards.
- C. Types of equipment to be furnished and installed in this section include the following:

- Rigid Metal Conduit
- Intermediate Metal Conduit (IMC)
- Electrical Metallic Tubing (EMT)
- Wires and Cables
- Junction Boxes
- Pull Boxes
- Conduit Bodies
- Bushings
- Locknuts
- Supporting Devices

**PART 2 – PRODUCTS**

**2.1 DISTRIBUTION CIRCUITS**

- A. Furnish and install each distribution circuit indicated, with assembly of materials, including but not necessarily limited to, conduit, wire, pull boxes, junction boxes and other items and accessories needed for a complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF DISTRIBUTION CIRCUITS**

- A. Install distribution circuits complying with equipment manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Multiple circuits within a single raceway shall not be permitted under this section.

END OF SECTION 26 04 70

**SECTION 26 04 71**

**FEEDER CIRCUITS**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Feeder circuit work is indicated by drawings and schedules.
- B. The feeder circuits shall include furnishing and installing a complete wire and conduit system between distribution panelboards and major 3 phase loads, between power panels and 3 phase motor loads.
- C. Types of equipment to be furnished and installed in this section include the following:

- Rigid Metal Conduit
- Electrical Metallic Tubing (EMT)
- Intermediate Metal Conduit (IMC)
- Wires and Cables
- Junction Boxes
- Pull Boxes
- Conduit Bodies
- Bushings
- Locknuts
- Supporting Devices

**PART 2 – PRODUCTS**

**2.1 FEEDER CIRCUITS**

- A. Furnish and install each feeder circuit with assembly of materials, including but not necessarily limited to, conduit, wire, pull boxes, junction boxes and other items and accessories needed for a complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

**PART 3 – EXECUTION**

**3.1 INSTALLATION OF FEEDER CIRCUITS**

- A. Install feeder circuits, complying with equipment manufacturer's written instructions, applicable requirements of NEC, NEMA and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Multiple circuits within a single raceway shall not be permitted under this section.

END OF SECTION 26 04 71

**SECTION 26 04 72**

**BRANCH CIRCUITS**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Branch circuit work is indicated by drawings.
- B. The branch circuits shall include furnishing and installing a complete wire and conduit or cable system between panelboards and lighting fixtures, receptacles, fractional horsepower motors, and small single phase loads.
- C. Types of equipment to be furnished and installed in this section include the following:

- Rigid Raceways – See Section 260110
- Electrical Metallic Tubing (EMT)
- MC (Metal Clad) (Concealed Work only)
- Wires and Cables
- Junction Boxes
- Pull Boxes
- Conduit Bodies
- Bushings
- Locknuts
- Supporting Devices

**PART 2 – PRODUCTS**

**2.1 BRANCH CIRCUITS**

- A. Furnish each branch circuit with an assembly of materials, including but not necessarily limited to, conduit, wire, cable, pull boxes, junction boxes and other items and accessories needed for a complete installation. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

**2.2 CONVENIENCE BRANCH CIRCUITS**

- A. Intent:
  - 1. The intent of this portion of the specifications is to describe the requirements of a convenience circuit as it applies to 120-volt receptacles.
  - 2. All convenience branch circuits may consist of more than one 120 volt receptacle.
- B. Convenience Circuit - General: A circuit consisting of a phase and neutral conductor, which may share its neutral with other phase conductors provided that the neutral conductor does not become overloaded due to circuit phase relationship. This type of circuit shall also include an equipment grounding conductor as described under the grounding section of the specifications.

- C. Convenience Circuit - Dedicated: A circuit consisting of a phase and neutral conductor which DOES NOT share conductors with any other circuits. This type of circuit shall also include an equipment grounding conductor as described under the grounding section of the specifications.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF BRANCH CIRCUITS**

- A. Install branch circuits, complying with equipment manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
- B. Multiple circuits within a single raceway or cable shall be permitted under this section. It shall be the responsibility of the Electrical Contractor to assure that the neutral conductors do not become overloaded due to circuit phase relationship, and isolated grounds not become voided or compromised due to miswiring or wrong connections.
- C. The Electrical Contractor may elect to use metal clad cable in lieu of electrical metallic tubing (EMT) in wall cavities, and/or above tile or dry wall ceilings. In all areas of exposed construction, electrical metallic tubing (EMT) shall be installed.

END OF SECTION 26 04 72

**SECTION 26 05 10**

**BUILDING LIGHTING**

**PART 1 – GENERAL**

**1.1 DESCRIPTION OF WORK**

- A. Lighting fixture work is indicated by specifications, drawings and schedules.
- B. Types of lighting fixtures in this section include the following:
  - 1. Fluorescent.
  - 2. Incandescent.
  - 3. High Intensity Discharge.
- C. Applications of lighting fixtures required for the project include the following:
  - 1. General Lighting.
  - 2. Supplementary Lighting.
  - 3. Emergency Lighting.

**1.2 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on building lighting fixtures.
- B. Shop Drawings: Submit dimensioned drawings of lighting fixture installations, including but not necessarily limited to, layout, relation to associated panelboards, and connections to panelboards. Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with project specifications and requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - 1. Refer to "Lighting Fixture Schedule", on the drawings, for fixture types and acceptable manufacturers.
- B. Each lighting fixture type specified represents a specific style and quality of fixture acceptable for this project. Equivalent manufacturers listed are consider to have lighting fixtures which meet or exceed those of the originally specified manufacturer.

- C. The Engineer reserves the right to reject any shop drawing and to request a resubmission should the contractor submit a shop drawing of an equivalent manufacturer which is viewed as being of an incompatible style or inferior quality.
- D. No fixture shop drawing shall be submitted, nor will any be accepted, for any manufacturer which is not specifically listed for that fixture type. When a fixture manufacturer is listed for a specific fixture type, this does not provide him with the right to submit for fixtures he is not listed under. A bidding Contractor may elect to submit non listed fixtures for the Engineer's review, a minimum of ten (10) working day prior to bid, if the Engineer agrees that the submitted fixture meets the intended design than a written addendum will be issued, if no addendum is issued than the manufacturer shall not submit shop drawings for that fixture type. The Engineer, and only the Engineer shall make the final decision on whether the submitted fixture meets the project's requirements.
- E. Should the Contractor be unable to obtain approval of the resubmitted manufacturer, than he should submit a fixture from one of the other equivalent manufacturers listed or from the originally specified manufacturer.

## 2.2 LIGHTING FIXTURES

- A. Provide lighting fixtures of the size, type and rating indicated complete with, but not necessarily limited to, housings, lamp holders, reflectors, ballast, lamps, mounting frames, pendants and wiring; wired and connected in place, complete, tested and left in satisfactory operating condition.
- B. Fluorescent Lamp Ballasts:

### Section 1 - Physical Characteristics

1. The ballast shall be physically interchangeable with a standard core & coil electromagnetic ballast.
2. The electronic ballast shall be provided with integral leads, color coded to ANSI standard C82.11 (latest version).

### Section 2 - Performance Requirement

1. The "High Frequency" electronic ballast shall operate lamps at a frequency of 20 KHz or higher without visible flicker.
2. The electronic ballast's input current shall have Total Harmonic Distortion (THD) of less than 20% when used with primary lamp.
3. The electronic ballast shall have a Power Factor greater than 98% when used with primary lamp.
4. The electronic ballast shall have Lamp Current Crest Factor of less than 1.7, in accordance with lamp manufacturers' recommendations and ANSI C82.11.

5. The electronic ballast shall support a sustained short to ground or open circuit of any output lead without damage to the ballast.
6. The electronic ballast shall have an audible noise rating of Class A or better.

Section 3 - Regulatory Requirements

1. Ballast shall meet the requirements of the Federal Communications Commission Rules and Regulations, Part 18, for non-consumer equipment.
2. The electronic ballast shall meet ANSI C82.11 standards regarding harmonic distortion.
3. Ballast shall meet ANSI C62.41 Cat. A for transient protection.
4. The electronic ballast shall comply with all applicable state and federal efficiency standards.
5. The electronic ballast shall be Underwriters' Laboratories (UL) listed (Class P) and CSA Certified where applicable.

Section 4 - Other

1. The electronic ballast shall not contain Polychlorinated Biphenyls (PCB's).
2. The electronic ballast shall carry a five year (5) warranty.

C. High Intensity Discharge Ballasts

Section 1 - Physical Characteristics

1. The ballast shall be either a open core and coil mounted within the fixture or an encapsulated core and core.
2. With both types the capacitor and the igniter are mounted separately within the fixture.

Section 2 - Performance Requirement

1. Where quiet performance is required the standard open core and coil shall be potted in a cube-shaped steel can utilizing Class H (180 Deg. C.) polyester compound.
2. Encapsulated ballasts shall carry a Class A noise rating up through 175 watts and Class B for 250 and 400 watts.
3. The ballast shall be designed with multiple input voltage taps on the primary coil. The four (4) tap design shall operate on 120 volt, 208 volt, 240 volt and 277 volt.

Section 3 - Regulatory Requirements

1. Ballast shall be Underwriters' Laboratories (UL) listed in accordance with UL 1029.

2. Ballast shall be designed and manufactured in accordance with ANSI C82.4.
- D. Fixture Lamps: For the type, number and color of the fixture lamps, refer to the Lighting Fixture Schedule on the drawings.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION OF LIGHTING FIXTURES**

- A. Install lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA Standards and with recognized industry practices to ensure that lighting fixtures fulfill requirements of the project.
- B. Install lighting fixtures in removable tile ceilings using 3/8" flexible metal conduit with 3 # 12 awg. conductor. Maximum length of flexible lead shall not exceed 60". Flexible lead shall extend from the fixture to the junction box. The junction box shall be securely fastened to the building structure above the removable tile ceiling and shall not serve more than two (2) lighting fixtures, nor shall the junction box support any of the lighting fixtures.

#### **3.2 LIGHTING FIXTURE MOUNTING**

- A. 1' x 4', 2' x 2' and 2' x 4' fluorescent fixtures installed in a removable tile ceiling shall be installed using T-Bar grid safety clips as provided by the fixture manufacturer and as required by the NEC.
- B. 2' x 2' and 2' x 4' fluorescent fixtures installed in a removable tile ceiling shall be installed using support wires at all four corners of the fixture. The support wires shall be carried up to the building structure and securely anchored using screwed or bolted hardware. Pressure type clips will not be acceptable. The Electrical Contractor shall be responsible for installing or having installed these four (4) support wires.
- C. 1' x 4' fluorescent fixtures installed in a removable tile ceiling shall be installed using support wires at two (2) corners of the fixture. The support wires shall be carried up to the building structure and securely anchored using screwed or bolted hardware. Pressure type clips will not be acceptable. The Electrical Contractor shall be responsible for installing or having installed these Two (2) support wires.
- D. Incandescent and fluorescent downlights installed in a removable tile ceiling shall be installed using 24" spreader bars attached to the T-Bar grid system. Two (2) support wires shall be installed, one (1) on each side of the fixture and centered between the spreader bars, these support wires shall be carried up to building structure and securely anchored using screwed or bolted hardware. Pressure type clips will not be acceptable. The Electrical Contractor shall be responsible for installing or having installed these two (2) support wires.
- E. Pendant lighting fixtures, either chain, cable or stem hung below a removable tile ceiling shall be installed in accordance with fixture manufacturer's written instructions and recommendations. The Electrical Contractor shall furnish and install support wire or

threaded rod from the fixture mounting hardware up to building structure and securely anchor using screwed or bolted hardware. Pressure type clips will not be acceptable. These support devices shall be independent from the ceiling T-Bar grid system, the system may be used as a guide, but in no way shall the T-Bar grid system carry any of the weight produced by the fixture or its support devices.

- F. Surface mounted fixtures installed on removable tile ceilings or dry wall ceilings shall be installed in accordance with fixture manufacturer's written instructions and recommendations.
1. Fixtures installed on removable tile ceilings shall be anchored to the T-Bar grid system using snap-on clips with threaded studs and wing nuts. The Electrical Contractor shall furnish and install a support wire from each snap-on clip carried up to building construction and securely anchor using screwed or bolted hardware.
  2. Fixtures installed on dry wall ceilings shall be mounted using spring-loaded toggle bolts. The number and location of the anchors shall depend on the fixture manufacturer's written instructions and recommendations. It shall be the responsibility of the Electrical Contractor to follow these instructions and recommendations.

### **3.3 ADJUST and CLEAN**

- A. Clean lens, reflectors and interiors of all lighting fixtures of dirt and construction debris upon completion of installation.
- B. Protect installed lighting fixtures from damage during the remainder of the construction period.

### **3.4 FIELD QUALITY CONTROL**

- A. Upon completion of the installation of the lighting fixtures, and after the building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with project requirements. Where possible, correct malfunctioning units at the site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
- B. At the time of Substantial Completion, replace lamps in lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by the Architect/Engineer. Furnish stock or replacement lamps amounting to 15% (but not less than one (1) lamp in each case) of each type and size used in each type of fixture. Deliver the replacement stock as directed to the Owner's storage area.
  1. Refer to Division 1 sections for the replacement/restoration of lamps in lighting fixtures, where used for temporary lighting prior to the time of Substantial Completion.
- C. Replace defective and burned out lamps for a period of one (1) year following the time of Substantial Completion.

**3.5 GROUNDING**

- A. Provide tight equipment grounding connections for each lighting fixture installation, in accordance with fixture manufacturer's recommendations and the NEC's requirements.

END OF SECTION 26 05 10

**SECTION 26 07 40**

**NETWORK CABLING SYSTEMS**

**PART 1 – GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Refer to other sections for General Requirements, etc., which shall apply to the work specified in this section. The following specifications for network cabling are based on the Communications Cabling Construction Standards generated and implemented for all State of Delaware schools and was developed by the State of Delaware, Center for Educational Technology (DCET).
- B. The following names shall be the only hardware and cable manufacturer's considered for this project at this time:
  - 1. Hardware
    - a. Ortronics, Inc.
  - 2. Wire and Cable
    - a. Berk-Tek
    - b. Mohawk/CDT
- C. The Electrical Contractor shall utilize one of the State approved vendors for furnishing, installation and testing of telecommunications cabling and equipment. The vendor's list can be obtained from the State of Delaware, Office of Management and Budget for Contract No. GSS09441A – Telecom CBL.
- D. The contractor must be certified and authorized for the installation of premises cabling systems and shall assume responsibility for certifying new installations and providing a warranty for a period of no less than 25 years.
- E. In general, the network sub-contractor will furnish, install and test all cabling and terminations herein specified for distribution of the station/field wiring.

**1.2 SCOPE**

- A. Perform all work necessary and/or required and furnish all materials and equipment for a complete network cabling system as described herein.
- B. The data communications system shall be installed, consisting of the following components:
  - 1. Twisted pair copper work station cabling
  - 2. Work station outlets
  - 3. Cable support system
- C. The hardware shall include equipment racks, patch panels, station outlets, Cat 6 data cables, all required terminations and labeling to provide for a complete data distribution system.

- D. In general, one or more data outlets shall be provided for each computer station in offices where indicated on floor plans.

### **1.3 SUBMITTALS**

- A. Furnish shop drawings and descriptive data, complete with project designations for the following:
  - 1. Equipment Racks
  - 2. Patch Panels
  - 3. Station Outlets
  - 4. Cat 6 Data Cables
  - 5. Cable Support System
  - 6. Wire Management Materials

### **1.4 DOCUMENTATION**

- A. The contractor shall provide a complete system walk-through, by suitably qualified personnel, to personnel designated by the owner, to instruct them on the installed system's location, operation and maintenance.
- B. Prior to assembly and installation, the contractor shall submit the following, on reproducible media, to the engineer for review
  - 1. Final schematic drawings of all circuitry, including outlet conductor assignments and all component callouts.
  - 2. Equipment modifications drawings.
  - 3. Front mechanical drawings of each equipment rack.
- C. At the completion of the installation, the contractor shall provide one (1) copy of each of the following:
  - 1. Equipment manufacturer's operation and maintenance manuals for each piece of equipment.
  - 2. "As-built" drawings for all equipment installed.
  - 3. "As-built" drawings on contract blueprints of all wire, cable and conduit placement throughout the building.
  - 4. "From-To" listing of in-building wiring and outlets, listing color coding scheme and conductor assignments.

## **PART 2 – PRODUCTS**

### **2.1 DATA OUTLETS**

- A. The jacks used for the data outlets shall be of the modular snap-in type.. A modular 110 PCB RJ-45 telephone jack (45\* angle) will be used for all voice grade cable terminations. A

modular 110 PCB RJ-45 data jack (45\* angle) will be used for all Cat 6 data grade cable terminations. All modular jacks will be mounted in a single or double gang faceplate based on the number of services required at that station. All RJ-45 jacks shall have dust covers installed.

The jack color code and lettering scheme is as follows:

- |                   |                          |                 |
|-------------------|--------------------------|-----------------|
| 1. Telephone Jack | Cat 5e voice grade cable | red tab – Voice |
| 2. Data Jack      | Cat 6 data grade cable   | blue tab – Data |

## **2.2 MDF and IDF EQUIPMENT RACKS**

- A. The MDF shall contain a minimum of one (1) 23.75” wide x 7’-0” high equipment rack to mount the data electronics and patch panels onto. The equipment racks shall have 77.75” of rack mounting space on 19” wide rails.
- B. The free-standing equipment racks shall be steel, grounded and bolted to each other and to the slab. All racks shall include rack top cable tray, cable management equipment and a 120 volt power strip.

## **2.3 HORIZONTAL DISTRIBUTION SYSTEM**

- A. Horizontal Cable Specifications:
  - 1. Plenum, 4 pair, 24 awg, Category 6 data cable (blue jacket).
  - 2. Plenum, 4 pair, 24 awg, Category 5e voice cable (gray jacket).
- B. Cable Support Systems:
  - 1. Cable support system shall be a hanger and plastic mesh system designed to support Video cables, telephone cables and high performance data cables. Caddy Cat. No. CatTrax Series or approved equal.
  - 2. Cable Tray shall be a 12” wide aluminum tray with a 4” load depth and 6” rung spacing. Tray shall be complete with all mounting hardware required. B-Line Systems, Inc. Cat. No. 25A06-12-144 or approved equal.

## **2.4 CABLE TERMINATIONS**

- A. All office data outlet jacks shall be wired with Cat 6 data cable using the TIA/EIA-568-B standards. In the MDF rooms the data contractor shall furnish and install rack mounted patch panels, the number of patch panels and number of required ports shall be based on the number of data outlets being terminated. On the rear of these patch panels the data contractor shall terminate each Cat 6 cable from each office data outlet. Each port shall be labeled as to room and data outlet served.
- B. In the IDF and MDF rooms the data contractor shall furnish and install on the plywood backboards, the required number of 110 termination punch down blocks with block covers and wire manager to terminate all office, work and conference room telephone outlet cables.

Each four (4) pair termination block shall be labeled as to room and telephone outlet served. Next to the outlet termination blocks the data contractor shall furnish and install on the plywood backboard, the required number of 110 cross-connect punch down blocks with block covers and wire manager to terminate the trunk cable from the MDF room. The data contractor shall terminate and cross-connect the trunk cables.

### **PART 3 – EXECUTION**

#### **3.1 INSTALLATION PRACTICES**

- A. Installation shall include delivery, unloading, setting in place, fastening to walls, floors, ceilings, or other structures where required, interconnecting wiring of system components, equipment alignment and adjustment, and all other related work whether or not expressly defined herein. Installation shall be performed in accordance with applicable standards, codes, requirements and recommendations of National, State, and Local authorities having jurisdiction, and the N.E.C. (National Electrical Code).
- B. All boxes, equipment, etc., shall be installed plumb and square, and firmly secured in place.
- C. Conduit sleeves shall be installed from the station outlet to within 12” of the cable support system. These sleeves shall be the responsibility of the data contractor and are required to accommodate both the data and communication wiring. After completion of the data and communication wiring the data contractor shall fire seal all sleeves with a UL approved fire stop in accordance with the NFPA (National Fire Protection Agency).
- D. All sleeves shall be EMT conduit installed with plastic conduit bushings to protect data and communication wiring from damage.
- E. In all cases, the Cat 6 data, and all communication cables shall be installed above the ceiling structure in the cable support system. No cable shall be exposed on any ceiling or wall, nor shall any cable lay-on or be in contact with the ceiling structure or its support system. The data contractor shall furnish and install large conduit sleeves above non-accessible ceilings where the cable support system must pass through, these sleeves shall be sized to handle both data and communication cabling.

#### **3.2 CABLE INSTALLATION**

- A. All data cables shall be installed in accordance with manufacturer’s recommended tension and bending specifications. Any lubricants used must be manufacturer guaranteed to be non-destructive to cable sheaths.
- B. All data cables shall be permanently marked with a wrap-around vinyl self-laminating printable marker label (Thomas & Betts E-Z-CODE WSL or approved equivalent) at both ends. There shall be no unmarked cables within the system at any location. Labels shall contain the room number, and the location and drop number within the room. All labeling shall be typed onto the label, not handwritten. Label all cable ends and individual jacks. All jacks shall be labeled to provide visibility when viewed behind cabinets and desks. All cables shall be labeled with jack numbers to permit identification in the event of damage to jacks.

- C. All data and communication cables shall not be run in close proximity to, in the same bundle, or parallel with power cables, in order to reduce signal contamination.
- D. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.

### **3.3 TESTING**

- A. General Test Procedures: Before an application for final acceptance of the work will be considered, all tests stated within this section shall be satisfactorily completed. The data work shall include miscellaneous tasks, (i.e.. removal of station faceplates) deemed necessary to demonstrate compliance with the requirements of the data specifications, and cable and equipment manufacturer's recommended installation procedures.
- B. Upon completion of testing and problem resolution, all connections must be 100% error free: "Error Free" is defined to mean the item meets all the manufacturer's specifications and recommendations as published in their latest manufacturing manuals for proper installation and testing. In addition, the item must conform with all other related industrial practices and standards, Building Trades, and Electrical and Telecommunications Industry Standards and Practices.
- C. Copper Cable Test Procedures: Contractor must complete cable system performance verifications on all copper and fiber cable as specified below and provide the test results. Category 6 cables must meet or exceed all manufacturer's and EIA/TIA standards for performance and installation.
  - 1. All copper testing documentation is to be submitted.
  - 2. After the installation is complete, in addition to any other required testing, the data contractor shall at a minimum, conduct and report on the following tests of copper cabling:
    - a. MDF tests of all new pairs installed under this contract to determine continuity, shorts, crossed pairs, correct pinning and grounds.
    - b. IDF to information outlet tests of all cable pairs installed under this contract to determine continuity, shorts, crossed pairs, correct pinning and grounds.
    - c. The Category 6 cabling, serving jacks installed from the MDF closet to the data outlets at the workstations is to be manufacturer verified and warranted for Category 6 compliance. All manufacturer's performance certificates and extended warranties are to be provided upon completion of the testing and manufacturer certification.
    - d. All Category 6 cabling is to be tested end to end and documented for Category 5e compliance at all frequencies up to and including 5500 MHz. Such testing is to comply with procedures and standards outlined by the cable manufacturer and EIA/TIA TSB-67 concerning testing of Category 6 cable plant. A Microtest Pentascanner Level 11 tester with 2 Way Injector is the instrument to be used for

such testing to insure that cable pairs are defect free. "Defect Free" for the copper cable is defined as a copper pair not having any pair reversals, split pairs, shorts or opens. Test results shall be provided to the Engineer within 2 days after testing or 5 days prior to the Owner connecting electronic equipment onto the cable network, whichever is sooner. The data contractor must also provide testing summary reports of all Category 6 cables including run numbers, and pass/fail results with respect to length, impedance, DC resistance, mutual capacitance, attenuation, NEXT loss and active ACR. The data contractor must also provide spread sheet analysis of the linearly dependent parameters of length DC resistance, mutual capacitance and attenuation the field measured values shall be compared to the specifications values on one spread sheet.

- e. In the event that a Category 6 cable fails to perform to the manufacturer's specifications, the data contractor will remove the cable and replace it with a new cable. Replacing the defective cable at no additional expense to the contract.
- f. End-to-end testing is required for every RJ-45 connection. "End-to-End" testing is defined here as testing all cable links to the very last termination point.
- g. The data contractor shall provide copies of all copper cable test results.

D. Documentation:

- 1. Proper labeling and documentation will allow a technician to quickly trace a particular cable link and will significantly reduce the time and cost of moves, adds, changes and troubleshooting. Both labeling and documentation depend on the use of a system-wide coding scheme that will identify and locate each component of the data system and allow all components to be linked in a logical fashion.
- 2. There are three components of wiring system documentation:
  - a. Labeling data closet termination areas aids in identifying the source and function of a circuit.
  - b. A labeling scheme simplifies the documentation process.
  - c. "As-built" documents provide a permanent record of data infrastructure. These documents are a critical management resource. As a result, it is imperative that "as built" documentation be prepared as part of the data infrastructure project. In addition, these documents must be kept current throughout the system's life cycle.

E. Cable and Data Outlet Identification:

- 1. The data contractor shall furnish and install cable tags labeled with identifying cable numbers.
- 2. The data contractor shall clearly and consistently mark the appropriate designation strip labels on all hardware. Data contractor shall submit for approval a sample of all designation labels.

3. The data contractor shall affix outlet identification labels, machine printed or typed, with identifying cable numbers.
4. Subsequent to pulling and terminating cables, the data contractor shall place the appropriate cable tags within six (6) inches of each Category 6 cable.
5. If at any time during the project, the cable tape becomes illegible or removed, the data contractor shall immediately replace it with a duplicate preprinted cable tag.
6. The data contractor shall provide a listing keyed to cable types of all cable identification numbers.
7. Data contractor shall label each data outlet with the following label scheme:

If the MDF closet "A" is the origination point of the cable feeding the data outlet "007" in classroom 129, the following is the configuration of the label to be installed:

MDF Closet – Room-data outlet

Example: A-129-007

Data contractor will submit for approval sample of all data outlet designation labels.

F. As-Built Documentation:

1. Maintaining records and documents is the most important portion of the administration of a data infrastructure. Maintenance and moves, adds and changes can become very tedious if a current set of records and documents are not maintained. In fact, isolation and resolution of problems are often delayed because configuration information is either unavailable or outdated.
2. Subsequent to the installation and prior to acceptance, the data contractor shall prepare and issue As-Built drawings, in an AutoCAD R-14 or earlier format, that shall reflect the lengths of cables installed, the actual manner and conditions of installation, including all deletions from additions to or departures from the contract documents. The documents are to include the data outlet station numbers and cable routing where it varies from the original plan. A copy of these documents will be stored in the MDF, with a master copy located at the School District's office.

END OF SECTION 26 07 40

**SECTION 311000**

**SITE CLEARING**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. Site Preparation shall consist of clearing of the site within the limits of construction to include the following:
  - 1. Removal and disposal of trees and brush, weeds, roots, and similar materials.
  - 2. Removal and disposal of structures, paving, base course, utilities, concrete sidewalks and aprons, and all other obstructions which are designated on the Plans for removal during construction.
  - 3. Topsoil stripping and stockpiling.
  - 4. Protection of existing utilities and adjacent property, structures, benchmarks, and monuments.

1.02 STANDARDS

- A. The quality and performance of work specified in this section shall be in accordance with the Delaware Department of Transportation Standard Specifications for Road and Bridge Construction, dated August 2001 (hereinafter referred to as the "Standard Specifications").
  - 1. Section 201: Clearing and Grubbing
  - 2. Section 211: Removal of Structures and Obstructions.

1.03 PHASING

- A. Clearing, grubbing, and removal shall be performed prior to the grading and stripping operations, within the limits of grading, as indicated on the drawings and as specified herein. Following clearing, topsoil shall be stripped and stored for later use on the site or disposition by the Owner.

1.04 PROTECTION

- A. The Contractor shall protect all trees, shrubs, ground plants, roads, walks, pavements, structures, civil improvements, and appurtenances not indicated to be cleared from the site. Methods of protection shall be by use of substantial wood or chain link fences, barriers, or other methods, as approved by the Engineer. Any trees, shrubs, ground plants, roads, walks, pavements, structures, or appurtenances indicated to remain that become damaged during construction of the project shall be repaired or replaced by the Contractor, as directed by the Engineer, at no additional cost to the Owner.
- B. The Contractor shall contact all utility companies to mark the location of their facilities. The contractor shall protect all existing utilities in place and maintain continuous service to the Owner. Any damage to the utilities shall be corrected by the Contractor at his expense. The Contractor shall also be responsible for coordinating and/or relocating any utilities which must be relocated to accommodate the proposed construction.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. All materials shall be at the Contractor's option, subject to the approval of the Engineer.

## **PART 3 EXECUTION**

### **3.01 CLEARING AND GRUBBING**

- A. Clearing shall consist of the removal of all trees and shrubs, brush, down timber, rotten wood, heavy growth of grass and weeds, vines, rubbish, walks, roads, curbs, walls and foundations, existing utilities already abandoned, and all objectionable debris. All walls, foundations, slabs, pavements, curbs, and footings shall be removed to their full depth.
- B. Grubbing shall consist of the removal of stumps, roots, root mats, stubs, buried logs, and other debris within the project limits. The Contractor shall remove all stumps and root mats in their entirety and all buried logs and other debris from within building areas and from the limits of proposed drives and walks. Within proposed lawn areas, stumps, roots and debris shall be removed to a minimum depth of one foot below design rough grade.
- C. Construction methods shall be in accordance with Section 201 of the Standard Specifications.

### **3.02 DISPOSAL OF REMOVED MATERIALS**

- A. All timber and cleared materials shall become the property of the Contractor, and shall be disposed of by the Contractor. Burning of materials on site is prohibited.
- B. Pavement, base course, concrete, utilities, and other obstructions shall be removed from the site and shall be disposed lawfully. The Contractor shall provide evidence of the lawful disposal when requested by the Owner or the Owner's Representative.

### **3.03 SALVAGED MATERIALS**

- A. Materials listed to be salvaged for reuse shall be stored by the Contractor in such a manner to prevent damage to the material. Salvaged materials which are not reused shall be disposed of lawfully by the Contractor unless the Owner specifically requests to take possession of the material.

### **3.04 SITE DEMOLITION**

- A. Remove walks, roads, curbs, walls and foundations, existing utilities already abandoned, and all objectionable debris. All walls, foundations, slabs, pavements, curbs, and footings shall be removed to their full depth.
- B. Procure all permits required for demolition and disposal. Coordinate utility work with utility companies and subcontractors. All debris shall be removed and disposed lawfully.

- C. Where applicable, brace and shore all portions of the existing structure for safety and to maintain the integrity of the existing building. Provide protection for the general public. Disconnect all utilities prior to demolition in areas where live utilities may be located.

**END OF SECTION**



**SECTION 312000**  
**EARTHMOVING**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
  - 1. Filling and backfilling to attain indicated grades.
  - 2. Excavation, rough and finish grading.
  - 3. Furnishing and installing graded aggregate base course material for pavements, hot-mix patches and other structures.
  - 4. Undercut excavation and furnishing graded aggregate base course for undercut excavation.
  - 5. Furnishing excavation support systems, as required, including shoring and bracing.
  - 6. Excavation for trenches.
  - 7. Preparing topsoil stripped from the site and placing topsoil in locations requiring seeding or sodding.
  
- B. Definitions
  - 1. Excavation: removal and disposal of all material encountered when establishing required grade elevations, including pavements and other obstructions visible on the ground surface, and underground structures and utilities indicated to be demolished and removed, and unsuitable subgrade material.
  - 2. Unauthorized excavation: Removal of materials beyond specified subgrade elevations without approval of Engineer.

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
  - 1. All excavations shall be in compliance with Federal Occupational Safety and Health Act.
  - 2. Excavation work shall be in compliance with application requirements of other governing authorities having jurisdiction.
  
- B. Standards
  - 1. Refer to the following sections in the Delaware Department of Transportation Standard Specifications for Road and Bridge Construction, dated August 2001. (Hereinafter referred to as the "Standard Specifications")
    - Section 202: Excavation and Embankment
    - Section 205: Rock Excavation for Roadway
    - Section 206: Rock Excavation for Structures and Trenches.
    - Section 207: Excavation and Backfill for Structures
    - Section 208: Excavation and Backfill for Pipe Trenches

- Section 209: Borrow
- Section 210: Furnishing Borrow Type "C" for Pipe, Utility Trench
- Section 212: Undercut Excavation
- Section 302: Graded Aggregate Base Course
- Section 732: Topsoil
- Section 733: Topsoiling
- Section 813: Grading Requirements Minimum and Maximum Percentages  
Passing
- Section 821: Graded Aggregates

- 2. American Society for Testing and Materials (ASTM);
  - D-1556: Density of Soil in Place by the Sand-Cone Method.
  - D-698: Moisture Density Relations of Soils and Soil Aggregate Mixtures
  - D-2049: Relative Density of Cohesionless Soils.
  - D-2166: Unconfined Compressive Strength of Cohesive Soil.
  - D-2922: Density of Soil and Soil Aggregate in Place by Nuclear Methods  
(Shallow Depth)

### 1.03 SUBMITTALS

- A. Material Certification and delivery Slips for:
  - 1. Select Borrow
  - 2. Graded Aggregate Base Course

### 1.04 JOB CONDITIONS

- A. Existing Utilities
  - 1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the Utility Owner immediately for directions. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Owner.
  - 2. Do not interrupt existing utilities serving facilities occupied and used by the Owner.
  - 3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.
- B. Use of Explosives: The use of explosives is not permitted unless approved by the Engineer.
- C. Protection of Persons and Property
  - 1. Barricade open excavations occurring as part of this work and post with warning signs as required to protect persons on the site.
  - 2. Protect trees, shrubs, lawns and other features remaining as part of final landscaping.
  - 3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement lateral movement undermining, washout and other hazards created by earthwork operations.
  - 4. In the event of damage, immediately make all repairs and replacements to the approval of the Engineer at no cost to the Owner.

D. Dust Control

1. Use all means necessary to control dust on and near the work if such dust is caused by the Contractor's operations during performance of the work or if resulting from the conditions in which the Contractor leaves the site.
2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of other work on the site.

- E. Weather Conditions: Do not place, spread, or roll fill material during freezing, raining, or otherwise unfavorable weather conditions.

**PART 2 PRODUCTS**

2.01 GENERAL

- A. For approval of borrow materials, at least five (5) working days in advance of intention to import material, designate the proposed borrow area, and provide samples to prove the quality and suitability of the material.

2.02 ON-SITE FILL

- A. All on-site materials used for fill shall be acceptable to the Engineer and shall be minimally subject to the following requirements:
1. Free from deleterious substances, stumps, brush, weeds, roots, sod, rubbish, garbage and matter that may decay.
  2. Free of large rocks or lumps that may create voids or prevent proper compaction.

2.03 BORROW FILL MATERIAL

- A. Free from deleterious substances, stumps, brush, weeds, roots, sod, rubbish, garbage and matter that may decay, and shall be Borrow Type "G" (Select Borrow), grade IV or V, conforming to Section 209 of the Standard Specifications.

2.04 TRENCH AND CIVIL STRUCTURE BACKFILL MATERIAL

- A. Backfill for civil structures shall conform to the requirements of Section 207 of the Standard Specifications.
- B. Backfill for trenches shall conform to the requirements of Section 208 of the Standard Specifications.
- C. All trench and civil structure backfill material shall meet the requirements of Section 209.03C of the Standard Specifications for Borrow Type C backfill. All suitable excavated material, which meets the requirements of Section 209.03C of the Standard Specifications shall be used for structure or trench backfill as far as practicable.

## 2.05 GRADED AGGREGATE BASE COURSE

- A. Graded Aggregate base course for bituminous and concrete pavements and other structures shall be Type "B" conforming to the requirements for Graded Aggregate in Section 821 of the Standard Specifications.

## 2.06 GEOTEXTILE STABILIZATION FABRIC

- A. Geotextile stabilization fabric used for undercut excavation shall be a woven polypropylene geotextile designed for base course reinforcement and subgrade stabilization. Geotextile shall have a minimum tensile strength of 500 lbs, and shall be Mirafi HP565, or approved equal.

## 2.07 TOPSOIL

- A. Topsoil furnished from within or outside the project limits shall conform to Section 732 of the Standard Specifications except as modified by the following requirements.
  - 1. Topsoil shall not contain stones, lumps, roots or other objects larger than one inch in any dimension.
  - 2. Acid-Alkaline Range: pH 5.8 to 6.5.
  - 3. Free of pests, pest larvae, and matter toxic to plants.
  - 4. Maximum soluble salts: 500 ppm
  - 5. Free of viable Bermudagrass, quackgrass, Johnsongrass, nutsedge, poison ivy, Canada thistle, and other objectionable grassy or broadleaf weeds.
- B. Topsoil Furnished from Outside Project Limits
  - 1. Gradation range:
    - Sand (2.00 mm to 0.05 mm) 40-80 percent
    - Silt (0.050 mm to 0.005 mm) 10-30 percent
    - Clay (0.005 mm and smaller) 10-30 percent
    - a. When one-half of the sand content is larger than 0.500 mm, the maximum sand content shall be seventy-five percent; and maximum clay content shall be fifteen percent.
    - b. Lower limits of silt and clay shall be flexible to extent that soils with minimum combined silt and clay content of twenty percent shall be satisfactory. However, if more than one-half of the sand is larger than 0.50 mm., then minimum clay content shall be fifteen percent, or the minimum combined silt and clay content shall be twenty-five percent.
  - 2. Organic content:
    - a. Minimum of 2.75 percent by weight.
    - b. If necessary, add peat at the rate necessary to attain minimum organic content.

### **PART 3 EXECUTION**

#### **3.01 INSPECTION BY CONTRACTOR**

- A. Examine the areas and conditions under which excavating, filling and grading are to be performed. No extra cost or time allowances will be granted for conditions existing and visible at the time of the bid opening.

#### **3.02 PREPARATION**

- A. Prior to commencement of work, establish location and extent of all utilities in the work areas. Maintain and protect, as required, existing utilities which pass through the work area.
- B. Prior to excavation in pavement areas, saw cut existing pavement in accordance with Section 762 of the Standard Specifications.

#### **3.03 EXCAVATION**

##### **A. Unauthorized Excavation**

Unauthorized excavation shall not be at the Owner's expense. Under roadways and pipes, fill unauthorized excavation by removing all loosened material and providing select material as required to attain a firm and unyielding subgrade and/or foundation and to attain required grade elevations.

##### **B. Rock Excavation**

Rock Excavation shall apply to the removal of bedrock and ledgerock which cannot be accomplished without blasting or the use of rippers, and the use or disposal of such material. Excavation of material classified as "rock" shall conform to the requirements of Section 205 of the Standard Specifications.

- C. Rock Excavation for Structures and Trenches shall apply to the removal, use, or disposal of all boulders or other detached stones having a volume of 1/3 cubic yard or more. Excavation of such material shall conform Section 206 of the Standard Specifications.

##### **D. Undercut Excavation**

- 1. If unsuitable bearing materials are encountered at the required subgrade elevations notify the Engineer immediately.
- 2. Unstable bearing materials shall be removed to a depth of one foot below subgrade. Place geotextile stabilization fabric and one foot of graded aggregate base course, Type B.
- 3. Base course shall be placed and compacted in six-inch lifts.

##### **E. Stability of Excavations**

- 1. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space.

2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

F. Shoring and Bracing

1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
2. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction
3. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
4. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind, whether on public or private property, will be fully protected from damage.
5. In the event of damage to such improvements, immediately make all repairs and replacements necessary at no additional cost to the Owner.
6. Arrange bracing, sheeting and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength.
7. Exercise care in the drawing and removal of sheeting, shoring, bracing and timbering to prevent collapse and caving of excavation faces being supported.

G. Dewatering

1. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding the project site and surrounding area.
2. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to the stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water from excavations.
3. Convey water removed from excavations and rainwater to collecting or runoff areas, which are not subject to erosion. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

H. Material Storage

1. Stockpile satisfactory excavated materials where directed until required for use as backfill or fill. Place, grade and shape stockpiles for proper drainage.
2. Locate and retain soil materials away from edge of excavations.
3. Dispose of excess soil material and waste materials as herein specified. Excavated material unsuitable for backfilling shall be kept separate from other materials excavated, and disposed of. Materials suitable for backfilling shall not be disposed of until completion of filling or backfilling operations.

I. Excavation for Pavements and Pavement Patches

1. Cut surface under pavements to comply with cross- sections, elevations and grades as shown.

## J. Excavation for Trenches

1. Dig trenches to the uniform width required for the particular item to be installed sufficiently wide to provide ample working room. Trench width to a point no less than two feet (2') above the outside top of pipe shall be the pipe outer diameter plus twenty-four inches (24").
2. Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations. Beyond the building perimeter, keep bottoms of trenches for which elevations are not given sufficiently below finish grade to avoid freeze-ups.
3. Trenches for pipes shall not be opened more than the number of linear feet of pipe that can be placed and backfilled in one (1) day.
4. Grub roots and stumps within six inches (6") of outside surface of pipe bottom and sides to minimum depth of six inches (6") below grade. Backfill trenches with concrete where trench excavations pass within eighteen inches (18") of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footing.
5. Pipe bedding shall be as shown on the Plans.

## K. Cold Weather Protection

1. Protect excavation bottoms against freezing when atmospheric temperature is less than thirty-five degrees (35°).

## 3.04 BACKFILL FILL AND COMPACTION

## A. General

1. The project Inspector or Engineer shall be notified 24 hours in advance of any fill, backfill or compaction operations.
2. Place acceptable material in 8" lifts to required subgrade elevations.
3. Fills: Use suitable material (per Section 2.2 of this section) obtained from on-site excavation, except use borrow material when suitable on-site material is not available or when specified by the Engineer or shown on the Plans.
4. Backfilling: Use suitable material (per Section 2.2 of this section) obtained from on-site excavation, except use select backfill where indicated on Plans. Backfill to a height of two feet (2') above the top of pipe with earth free from stones, rock fragments, dirt clogs or frozen material greater than two inches (2") in largest dimension.
5. Do not provide additional off-site borrow material until all acceptable excavated materials on the site have been utilized in the work unless approved by the Engineer.
6. Place the various types of materials in the areas as designated on the Plans.

## B. Backfill excavation as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval and recording locations of underground utilities.
2. Removal of concrete formwork.
3. Removal of shoring and bracing, and backfilling of voids satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

4. Removal of trash and debris.
5. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Backfilling Prior to Approvals

1. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the Owner.
2. After the work has been completely tested, inspected and approved, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.

D. Ground Surface Preparation Prior to Filling

1. Remove all vegetation, debris, topsoil, unsatisfactory soil materials, obstructions and deleterious materials from existing ground surface to a depth of not less than four inches (4") and not more than six inches (6") prior to placement of fills. Plow, strip or break-up sloped surfaces steeper than one (1) vertical to four (4) horizontal to a depth of not less than six inches (6") so that fill material will bond with existing surface.
2. When existing ground surface has a density less than that specified under "Compaction," for the particular area classification, break up the ground surface, pulverize, moisture condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

E. Placement and Compaction

1. Place backfill materials in layers not more than eight inches (8") in loose depth.
2. Control soil compaction during construction providing minimum percentage of density specified for each area classification listed below.
3. Pavement areas are defined, for the purpose of this Section, as extending a minimum of five feet (5') beyond the building and/or pavement.
4. Compact soil to not less than the following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D-1557; and not less than the following percentages of relative density determined in accordance with ASTM D-2049, for soils which will not exhibit a well-defined moisture-density relationship.
  - a. Lawn or Unpaved Areas: Compact top six inches (6") of subgrade and each layer of backfill or fill material at 90 percent (90%) maximum dry density.
  - b. Walkways: Compact top six inches (6") of subgrade and each layer of backfill or full material at 95 percent (95%) maximum dry density or 90 percent (90%) relative dry density.
  - c. Pavement Areas: Compact top twelve inches (12") of subgrade and each layer of backfill or fill material at 95 percent (95%) maximum dry density or 90 percent (90%) relative dry density.
  - d. Base Course Materials: Compact each layer of base course material to 95 percent (95%) of maximum dry density.
  - e. Trench Stabilization Materials: Compact each layer of material to 95 percent (95%) of maximum dry density.

5. Moisture control:
  - a. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
  - b. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
  - c. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.
  - d. Moisture condition fills materials to within 3 percent (3%) of the optimum moisture. Fill that is so wet that it is unstable under compaction equipment shall be dried and re-compacted to achieve a stable fill.
6. Puddling or jetting will not be permitted.
7. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice, or other unsuitable materials.
8. Place backfill and fill material evenly adjacent to structures, to be required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift.
9. Compact backfill to height of two feet (2') above top of pipe using approved flat-faced mechanical tampers.

### 3.05 GRADING

#### A. General

Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

#### B. Grading Outside Building Lines

Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:

1. Lawn or unpaved areas: Finish area to receive topsoil to within not more than 0.10 feet above or below the required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 feet above or below the required subgrade elevation.
3. Pavement: Shape surface of areas under pavement line, grade and cross-section, with finish surface not more than 1/2 inch above or below the required subgrade elevation. All topsoil and other unsuitable material shall be removed and replaced with suitable backfill.

## C. Compaction

1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

## D. Treating after Grading

1. After grading is completed, permit no further excavating, filling or grading.
2. Use all means necessary to prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

## E. Subgrade Preparation

1. All subgrade preparation shall be performed in accordance with the applicable Sections of the Delaware Department of Transportation Standard Specifications except as may be modified by this Specification Section.
2. Subgrades for paving shall be firm and unyielding when proof-rolled in accordance with Section 202 of the Standard Specifications.

## 3.06 GRADED AGGREGATE BASE COURSE

## A. General

1. Base Course consists of placing graded aggregate base course material in layers of specified thickness over subgrade surface to support pavements, pavement patches and structures, as shown on Plans.
2. Provide Base Course in accordance with Section 302 of the Standard Specifications, except as otherwise modified by this Specification Section.

## B. Grade Control

1. During construction, maintain lines and grades including crown and cross-slope of base course.

## C. Placing

1. Place base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base course material during placement operations.
2. When a compacted base course is shown to be eight inches (8") or less, place material in a single layer. When shown to be more than eight inches (8") thick, place material in equal layers, except no single layer shall be more than eight inches (8") in thickness when compacted.
3. Spread, shape and compact all base course material deposited on the subgrade during the same day.

## 3.07 FIELD QUALITY CONTROL

- A. Quality control testing during construction. Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

- B. If subgrade or fills which have been placed are below specified density, provide additional compaction and testing at no expense to the Owner. This shall include compaction and testing at areas initially tested and at other locations as directed.

### 3.08 MAINTENANCE

- A. Protection of Graded Areas
  - 1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
  - 2. Repair and establish grades in settled, eroded and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas
  - 1. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape and compact to required density prior to further construction.

### 3.09 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A. Remove waste materials, including excess and unacceptable excavated material, trash and debris, and dispose of it off the Owner's property.

### 3.10 TOPSOILING

- A. Preparation
  - 1. Verify that clearing, earthwork, grading and other preceding work affecting ground surface have been completed and that the area to be topsoiled is cleared, shaped, and dressed.
  - 2. Preparation of Topsoil Subsoil
    - a. Shape and dress area to be topsoiled. This work includes grading to required lines and elevations; removal of all stones, clods, lumps two inches or larger in any dimension; removal of all wires, cables, pieces of concrete, tree roots, and debris or other unsuitable material.
    - b. Do not proceed with installation of topsoil until this work has been approved.
- B. Installation
  - 1. Place in even layers that will produce the minimum compacted thickness as indicated on the Plans.
  - 2. If quantity of topsoil obtained from stripping is insufficient for the project requirements, provide required topsoil from approved sources located outside project limits.
  - 3. Remove stones, lumps, roots and other objects larger than one inch in any dimension from graded topsoil surface.
- C. Maintenance
  - 1. Immediately before establishment of ground cover, re-topsoil and regrade areas, which become eroded or otherwise disturbed.
  - 2. Perform all maintenance work in accordance with the Specifications without additional compensation.

3. Maintenance period to extend until installation of ground cover.

D. Cleaning

1. Immediately clean spills, soil, and conditioners on paved and finished areas.
2. Haul and dispose of topsoil in excess of the quantity required for the project off site.
3. Dispose of protective barricades and warning signs at termination of maintenance period.

**PART 4 MEASUREMENT AND PAYMENT**

4.01 METHOD OF MEASUREMENT

- A. No separate measurement or payment will be made for any earthwork, except for undercutting, as described below.
- B. Undercut Excavation shall be measured by the actual number of tons of graded aggregate base course placed in areas that are undercut. Certified weight slips signifying the weight of each load of materials delivered and placed shall be submitted to the Engineer. No separate measurement or payment will be made for the volume of unsuitable material excavated or for geotextile fabric. No separate measurement or payment will be made for undercut excavation unless the undercutting is directed by the Engineer.

4.02 BASIS OF PAYMENT

- A. Undercut excavation, measured as provided above, shall be paid for at the contract unit price per ton bid for this item, which price and payment shall constitute full compensation for all undercut excavation, disposal of unsuitable materials, supplying and placing geotextile fabric and graded aggregate backfill, and all tasks, labor, equipment, material, tools, and incidentals needed to complete the work.

**END OF SECTION**

**SECTION 312500**

**EROSION AND SEDIMENT CONTROLS**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. General: Provide temporary soil and sediment control measures in accordance with the Plans and Contract Documents.

1.02 QUALITY ASSURANCE

A. Standards

Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. Delaware Erosion and Sediment Control Handbook.
2. Delaware Department of Transportation Standard Specifications for Highways and Bridges, dated August 2001 (hereinafter referred to as the "Standard Specifications").

B. Design Criteria

1. The primary objective of this specification is to control soil erosion to the maximum extent practicable.
2. The temporary control provisions contained herein shall be coordinated with permanent erosion control features to the extent practical to assure effective and continuous erosion control throughout the construction and post- construction period.
3. The erosion control measures described herein shall be continued until the construction is complete and all disturbed areas are fully stabilized.
4. Wherever construction exposes work which is subject to erosion, erosion control features or other work to be completed within such areas shall follow as soon after exposure as practicable.

**PART 2 PRODUCTS**

2.01 MATERIALS

- A. Temporary mulches shall conform to Section 735 of the Delaware Department of Transportation Standard Specifications for Bridges and Highways.
- B. Temporary grass mixtures shall be as shown on the Plans and shall conform to the Section 734 of the Standard Specifications.
- C. Fertilizer and soil conditioners shall be a standard commercial grade.
- D. Temporary structural Erosion Control measures shall conform to the requirements of the Delaware Erosion and Sediment Control Handbook and the Delaware Department of Transportation Standard Specifications.

- E. Erosion control matting and blankets shall conform with the Delaware Erosion and Sediment Control Handbook requirements for soil stabilization matting (SSM) I and II. Matting shall be composed of 100% agricultural straw (minimum 0.5 pounds per square yard) or 100% wood excelsior fiber (0.8 pounds per square yard) with a single or double netting of either photo-degradable or bio-degradable material. SSM-I shall be North American Green S75, American Excelsior Curlex I, or approved equal. SSM-II shall be North American Green S150, American Excelsior Curlex II, or approved equal.

### **PART 3 EXECUTION**

#### **3.01 CONSTRUCTION REQUIREMENTS**

- A. Vegetative stabilization shall be used on graded or cleared areas, which are subject to erosion for a period of 14 days or more.
- B. All temporary erosion control measures shall be installed in accordance with the Delaware Erosion and Sediment Control Handbook.
- C. Erosion control matting shall be installed in accordance with the manufacturer's written instructions, the requirements of the Delaware Erosion and Sediment Control Handbook, and the details on the Plans.
- D. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal or state agencies, the more restrictive laws, rules, or regulations shall apply.
- E. The Contractor shall be responsible for maintaining all soil erosion and sediment control measures in an acceptable and functional manner. The Contractor shall remove all temporary measures after all other construction is complete, final restorations installed, and all disturbed areas have been adequately stabilized.

**END OF SECTION**

**SECTION 320523**  
**CONCRETE SIDEWALKS**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. Remove existing concrete sidewalk as shown on the plan, marked in the field, or as directed by the Engineer.
- B. Provide new concrete sidewalk in areas designated on Plans, marked in the field, or as directed by the Engineer.
- C. Place Graded Aggregate Base Course below proposed concrete sidewalks.

1.02 STANDARDS

- A. The quality of materials and performance of work specified in this section shall be in accordance with the Delaware Department of Transportation Standard Specifications for Road and Bridge Construction, dated August 2001 (hereinafter referred to as the "Standard Specifications").

Section 302: Graded Aggregate Base Course  
Section 705: Portland Cement Concrete Sidewalk  
Section 762: Saw Cutting  
Section 812: Portland Cement Concrete

1.03 SUBMITTALS

- A. Certificates: All deliveries of concrete shall be accompanied by delivery slips.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Allowable Concrete Temperatures
  - 1. Cold weather: 60 degrees Fahrenheit. (18° C) when discharged from the mixer.
  - 2. Hot weather: Maximum concrete temperature is 80 degrees Fahrenheit. (30° C).
- B. Do not place concrete during rain, when atmospheric temperature is at or below 36 degrees Fahrenheit (2° C), or when conditions are otherwise unfavorable.

1.05 PROTECTION

- A. Protect concrete from pedestrian and vehicular traffic until concrete has been sufficiently cured.

**PART 2 PRODUCTS**

## 2.01 MATERIALS

- A. Concrete
  - 1. Use concrete developing a compressive strength of 3,000 p.s.i. at twenty-eight (28) days.
  - 2. Use air-entrained concrete.
- B. Cement aggregates, water and air-entrainment methods and materials conforming to Section 812 of the Standard Specifications.
- C. Joint filler: Pre-formed expansion joint material, conforming to Section 808.06 of the Standard Specifications.
- D. Curing compound: White pigmented liquid, conforming to AASHTO M 148 for Type 2, Class A or B.
- E. Vapor barrier: Where called for on Plans shall be 6 mil. polyethylene.
- F. Spalled areas shall be repaired with a pre-blended, pre-packaged cement based mortar requiring only the addition of potable water. The material shall not contain any chlorides or lime other than the amounts contained within the hydraulic composition. The concrete repair material shall have a minimum strength of 5000 psi after 28 days. Concrete repair material shall be as manufactured by Five Star Products, Inc., or approved equal.
- G. Newly constructed concrete sidewalks shall be sealed with a concrete treating oil. The treating oil shall be a solution of boiled linseed oil and mineral spirits in accordance with ASTM D 260. Concrete treating oil shall be TK-3102, as manufactured by TK Products, or Lin-Seal, as distributed by W.R. Meadows, Inc., or approved equal.

## PART 3 EXECUTION

### 3.01 REMOVING EXISTING SIDEWALK

- A. All portions of existing concrete sidewalk to be removed shall be isolated from pavements, curb, or buildings to remain by saw cutting or by the presence of an existing expansion joint. Care shall be exercised by the Contractor to insure that no damage occurs to any elements to remain and any damage to items to remain shall be replaced or repaired by the Contractor at no additional cost to the Owner.
- B. Concrete shall be broken up by an approved power breaking machine. All concrete removed shall be taken off the project site and disposed of lawfully.

### 3.02 PREPARATION FOR NEW SIDEWALK

- A. Excavate subgrade and set forms so that finished sidewalk conforms to lines and grades shown on Plans.

- B. Prepare sidewalk subgrade as specified in Section 705 of the Standard Specifications.
- C. Verify that earthwork is completed to correct line and grade.
- D. Verify that forms conform to line, grade and dimensions shown on Plans.
- E. Check that subgrade is smooth, compacted and free of excessive moisture.
- F. Do not commence work until conditions are satisfactory.

### 3.03 CONSTRUCTION METHODS

- A. Concrete sidewalks and aprons shall be constructed in accordance with the requirements of Section 705 of the Delaware Department of Transportation Standard Specifications for Road and Bridge Construction.
- B. Use vibration or tamping to consolidate the rapid set concrete patching material. Work material into saw cuts, extending beyond the corners of the repair area. Strike-off and shape the material to match the surrounding concrete.
- C. Concrete treating oil shall be sprayed or rolled onto clean and dry concrete in accordance with the manufacturer's written instructions.

**END OF SECTION**



**SECTION 321216**  
**ASPHALT PAVING**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. Work included: Provide labor, materials, and equipment necessary to complete the work of this Section, including but not limited to the following:
1. Patching pavement, including removal of existing pavement and installation of bituminous concrete base course patch.
  2. Surface preparation, and installation of bituminous concrete base course (BCBC).
  3. Surface preparation, and installation of Type B, binder course pavement, where applicable.
  4. Installation of Type C, wearing surface course for pavement patching, and for overlay of existing bituminous pavement including patched and repaired areas.
  5. Pavement markings

1.02 STANDARDS

- A. The quality of materials and performance of work specified in this section shall be in accordance with the Delaware Department of Transportation Standard Specifications for Road and Bridge Construction, dated August 2001 (hereinafter referred to as the "Standard Specifications").
1. Section 401: Hot-Mix, Hot-Laid Bituminous Concrete Pavement
  2. Section 406: Hot-Mix Patch
  3. Section 748: Pavement Markings
  4. Section 760: Pavement Milling

1.03 DEFINITIONS

- A. Subgrade: Surface upon which pavements will be constructed.
- B. Base Course: That portion of the pavement cross section consisting of graded aggregate base course or bituminous concrete deep lift.

1.04 QUALITY ASSURANCE

- A. Bituminous concrete producer shall be regularly engaged in the production of hot-mix, hot-laid bituminous concrete, and shall be approved by the Delaware Department of Transportation or the Pennsylvania Department of Transportation.

1.05 SUBMITTALS

- A. Job mix formula.
- B. Provide copies of delivery slips at the end of each working day.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. Materials and mixtures shall comply with the following sections of Delaware Department of Transportation Standard Specifications. All bituminous concrete paving shall be obtained from a DeIDOT approved plant.

### **2.02 PAVING MATERIALS AND MIXTURES**

- A. Graded Aggregate Base Course
  - 1. Materials: Section 302.
- B. Hot Mix, Hot Laid Bituminous Concrete Pavement
  - 1. Materials: Section 401.
  - 2. Mixture: Section 401
- C. Emulsified Asphalt: Section 811
- D. Course Aggregate: Sections 805, 813
- E. Tack Coat: CSS-1-h asphalt (diluted with 50% water) meeting the requirements of AASHTO M208.

### **2.03 JOB MIX FORMULA REQUIREMENTS**

- A. Provide job mix formulas for each required bituminous concrete mixture as specified in Section 401.20 of the Standard Specifications.
- B. Submit for approval prior to beginning paving operations.

### **2.04 MIX DESIGN AND CONTROL REQUIREMENTS**

- A. The design and control requirements for all paving mixtures shall conform to Section 401 of the Standard Specifications.

### **2.05 SAMPLES AND TESTING**

- A. Methods and rates of sampling bituminous mixtures shall conform to Section 401 of the Standard Specifications with the following exceptions:
  - 1. Sampling shall be performed by the producer's quality control technician.
  - 2. For small scale projects where it is possible to attain the minimum lot size specified, a total of five (5) samples shall be taken at random for each type of mix specified, per each day's production.

B. Testing of bituminous concrete mixtures to determine the quantity of bitumen, gradation of aggregate, and conformance to mix design requirements shall be as specified in Section 401 of the Standard Specification.

C. Submit results of tests on forms signed by producer's quality control technician.

## 2.06 PREPARATION OF MIXTURES

A. The preparation of all bituminous mixtures shall conform to Section 401 of the Standard Specifications.

## 2.07 PAVEMENT MARKINGS

A. All paint shall be of materials approved by the Delaware Department of Transportation per Section 748 of the Standard Specifications.

B. Thermoplastic material, where required, shall meet the requirements of section 748 of the Standard Specifications.

## PART 3 EXECUTION

### 3.01 GENERAL

A. The method of construction including bituminous concrete plant and equipment, bituminous concrete pavers, vehicles for transporting bituminous mixtures, rollers, and all construction methods shall conform to Section 401 of the Standard Specifications except as modified by the Supplemental Requirements below.

### 3.02 PAVEMENT MILLING

A. Construction methods for pavement milling shall conform to Section 760 of the Standard Specifications.

### 3.03 PAVEMENT PATCHING

A. Construction methods for patching pavement shall conform to Sections 401 and 406 of the Standard Specifications. A milling machine may be use for pavement and base course removal.

### 3.04 PROOF ROLL

A. Proof roll subgrade surfaces using heavy, rubber-tired rollers, or loaded dump truck in accordance with Section 202 of the Standard Specifications. Proof roll in the presence of the Owner's Representative.

1. Subgrades shall be firm and unyielding.
2. Compact areas showing deflection and instability.

B. Notify the Engineer or the Inspector of unsatisfactory conditions.

- C. Do not begin paving work until any such unsatisfactory conditions have been corrected.

### 3.05 SURFACE PREPARATION

#### A. Earth and Base Course Surface

1. Remove loose and foreign material from compacted subgrade surface immediately before application as required.
2. Use power broom or blowers and hand brooming as required.
3. Do not displace subgrade material.

#### B. Existing Pavement Surfaces

1. Remove loose and foreign material from existing pavement surfaces immediately before application of paving
2. Use self-propelled mechanical sweepers. Supplement with hand brooming as required.
3. Pay particular attention to cleaning of gutter lines and outer edges of pavement areas.
4. Remove all weeds, grass or other vegetative matter growing in pavement areas, particularly along joints and curbs.

#### C. Minor Patching

1. Existing pavement surfaces: Fill in depressions, and patch pavement in overlay areas that are not marked out for base repairs.

### 3.06 TACK COAT

- A. Apply to cleaned surfaces of all pavements to be overlaid or slurry seal coated.
- B. Apply to cleaned surfaces of newly constructed base pavement if coated with dust, dirt, foreign materials in sufficient amount to prevent bond with surface course.
- C. Apply to edges of paving where base repairs are to be made.
- D. Apply tack coat material at temperatures, specified in Section 401 of the Standard Specifications.
- E. Apply at rate of 0.02 gallon per square yard immediately prior to placing pavement.
- F. Apply tack coat by brush to contact surfaces of pavement cold joints, curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.
- G. Allow surfaces to dry until material is in a condition of tackiness to receive pavement.
- H. Take precautions to insure tack coat is not applied to exposed surfaces of curbs or other exposed surfaces. Tack coat so applied shall be removed by Contractor at no additional cost to Owner.

### 3.07 GENERAL SURFACE REQUIREMENTS

- A. Test finished surface of each bituminous concrete course for smoothness using a ten (10) foot straightedge.
- B. The straightedge shall have projections on the bottom at each end, either built-in or firmly attached, so that it is supported six (6") inches above the pavement surface at the ends. It shall be free from warp and deflection, and furnished by the Contractor without additional compensation.
- C. Check surfaced areas at intervals and in directions specified.
- D. Check surfaces for pavement smoothness immediately after initial compaction, and correct variations by removing or adding material as may be necessary. Then rolling shall be continued as specified.
- E. Immediately after final rolling and while the pavement is still hot, the smoothness of the course shall be checked again and all projections or depressions exceeding the specified tolerances shall be corrected by removing defective work and replacing it with new surface course as specified. Portions of the surface otherwise unsatisfactory shall be replaced.
- F. Finished surfaces shall be free of all roller marks, ridges and voids.

### 3.08 FIELD QUALITY CONTROL

- A. Taking of pavement cores and testing for the determination of conformance to control air voids and pavement thickness shall be performed in accordance with Section 401 of the Standard Specifications.
- B. When required per the General or Special Provisions, the Contractor shall employ and pay for the services of an Independent Testing Laboratory acceptable to the Engineer to perform additional field quality control sampling and testing when initial tests indicate work does not comply with the Contract Documents. All sampling and testing shall be performed as specified in section 401 of the Standard Specifications.
- C. Areas of pavement removed for field quality control testing shall be replaced by the Contractor as follows:
  - 1. Clean debris from core area. Cut all exposed pavement edges vertical.
  - 2. Apply tack coat to exposed surfaces before installing replacement pavement.
  - 3. Fill core area with surface course mixture for the full depth of the core.
  - 4. Compact and grade mixture; seal repaired area with tack coat; and apply thin layer of sand over tack coat.

### 3.09 PAVEMENT MARKINGS

- A. Paint equipment and installation shall conform to Section 748 of the Standard Specifications.

- B. Application of Thermoplastic materials, where required, shall conform to Sections 748.08 and 748.09 of the Standard Specifications.
  
- C. All markings shall comply with the Manual on Uniform Traffic Control Devices, the Delaware Manual on Traffic Controls for Street and Highway Construction and Maintenance, the Delaware State Fire Prevention Regulations, and the Delaware State Accessibility Board.

**END OF SECTION**

**SECTION 334100**  
**SANITARY AND STORM DRAINAGE PIPING**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. Furnish and install polyvinyl chloride (PVC) gravity sewer and storm pipe and appurtenances as shown on the Plans and described herein.
- B. Furnish and install catch basins and manholes, and connect existing pipes to manholes or catch basins, and connect proposed pipes to existing manholes or catch basins where shown on the Plans or as directed by the Engineer.
- C. Repair and adjust catch basins and catch basin tops as shown on the Plans.

1.02 STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM D-2241: Polyvinyl Chloride (PVC) Pressure-Rated Pipe.
  - 2. ASTM 1785: Schedule 40 Polyvinyl Chloride (PVC) pipe.
- B. City of Wilmington Department of Public Works
- C. Delaware Department of Transportation Standard Specifications for Road and Bridge Construction, dated August 2001 :
  - 1. Section 708: Drainage Inlets and Manholes
  - 2. Section 710: Adjusting and Repairing Drainage Inlets and Manholes

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Storage and Materials
  - 1. Store materials to prevent physical damage.
  - 2. Store pipe and fittings off ground to prevent dirt and debris from entering.
  - 3. Store flexible gasket materials and joint primer or adhesive compounds in cool dry place. Keep rubber gaskets clean, away from oil, grease, excessive heat, and out of direct sunlight.
- B. Handling of Materials
  - 1. Protect materials during transportation and installation to avoid physical damage.
  - 2. Do not install out-of-round pipe.
  - 3. Unload pipe to prevent abrasion.
  - 4. Do not drag or push pipe while handling or distributing on project site.

## **PART 2 PRODUCTS**

### 2.01 MATERIALS

- A. P.V.C. Pipe and Fittings
  - 1. ASTM D-2241; SDR 21.
  - 2. ASTM 1785, Schedule 40
  
- B. All catch basins and manholes shall be precast or cast-in-place Portland cement concrete (p.c.c.) and shall conform to Section 708 of the Standard Specifications. Precast manholes shall conform with ASTM C-478, except where noted on the Plan.

## **PART 3 EXECUTION**

### 3.01 MATERIAL INSPECTION

- A. The following information shall be clearly marked on each pipe section of P.V.C. pipe:
  - 1. Pipe type and SDR number.
  - 2. Nominal pipe size.
  - 3. The PVC cell classification.
  - 4. Name or trademark of manufacturer.
  - 5. The ASTM Specification designation.
  
- B. P.V.C. Fittings shall have the following markings:
  - 1. The ASTM Specification designation.
  - 2. Manufacturer's name or trademark.
  - 3. Nominal size.
  - 4. The material designation.
  
- C. Inspect pipe for defects prior to placement in trench. The pipe and fittings shall be free from visible cracks, holes, foreign inclusions or other injurious defects.
  
- D. Assure that all materials are of the type specified and are not defective. Unmarked pipe or pipe and materials not meeting Specifications requirements shall be removed from the site as directed by the Engineer.

### 3.02 INSTALLATION

- A. Fine grade trench bottom so that pipe is supported for its full length.
  
- B. Install piping beginning at the low point of the system, true to grades and alignment indicated on the Plans. Place the bell ends of the pipe facing upstream.
  
- C. Do not lay pipe on unsuitable material, in wet trench, or in same trench with another pipe or utility.
  
- D. General Procedure for Joining Pipe

1. Do not use excavating equipment to force pipe sections together.
2. Hold pipe securely and in proper alignment when joining.
3. Do not disturb previously made joints. Check completed piping to assure joints are intact. Insure placement of backfill over pipe is accomplished without disturbing pipe position.
4. Do not allow earth, stones, or other debris to enter pipe or fittings.
5. Method of installing joint materials and joining piping shall be in strict accordance with manufacturer's printed instructions.

### 3.03 BACKFILL AND COMPACTION

#### A. Bedding and Initial Backfill

1. Bedding and initial backfill shall be in accordance with the manufacturer's written instruction or, in absence of said instructions, in accordance with Section 31200 of these Specifications.
2. Install initial backfill material as shown on the Plan details for the type of pipe being used.
3. When required, material shall be placed under the pipe haunch to provide adequate side support. Material shall be installed for entire trench width and shall be tamped and rodded to insure full contact with pipe at haunch up to the spring line.
4. Little or no tamping of the initial backfill directly over the pipe shall be done.

#### B. Final Backfill

1. Final backfill shall be in accordance with Section 312000 of these Specifications.

### 3.04 TESTING

#### A. Deflection Testing – PVC Sanitary Sewer Pipe

1. For pipe conforming to the requirements of ASTM D-3034, the maximum allowable pipe deflection (reduction in vertical diameter) shall be 7-1/2%.
2. For pipe conforming to the requirements of ASTM D-2241, the maximum allowable pipe deflection (reduction in vertical inside diameter) shall be 5%.
3. Deflection tests shall be successfully performed on the complete installation by means of one of the following methods prior to the acceptance of construction.
  - a. "Go-No-Go" mandrel properly sized
  - b. Calibrated television.

#### B. Lamping

1. Sewer lines shall meet the following standards to pass the lamping inspection:
  - a. The barrel of the pipe shall have no vertical deflection and at least seventy-five percent of the barrel shall be visible in the horizontal direction.
  - b. Pipe not meeting this Specification shall be re-laid and re-lamped until compliance is achieved at no additional cost to the Owner.

#### B. Low Pressure Air Test

1. All gravity sanitary sewer lines shall be air tested in accordance with the requirements of the City of Wilmington Department of Public Works.

2. The drop in pressure during the prescribed test time shall not exceed 0.5 psi, from 3.5 to 3.0 psi testing pressure. A drop in pressure below 3.0 psi shall indicate a failure of the test.

#### 3.04 CATCH BASINS AND MANHOLES

- A. Catch basins and manholes shall be installed in accordance with Section 708 of the Standard Specifications.
- B. Installation of rubber gaskets for precast catch basins and manholes shall be in accordance with the manufacturer's recommendations.
- C. Frames shall be well bedded in mortar, making a watertight joint. Cover and frame shall have a shop coat of asphaltic pitch and shall have a field coat of similar paint after the frame is set in final position.
- D. Repair and adjustment of catch basins and manholes shall be in accordance with Section 710 of the Standard Specifications.

**END OF SECTION**

**SECTION 331100**  
**WATER UTILITY PIPING**

**PART 1 GENERAL**

1.01 DESCRIPTION

- A. Furnish and install Ductile Iron water pipe, fittings, and appurtenances as shown on the Plans and described herein.
- B. Furnish and install P.V.C. water pipe, fittings, and appurtenances as shown on the Plans and described herein.
- C. All water mains, fittings, taps, valves, and fire hydrants shall be supplied, installed, disinfected, and tested in accordance with the requirements of the City of Wilmington Department of Public Works, and the Delaware Department of Health.
- D. Furnish and install copper water tubing for service connections under three-inches in diameter.
- E. Coordinate with the he City of Wilmington Department of Public Works for service connections and to determine the scope of services to be performed by the City of Wilmington.
- F. Related work specified elsewhere includes:

Section 02200: Earthwork

1.02 STANDARDS

- A. City of Wilmington Department of Public Works Standards and Specifications.
- B. American Water Works Association
  - 1. AWWA C900
  - 2. AWWA C151
  - 3. AWWA C104
  - 4. AWWA C110
  - 5. AWWA C111

1.03 SUBMITTALS

- A. All pipe and fittings shall be inspected and tested at place of manufacture as required by the AWWA standards referenced in the specification. Provide the Engineer with two copies of certifications from each manufacturer stating the product was inspected as required, and that the test results comply with AWWA standards.

- B. Submit manufacturers' product data for pipe, fittings, valves, hydrants, and gaskets.
- C. All manufacturers shall validate other than by certification, the ductility of each length of pipe by an Underwriters Laboratory approved method. All P.V.C. pipe is to have Underwriters Laboratory approval.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Polyvinyl Chloride Pipe
  - 1. Water mains shall conform to AWWA C900, Class 150.
  - 2. P.V.C. services shall conform to ASTM-2241 for SDR 21, unless otherwise approved by the Water Company or Engineer.
- B. Joints for P.V.C. Pipe: Integral-bell push-on joints except where mechanical joints are necessary to change pipe material.
- C. Pipe Fittings
  - 1. Shall be ductile iron fittings conforming to AWWA C110, with minimum pressure rating of 250 p.s.i.
  - 2. Fittings shall be cement-lined, 1/8-inch thick, in accordance with AWWA C104 and seal-coated inside.
  - 3. Fittings shall have mechanical or push-on joints.
- D. All water valves, valve boxes, and fire hydrants shall meet the requirements of City of Wilmington Department of Public Works and the Delaware Department of Health.
- E. Ductile Iron Pipe
  - 1. Shall conform to AWWA C-151, Class 52, and shall be manufactured in eighteen or twenty foot nominal lengths.
  - 2. All ductile iron pipe for water mains shall be cement-lined, 1/8-inch thick, in accordance with AWWA C104 and seal coated inside.
  - 3. Use Push-on joints, conforming to AWWA C151 and AWWA C111, except where mechanical joints are indicated on the Plans.
- F. Seamless copper tubing shall be type "K" in conformance with ASTM B-88 and ANSI/NSF 61. Valves and fittings shall be in conformance with AWWA C800.

## **PART 3 EXECUTION**

### **3.01 INSPECTION AND QUALITY OF PIPE**

- A. Before being lowered into the trench, each pipe shall be carefully inspected, and those not meeting the Specifications shall be rejected and either destroyed or removed from the work within ten (10) hours. No pipe shall be laid except in the presence of the Owner's

designated representative. The Owner's designated representative may order the removal and relaying of any pipe not so laid.

- B. The Contractor shall carefully examine all pipe and special castings before placing the same in the trench. Any pieces which are broken or show evidence of cracks or fractures shall be rejected by the Contractor. Such inspection shall carry with it the responsibility on the part of the Contractor for the removal at the Contractor's own expense of all pipe, special castings, and appurtenances, incorporated in the work, and which under test are found to be cracked or otherwise defective.

### 3.02 INSTALLATION

- A. Excavation and backfill for pipes shall conform to Specification Section 02200 - Earthwork and shall be as shown on the Plans.
- B. All piping shall be installed in a neat and workmanlike manner. All piping shall be installed to accurate lines and grades and shall be supported as shown, specified, or necessary. Where temporary supports are used, they shall be sufficiently rigid to prevent shifting or distortion of the pipe. Suitable provision shall be made for expansion where necessary.
- C. No defective pipe or fitting shall be laid or placed in the piping, and any piece discovered to be defective after having been laid shall be removed and replaced by a sound and satisfactory piece by the Contractor at the Contractor's own expense.
- D. Every pipe and fitting shall be cleared of all dirt and other debris before being installed and shall be kept clean until accepted in the completed work.
- E. No pipes shall be laid in fill or other unsuitable material, in a wet trench, or in the same trench with another pipe or other utility unless so noted on the drawings. A minimum eighteen inch (18") clearance shall be maintained between the outside surface of pipe and outside surface of other existing pipes and structures. When this clearance cannot be maintained, contact the Engineer for instructions prior to proceeding with the pipe installation.
- F. No direct contact between pipes and structures at crossings will be permitted. Pipes in place shall not be worked over or walked on until covered by backfill well tamped in place to a depth of twelve inches over the pipe.
- G. Minimum cover over water mains shall be three and one half feet (3-1/2').
- H. The interior of all pipes shall be thoroughly cleaned of all foreign material before being lowered into trench. Pipes shall be kept clean during laying operations by means of plugs or other approved methods.
- I. Gas, storm sewer, and sanitary sewer lines shall have right-of-way and water mains shall be installed to avoid the same. If conflicts occur between proposed water lines and other

utilities, the water lines shall be dropped below the conflicting utility to attain the proper clearance.

- J. Brace all plugs as required to prevent leakage or blowout during testing.
- K. All newly placed pipes shall be pressure tested, sterilized, and cleaned in accordance with City of Wilmington Department of Public Works, the Delaware Department of Health, and NFPA Standards and Specifications.

### 3.03 PIPING SUPPORTS

- A. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the drawings or specified. Bends, tees, and other fittings buried in the ground shall be backed up with concrete placed against undisturbed earth where firm support can be obtained. If the soil does not provide firm support, then suitable bridle rods, clamps, and accessories to brace the fitting properly shall be provided. Such bridle rods, etc., shall be coated thoroughly with an approved bituminous paint after assembly, or, if necessary, before assembly. This work shall include bracing plugs to prevent leakage or blowout during testing.

### 3.04 HANDLING AND CUTTING PIPE

- A. Handle and lay pipe and fittings to avoid damage to the pipe, scratching or marring machined surfaces, and abrasion of the coating or lining. Pipe cuts shall be made using an abrasive wheel, rotary wheel cutter, guillotine pipe saw, milling wheel saw, or other method approved by the Engineer. Grind cut ends and rough edges smooth. For push-on connections, bevel cut all ends.

### 3.05 ASSEMBLING PIPE

- A. Clean ring groove and bell socket prior to inserting rubber gasket seal. Properly seat gasket; make sure it faces proper direction.
- B. Clean bell and spigot ends of pipe. Lubricate spigot end of pipe and rubber gasket.
- C. Hold pipe securely and in proper alignment when joining.
- D. Join pipe so that reference mark on spigot end, if provided by manufacturer, is flush with end of bell.
- E. Join pipe in strict accordance with manufacturer's printed installation procedures.
- F. General Procedure for Joining PVC Pipe
  1. Join pipe up to twenty-four inches in diameter when installed on non-granular and firm bedding, by means of a bar and wood block or use mechanical pipe pullers.
  2. Do not use excavating equipment to force pipe Sections together.
  3. Hold pipe securely and in proper alignment when joining.

4. Do not disturb previously made joints. Check completed piping to assure joints are intact. Insure backfilling is accomplished without disturbing pipe.
5. Do not allow earth, stones, or other debris to enter pipe or end section.

### 3.06 PROTECTION

- A. Protect all finished work. Joints once made and disturbed shall be subjected to immediate rejection. It shall therefore be the duty of the Contractor to avoid the slightest movement in completed work, while in the act of laying the pipe, in backfilling, or in the passage of workmen up and down the trench. At all times during which pipe is not being laid, the end of the pipe shall be sealed with a tight fitting plug. In no case will the drainage of trench water through a completed pipe be permitted.
- B. All curves, bends, tees, hydrants and ends of pipe shall be securely blocked with socket clamps or yokes to prevent movement. At the end of a line or turn, where provision has been made for future extension or connections, fittings shall be furnished with lugs and anchored by means of socket clamps or yokes.

### 3.07 ADAPTORS

- A. When it is necessary to join pipes of different types the Contractor shall furnish and install the necessary adaptors. Adaptors shall have ends conforming to the above Specifications for the appropriate type of joint to receive the adjoining pipe. When adaptors join two classes of pipe, the adaptors may be the lighter class.

### 3.08 CLEANING AND TESTING

- A. All waterlines shall be fully cleaned, disinfected, and tested in accordance with City of Wilmington Department of Public Works and the Delaware Department of Health standards and requirements, or the NFPA standards in the case of fire system lines, before being accepted by the Owner.

**END OF SECTION**

