

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
HIGHWAY DIVISION 4

**PROPOSAL**

**DATE AND TIME OF BID OPENING: FEBRUARY 26, 2019 AT 2:00 PM**

**CONTRACT ID: DD00295**

**WBS ELEMENT NO.: 15RE.10.3, 46305.3.58**

**FEDERAL AID NO.: STP-0095(55)**

**COUNTY: NORTHAMPTON COUNTY**

**TIP NO.: ER-5600AA**

**MILES: 0.0 MILES**

**ROUTE NO.: I-95**

**LOCATION: NORTHAMPTON WELCOME CENTER**

**TYPE OF WORK: REST AREA RENOVATION**

**NOTICE:**

**ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS \$30,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.**

**THIS IS A REST AREA PROJECT.**

**BID BONDS ARE REQUIRED.**

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**NAME OF BIDDER**

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**ADDRESS OF BIDDER**

**PROPOSAL FOR THE CONSTRUCTION OF  
CONTRACT No. DD00295 IN NORTHAMPTON COUNTY, NORTH CAROLINA  
FEBRUARY 26, 2019  
DEPARTMENT OF TRANSPORTATION,  
WILSON, NORTH CAROLINA**

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **DD00295**; has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Department of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with *the 2018 Standard Specifications for Roads and Structures* by the dates(s) specified in the Project Special Provisions and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete State Highway Contract No. **DD00295** in **NORTHAMPTON COUNTY**, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures, January 2018* with all amendments and supplements thereto, is by reference incorporated into and made a part of this contract; that, except as herein modified, all the construction and work included in this contract is to be done in accordance with the specifications contained in said volume, and amendments and supplements thereto, under the direction of the Engineer.

If the proposal is accepted and the award is made, the contract is valid only when signed either by the Contract Officer or such other person as may be designated by the Secretary to sign for the Department of Transportation. The conditions and provisions herein cannot be changed except over the signature of the said Contract Officer or Division Engineer.

The quantities shown in the itemized proposal for the project are considered to be approximate only and are given as the basis for comparison of bids. The Department of Transportation may increase or decrease the quantity of any item or portion of the work as may be deemed necessary or expedient.

An increase or decrease in the quantity of an item will not be regarded as sufficient ground for an increase or decrease in the unit prices, nor in the time allowed for the completion of the work, except as provided for the contract.

Accompanying this bid is a bid bond secured by a corporate surety, or certified check payable to the order of the Department of Transportation, for five percent of the total bid price, which deposit is to be forfeited as liquidated damages in case this bid is accepted and the Bidder shall fail to provide the required payment and performance bonds with the Department of Transportation, under the condition of this proposal, within 14 calendar days after the written notice of award is received by him, as provided in the Standard Specifications; otherwise said deposit will be returned to the Bidder.

THIS CONTRACT IS FOR TIP **ER-5600AA** CONTRACT ID **DD00295** FOR **REST AREA RENOVATION** TYPE OF WORK IN NORTHAMPTON COUNTY.

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### PROPOSAL ITEM SHEETS AND SIGNATURE SHEETS

**INSTRUCTIONS TO BIDDERS**

**PLEASE READ ALL INSTRUCTIONS CAREFULLY  
BEFORE PREPARING AND SUBMITTING YOUR BID.**

**All bids shall be prepared and submitted in accordance with the following requirements. Failure to comply with any requirement may cause the bid to be considered irregular and may be grounds for rejection of the bid.**

For preparing and submitting the bid electronically using the on-line system Bid Express®, refer to Article 102-8(B) of the *2018 Standard Specifications*.

Bidders that bid electronically on Raleigh Central-Let projects will need a separate Digital Signature form Bid Express® for Division Contracts.

**ELECTRONIC ON-LINE BID THRU BID EXPRESS:**

1. Download entire proposal from Connect NCDOT website. Download EBS file from Bid Express website.
2. Prepare and submit EBS file using Expedite software.
3. Expedite software necessary for electronic bid preparation may be downloaded from the Connect NCDOT website at: <https://connect.ncdot.gov/letting/Pages/EBS-Information.aspx> or from Bid Express.

**PROJECT SPECIAL PROVISIONS****GENERAL****MANDATORY PRE-BID MEETING:**

All Bidders for this contract must attend a **MANDATORY** Pre-Bid Meeting on Monday, February 4, 2019 at 9:30 AM at the NCDOT Division 4 Office, located at 509 Ward Blvd, Wilson, NC 27893.

**PRECONSTRUCTION MEETING:**

The Contractor shall contact Kristin Barnes, PE at (252) 583-4230 to arrange a Preconstruction conference. The project superintendent is required to attend the Preconstruction conference.

The proposed progress schedule must be submitted to the Engineer prior to the date of the preconstruction meeting. At the preconstruction meeting the Contractor shall supply the following information:

- Name of persons authorized to sign Supplemental Agreements
- Name of the EEO Officer and Minority Liaison Officer
- Name of the Erosion Control and Sediment Control/Storm Water Certified Supervisor, Certified Foreman, Certified Installer, and Certified Designer
- Name of the Work Zone Traffic Control Supervisor
- Buy America Certification

**BOND REQUIREMENTS:**

(06-01-16)

102-8, 102-10

SPD 01-420A

A Bid Bond is required in accordance with Article 102-10 of the *2018 Standard Specifications for Roads and Structures*.

Contract Payment and Performance Bonds are required in accordance with Article 103-7 of the *2018 Standard Specifications for Roads and Structures*.

**CONTRACT TIME AND LIQUIDATED DAMAGES:**

(7-1-95) (Rev. 12-18-07)

108

SP1 G10 A

The date of availability for this contract is **March 18, 2019**.

The completion date for this contract is **June 21, 2021**.

Except where otherwise provided by the contract, observation periods required by the contract will not be a part of the work to be completed by the completion date and/or intermediate contract times stated in the contract. The acceptable completion of the observation periods that extend beyond the final completion date shall be a part of the work covered by the performance and payment bonds.

The liquidated damages for this contract are **Two Hundred Fifty Dollars (\$250.00)** per calendar day.

**INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES:**

Except for that work required under the Project Special Provisions entitled “Warranty Work”, included elsewhere in this proposal, the Contractor will be required to complete all work included in this contract.

The date of availability for this intermediate contract time is **March 18, 2019**.

The completion date for this intermediate contract time is **December 16, 2019**.

The liquidated damages for this intermediate contract time are **One Thousand Dollars (\$1,000.00)** per calendar day.

**CLOSING OF REST AREA AND TRAFFIC CONTROL MANAGEMENT:**

As part of the work of this contract, the rest area will be closed during construction operations. The Contractor shall be responsible for installing all traffic control and messaging in accordance with the 2018 Roadway Standard Drawings and 2018 Standard Specifications necessary to close the ramps to the rest area, or as directed by the Engineer. The Contractor shall be responsible for the maintenance of traffic control devices on the project limits throughout the life of this contract. There will be no payment for the maintenance of these devices, as this cost will be considered incidental to the other items of the contract. Contractor shall provide at least a 7 day notification to the Engineer of their intent to close of the rest area to public use.

**NO MAJOR CONTRACT ITEMS:**

(2-19-02) (Rev. 8-21-07)

104

SP1 G31

None of the items included in this contract will be major items.

**SPECIALTY ITEMS:**

(7-1-95)(Rev. 1-17-12)

108-6

SP1 G37

Items listed below will be the specialty items for this contract (see Article 108-6 of the *2018 Standard Specifications*).

<b>Line #</b>	<b>Description</b>
76	Lighting
79	Utility Construction
21 - 26, 29	Erosion Control
30 - 65	Planting

**DISADVANTAGED BUSINESS ENTERPRISE (DIVISIONS):**

(10-16-07)(Rev.2-19-19)

102-15(J)

SP1 G62

**Description**

The purpose of this Special Provision is to carry out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts financed in whole or in part with Federal funds. This provision is guided by 49 CFR Part 26.

**Definitions**

*Additional DBE Subcontractors* - Any DBE submitted at the time of bid that will not be used to meet the DBE goal. No submittal of a Letter of Intent is required.

*Committed DBE Subcontractor* - Any DBE submitted at the time of bid that is being used to meet the DBE goal by submission of a Letter of Intent. Or any DBE used as a replacement for a previously committed DBE firm.

*Contract Goal Requirement* - The approved DBE participation at time of award, but not greater than the advertised contract goal.

*DBE Goal* - A portion of the total contract, expressed as a percentage, that is to be performed by committed DBE subcontractor(s).

*Disadvantaged Business Enterprise (DBE)* - A firm certified as a Disadvantaged Business Enterprise through the North Carolina Unified Certification Program.

*Goal Confirmation Letter* - Written documentation from the Department to the bidder confirming the Contractor's approved, committed DBE participation along with a listing of the committed DBE firms.

*Manufacturer* - A firm that operates or maintains a factory or establishment that produces on the premises, the materials or supplies obtained by the Contractor.

*Regular Dealer* - A firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public in the usual course of business. A regular dealer engages in, as its principal business and in its own name, the purchase and sale or lease of the products in question. A regular dealer in such bulk items as steel, cement, gravel, stone, and petroleum products need not keep such products in stock, if it owns and operates distribution equipment for the products. Brokers and packagers are not regarded as manufacturers or regular dealers within the meaning of this section.

*Replacement / Substitution* - A full or partial reduction in the amount of work subcontracted to a committed (or an approved substitute) DBE firm.

*North Carolina Unified Certification Program (NCUCP)* - A program that provides comprehensive services and information to applicants for DBE certification, such that an applicant is required to apply only once for a DBE certification that will be honored by all recipients of USDOT funds in the state and not limited to the Department of Transportation only. The Certification Program is in accordance with 49 CFR Part 26.

*United States Department of Transportation (USDOT)* - Federal agency responsible for issuing regulations (49 CFR Part 26) and official guidance for the DBE program.

### **Forms and Websites Referenced in this Provision**

*DBE Payment Tracking System* - On-line system in which the Contractor enters the payments made to DBE subcontractors who have performed work on the project.  
<https://apps.dot.state.nc.us/Vendor/PaymentTracking/>

*DBE-IS Subcontractor Payment Information* - Form for reporting the payments made to all DBE firms working on the project. This form is for paper bid projects only.  
<https://connect.ncdot.gov/business/Turnpike/Documents/Form%20DBE-IS%20Subcontractor%20Payment%20Information.pdf>

*RF-1 DBE Replacement Request Form* - Form for replacing a committed DBE.  
<http://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20MBE%20WBE%20Replacement%20Request%20Form.pdf>

*SAF Subcontract Approval Form* - Form required for approval to sublet the contract.  
<http://connect.ncdot.gov/projects/construction/Construction%20Forms/Subcontract%20Approval%20Form%20Rev.%202012.zip>

*JC-1 Joint Check Notification Form* - Form and procedures for joint check notification. The form acts as a written joint check agreement among the parties providing full and prompt disclosure of the expected use of joint checks.  
<http://connect.ncdot.gov/projects/construction/Construction%20Forms/Joint%20Check%20Notification%20Form.pdf>

*Letter of Intent* - Form signed by the Contractor and the DBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed DBE for the estimated amount (based on quantities and unit prices) listed at the time of bid.  
<http://connect.ncdot.gov/letting/LetCentral/Letter%20of%20Intent%20to%20Perform%20as%20a%20Subcontractor.pdf>

*Listing of DBE Subcontractors Form* - Form for entering DBE subcontractors on a project that will meet this DBE goal. This form is for paper bids only.  
[http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/08%20DBE%20Subcontractors%20\(Federal\).docx](http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/08%20DBE%20Subcontractors%20(Federal).docx)

*Subcontractor Quote Comparison Sheet* - Spreadsheet for showing all subcontractor quotes in the work areas where DBEs quoted on the project. This sheet is submitted with good faith effort packages.



<http://connect.ncdot.gov/business/SmallBusiness/Documents/DBE%20Subcontractor%20Quote%20Comparison%20Example.xls>

### **DBE Goal**

The following DBE goal for participation by Disadvantaged Business Enterprises is established for this contract:

Disadvantaged Business Enterprises **5.0%**

- (A) *If the DBE goal is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that DBEs participate in at least the percent of the contract as set forth above as the DBE goal.
- (B) *If the DBE goal is zero*, the Contractor shall make an effort to recruit and use DBEs during the performance of the contract. Any DBE participation obtained shall be reported to the Department.

### **Directory of Transportation Firms (Directory)**

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as DBE certified shall be used to meet the DBE goal. The Directory can be found at the following link. [https:// www.ebs.nc.gov/VendorDirectory/default.html](https://www.ebs.nc.gov/VendorDirectory/default.html)

The listing of an individual firm in the directory shall not be construed as an endorsement of the firm's capability to perform certain work.

### **Listing of DBE Subcontractors**

At the time of bid, bidders shall submit all DBE participation that they anticipate to use during the life of the contract. Only those identified to meet the DBE goal will be considered committed, even though the listing shall include both committed DBE subcontractors and additional DBE subcontractors. Additional DBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goal. Only those firms with current DBE certification at the time of bid opening will be acceptable for listing in the bidder's submittal of DBE participation. The Contractor shall indicate the following required information:

- (A) Electronic Bids

Bidders shall submit a listing of DBE participation in the appropriate section of the electronic submittal file.

- (1) Submit the names and addresses of DBE firms identified to participate in the contract. If the bidder uses the updated listing of DBE firms shown in the electronic submittal file, the bidder may use the dropdown menu to access the name and address of the DBE firm.

- (2) Submit the contract line numbers of work to be performed by each DBE firm. When no figures or firms are entered, the bidder will be considered to have no DBE participation.
  - (3) The bidder shall be responsible for ensuring that the DBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that DBE's participation will not count towards achieving the DBE goal.
- (B) Paper Bids
- (1) *If the DBE goal is more than zero,*
    - (a) Bidders, at the time the bid proposal is submitted, shall submit a listing of DBE participation, including the names and addresses on *Listing of DBE Subcontractors* contained elsewhere in the contract documents in order for the bid to be considered responsive. Bidders shall indicate the total dollar value of the DBE participation for the contract.
    - (b) If bidders have no DBE participation, they shall indicate this on the *Listing of DBE Subcontractors* by entering the word "None" or the number "0." This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation.** Bids submitted that do not have DBE participation indicated on the appropriate form will not be read publicly during the opening of bids. The Department will not consider these bids for award and the proposal will be rejected.
    - (c) The bidder shall be responsible for ensuring that the DBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that DBE's participation will not count towards achieving the DBE goal.
  - (2) *If the DBE goal is zero,* entries on the *Listing of DBE Subcontractors* are not required, however any DBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.

### **DBE Prime Contractor**

When a certified DBE firm bids on a contract that contains a DBE goal, the DBE firm is responsible for meeting the goal or making good faith efforts to meet the goal, just like any other bidder. In most cases, a DBE bidder on a contract will meet the DBE goal by virtue of the work it performs on the contract with its own forces. However, all the work that is performed by the DBE bidder and any other DBE subcontractors will count toward the DBE goal. The DBE bidder shall list itself along with any DBE subcontractors, if any, in order to receive credit toward the DBE goal.

For example, if the DBE goal is 45% and the DBE bidder will only perform 40% of the contract work, the prime will list itself at 40%, and the additional 5% shall be obtained through additional DBE participation with DBE subcontractors or documented through a good faith effort.

DBE prime contractors shall also follow Sections A or B listed under *Listing of DBE Subcontractor* just as a non-DBE bidder would.

### **Written Documentation – Letter of Intent**

The bidder shall submit written documentation for each DBE that will be used to meet the DBE goal of the contract, indicating the bidder's commitment to use the DBE in the contract. This documentation shall be submitted on the Department's form titled *Letter of Intent*.

The documentation shall be received in the office of the Engineer no later than 2:00 p.m. of the fifth calendar day following opening of bids, unless the fifth day falls on Saturday, Sunday or an official state holiday. In that situation, it is due in the office of the Engineer no later than 10:00 a.m. on the next official state business day.

If the bidder fails to submit the Letter of Intent from each committed DBE to be used toward the DBE goal, or if the form is incomplete (i.e. both signatures are not present), the DBE participation will not count toward meeting the DBE goal. If the lack of this participation drops the commitment below the DBE goal, the Contractor shall submit evidence of good faith efforts, completed in its entirety, to the Engineer no later than 2:00 p.m. on the eighth calendar day following opening of bids, unless the eighth day falls on Saturday, Sunday or an official state holiday. In that situation, it is due in the office of the Engineer no later than 10:00 a.m. on the next official state business day.

### **Submission of Good Faith Effort**

If the bidder fails to meet or exceed the DBE goal the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach the DBE goal.

One complete set and one electronic copy (**in .PDF format**) of this information shall be received in the office of the Engineer no later than 2:00 p.m. of the fifth calendar day following opening of bids, unless the fifth day falls on Saturday, Sunday or an official state holiday. In that situation, it is due in the office of the Engineer no later than 10:00 a.m. on the next official state business day.

Note: Where the information submitted includes repetitious solicitation letters, it will be acceptable to submit a representative letter along with a distribution list of the firms that were solicited. Documentation of DBE quotations shall be a part of the good faith effort submittal. This documentation may include written subcontractor quotations, telephone log notations of verbal quotations, or other types of quotation documentation.

### **Consideration of Good Faith Effort for Projects with DBE Goals More Than Zero**

Adequate good faith efforts mean that the bidder took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to

obtain sufficient DBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought DBE participation. Mere *pro forma* efforts are not considered good faith efforts.

The Department will consider the quality, quantity, and intensity of the different kinds of efforts a bidder has made. Listed below are examples of the types of actions a bidder will take in making a good faith effort to meet the goal and are not intended to be exclusive or exhaustive, nor is it intended to be a mandatory checklist.

- (A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the DBEs to respond to the solicitation. Solicitation shall provide the opportunity to DBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
- (B) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved.
  - (1) Where appropriate, break out contract work items into economically feasible units to facilitate DBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.
  - (2) Negotiate with subcontractors to assume part of the responsibility to meet the contract DBE goal when the work to be sublet includes potential for DBE participation (2<sup>nd</sup> and 3<sup>rd</sup> tier subcontractors).
- (C) Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- (D)
  - (1) Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.
  - (2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire

of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidding contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

- (E) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associates and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.
- (F) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.
- (G) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- (H) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; Federal, State, and local minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs. Contact within 7 days from the bid opening the Business Opportunity and Work Force Development Unit at [BOWD@ncdot.gov](mailto:BOWD@ncdot.gov) to give notification of the bidder's inability to get DBE quotes.
- (I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the DBE goal.

In addition, the Department may take into account the following:

- (1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the DBE goal.
- (2) The bidders' past performance in meeting the DBE goals.
- (3) The performance of other bidders in meeting the DBE goal. For example, when the apparent successful bidder fails to meet the DBE goal, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the DBE goal, but meets or exceeds the average DBE participation obtained by other bidders, the Department may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made a good faith effort.

If the Department does not award the contract to the apparent lowest responsive bidder, the Department reserves the right to award the contract to the next lowest responsive bidder that can satisfy to the Department that the DBE goal can be met or that an adequate good faith effort has been made to meet the DBE goal.

**Non-Good Faith Appeal**

The Engineer will notify the contractor verbally and in writing of non-good faith. A contractor may appeal a determination of non-good faith made by the Goal Compliance Committee. If a contractor wishes to appeal the determination made by the Committee, they shall provide written notification to the Engineer. The appeal shall be made within 2 business days of notification of the determination of non-good faith.

**Counting DBE Participation Toward Meeting DBE Goal****(A) Participation**

The total dollar value of the participation by a committed DBE will be counted toward the contract goal requirement. The total dollar value of participation by a committed DBE will be based upon the value of work actually performed by the DBE and the actual payments to DBE firms by the Contractor.

**(B) Joint Checks**

Prior notification of joint check use shall be required when counting DBE participation for services or purchases that involves the use of a joint check. Notification shall be through submission of Form JC-1 (*Joint Check Notification Form*) and the use of joint checks shall be in accordance with the Department's Joint Check Procedures.

**(C) Subcontracts (Non-Trucking)**

A DBE may enter into subcontracts. Work that a DBE subcontracts to another DBE firm may be counted toward the contract goal requirement. Work that a DBE subcontracts to a non-DBE firm does not count toward the contract goal requirement. If a DBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the DBE is not performing a commercially useful function. The DBE may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption is subject to review by the Federal Highway Administration but is not administratively appealable to USDOT.

**(D) Joint Venture**

When a DBE performs as a participant in a joint venture, the Contractor may count toward its contract goal requirement a portion of the total value of participation with the DBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the DBE performs with its forces.

**(E) Suppliers**

A contractor may count toward its DBE requirement 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from a DBE regular dealer and 100 percent of such expenditures from a DBE manufacturer.

(F) Manufacturers and Regular Dealers

A contractor may count toward its DBE requirement the following expenditures to DBE firms that are not manufacturers or regular dealers:

- (1) The fees or commissions charged by a DBE firm for providing a *bona fide* service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a DOT-assisted contract, provided the fees or commissions are determined to be reasonable and not excessive as compared with fees and commissions customarily allowed for similar services.
- (2) With respect to materials or supplies purchased from a DBE, which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site (but not the cost of the materials and supplies themselves), provided the fees are determined to be reasonable and not excessive as compared with fees customarily allowed for similar services.

**Commercially Useful Function**

(A) DBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to DBEs that perform a commercially useful function in the work of a contract. A DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the DBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine whether a DBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the DBE credit claimed for its performance of the work, and any other relevant factors.

(B) DBE Utilization in Trucking

The following factors will be used to determine if a DBE trucking firm is performing a commercially useful function:

- (1) The DBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there shall not be a contrived arrangement for the purpose of meeting DBE goals.

- (2) The DBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.
- (3) The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
- (4) The DBE may subcontract the work to another DBE firm, including an owner-operator who is certified as a DBE. The DBE who subcontracts work to another DBE receives credit for the total value of the transportation services the subcontracted DBE provides on the contract.
- (5) The DBE may also subcontract the work to a non-DBE firm, including from an owner-operator. The DBE who subcontracts the work to a non-DBE is entitled to credit for the total value of transportation services provided by the non-DBE subcontractor not to exceed the value of transportation services provided by DBE-owned trucks on the contract. Additional participation by non-DBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the DBE and the Contractor will not count towards the DBE contract requirement.
- (6) A DBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the DBE has exclusive use of and control over the truck. This requirement does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. This type of lease may count toward the DBE's credit as long as the driver is under the DBE's payroll.
- (7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the DBE that they are subcontracted/leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

### **DBE Replacement**

When a Contractor has relied on a commitment to a DBE subcontractor (or an approved substitute DBE subcontractor) to meet all or part of a contract goal requirement, the contractor shall not terminate the DBE subcontractor for convenience. This includes, but is not limited to, instances in which the Contractor seeks to perform the work of the terminated subcontractor with another DBE subcontractor, a non-DBE subcontractor, or with the Contractor's own forces or those of an affiliate.

The Contractor must give notice in writing both by certified mail and email to the DBE subcontractor, with a copy to the Engineer of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor must give the DBE subcontractor five (5) business days to respond to the Contractor's Notice of Intent to Request Termination and/or Substitution. If the DBE subcontractor objects to the intended termination/substitution, the DBE, within five (5) business days must advise the Contractor and the Department of the reasons why the action should



not be approved. The five-day notice period shall begin on the next business day after written notice is provided to the DBE subcontractor.

A committed DBE subcontractor may only be terminated after receiving the Department's written approval based upon a finding of good cause for the proposed termination and/or substitution. For purposes of this section, good cause shall include the following circumstances:

- (a) The listed DBE subcontractor fails or refuses to execute a written contract;
- (b) The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
- (c) The listed DBE subcontractor fails or refuses to meet the prime contractor's reasonable, nondiscriminatory bond requirements;
- (d) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
- (e) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR Parts 180, 215 and 1,200 or applicable state law;
- (f) The listed DBE subcontractor is not a responsible contractor;
- (g) The listed DBE voluntarily withdraws from the project and provides written notice of withdrawal;
- (h) The listed DBE is ineligible to receive DBE credit for the type of work required;
- (i) A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract;
- (j) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the prime contractor seeks to terminate a DBE it relied upon to obtain the contract so that the prime contractor can self-perform the work for which the DBE contractor was engaged or so that the prime contractor can substitute another DBE or non-DBE contractor after contract award.

The Contractor shall comply with the following for replacement of a committed DBE:

(A) Performance Related Replacement

When a committed DBE is terminated for good cause as stated above, an additional DBE that was submitted at the time of bid may be used to fulfill the DBE commitment. A good faith effort will only be required for removing a committed DBE if there were no additional DBEs submitted at the time of bid to cover the same amount of work as the DBE that was terminated.

If a replacement DBE is not found that can perform at least the same amount of work as the terminated DBE, the Contractor shall submit a good faith effort documenting the steps taken. Such documentation shall include, but not be limited to, the following:

- (1) Copies of written notification to DBEs that their interest is solicited in contracting the work defaulted by the previous DBE or in subcontracting other items of work in the contract.

- (2) Efforts to negotiate with DBEs for specific subbids including, at a minimum:
    - (a) The names, addresses, and telephone numbers of DBEs who were contacted.
    - (b) A description of the information provided to DBEs regarding the plans and specifications for portions of the work to be performed.
  - (3) A list of reasons why DBE quotes were not accepted.
  - (4) Efforts made to assist the DBEs contacted, if needed, in obtaining bonding or insurance required by the Contractor.
- (B) Decertification Replacement
- (1) When a committed DBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Contractor to solicit replacement DBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.
  - (2) When a committed DBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named DBE firm, the Contractor shall take all necessary and reasonable steps to replace the DBE subcontractor with another DBE subcontractor to perform at least the same amount of work to meet the DBE goal requirement. If a DBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).

All requests for replacement of a committed DBE firm shall be submitted to the Engineer for approval on Form RF-1 (*DBE Replacement Request*). If the Contractor fails to follow this procedure, the Contractor may be disqualified from further bidding for a period of up to 6 months

### **Changes in the Work**

When the Engineer makes changes that result in the reduction or elimination of work to be performed by a committed DBE, the Contractor will not be required to seek additional participation. When the Engineer makes changes that result in additional work to be performed by a DBE based upon the Contractor's commitment, the DBE shall participate in additional work to the same extent as the DBE participated in the original contract work.

When the Engineer makes changes that result in extra work, which has more than a minimal impact on the contract amount, the Contractor shall seek additional participation by DBEs unless otherwise approved by the Engineer.

When the Engineer makes changes that result in an alteration of plans or details of construction, and a portion or all of the work had been expected to be performed by a committed DBE, the Contractor shall seek participation by DBEs unless otherwise approved by the Engineer.

When the Contractor requests changes in the work that result in the reduction or elimination of work that the Contractor committed to be performed by a DBE, the Contractor shall seek additional participation by DBEs equal to the reduced DBE participation caused by the changes.

### **Reports and Documentation**

A SAF (*Subcontract Approval Form*) shall be submitted for all work which is to be performed by a DBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving DBE subcontractors.

When using transportation services to meet the contract commitment, the Contractor shall submit a proposed trucking plan in addition to the SAF. The plan shall be submitted prior to beginning construction on the project. The plan shall include the names of all trucking firms proposed for use, their certification type(s), the number of trucks owned by the firm, as well as the individual truck identification numbers, and the line item(s) being performed.

Within 30 calendar days of entering into an agreement with a DBE for materials, supplies or services, not otherwise documented by the SAF as specified above, the Contractor shall furnish the Engineer a copy of the agreement. The documentation shall also indicate the percentage (60% or 100%) of expenditures claimed for DBE credit.

### **Reporting Disadvantaged Business Enterprise Participation**

The Contractor shall provide the Engineer with an accounting of payments made to all DBE firms, including material suppliers and contractors at all levels (prime, subcontractor, or second tier subcontractor). This accounting shall be furnished to the Engineer for any given month by the end of the following month. Failure to submit this information accordingly may result in the following action:

- (A) Withholding of money due in the next partial pay estimate; or
- (B) Removal of an approved contractor from the prequalified bidders' list or the removal of other entities from the approved subcontractors list.

While each contractor (prime, subcontractor, 2nd tier subcontractor) is responsible for accurate accounting of payments to DBEs, it shall be the prime contractor's responsibility to report all monthly and final payment information in the correct reporting manner.

Failure on the part of the Contractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from further bidding until the required information is submitted.

Failure on the part of any subcontractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from being approved for work on future projects until the required information is submitted.

Contractors reporting transportation services provided by non-DBE lessees shall evaluate the value of services provided during the month of the reporting period only.

At any time, the Engineer can request written verification of subcontractor payments.

The Contractor shall report the accounting of payments through the Department's DBE Payment Tracking System.

### **Failure to Meet Contract Requirements**

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2018 Standard Specifications* may be cause to disqualify the Contractor.

### **CERTIFICATION FOR FEDERAL-AID CONTRACTS:**

(3-21-90)

SP1 G85

The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

- (A) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (B) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, *Disclosure Form to Report Lobbying*, in accordance with its instructions.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by *Section 1352, Title 31, U.S. Code*. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such subrecipients shall certify and disclose accordingly.

**CONTRACTOR'S LICENSE REQUIREMENTS:**

(7-1-95)

102-14

SP1 G88

If the successful bidder does not hold the proper license to perform any plumbing, heating, air conditioning, or electrical work in this contract, he will be required to sublet such work to a contractor properly licensed in accordance with *Article 2 of Chapter 87 of the General Statutes* (licensing of heating, plumbing, and air conditioning contractors) and *Article 4 of Chapter 87 of the General Statutes* (licensing of electrical contractors).

**U.S. DEPARTMENT OF TRANSPORTATION HOTLINE:**

(11-22-94)

108-5

SP1 G100

To report bid rigging activities call: **1-800-424-9071**

The U.S. Department of Transportation (DOT) operates the above toll-free hotline Monday through Friday, 8:00 a.m. to 5:00 p.m. eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the hotline to report such activities.

The hotline is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

**CARGO PREFERENCE ACT:**

(2-16-16)

Privately owned United States-flag commercial vessels transporting cargoes are subject to the Cargo Preference Act (CPA) of 1954 requirements and regulations found in 46 CFR 381.7. Contractors are directed to clause (b) of 46 CFR 381.7 as follows:

(b) Contractor and Subcontractor Clauses. "Use of United States-flag vessels: The contractor agrees-

" (1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract."

**SUBSURFACE INFORMATION:**

(7-1-95)

450

SP1 G112 A

There is **no** subsurface information available on this project. The Contractor shall make his own investigation of subsurface conditions.

**COOPERATION BETWEEN CONTRACTORS:**

(7-1-95)

105-7

SP1 G133

The Contractor's attention is directed to Article 105-7 of the *2018 Standard Specifications*.

I-5839 in Northampton and Halifax County (I-95 pavement rehabilitation from Mile Marker 172 (Chockoyotte Creek) to Mile Marker 182 (Virginia State Line) is currently under contract with Adams Construction Company and may not be completed prior to the letting of this project.

The Contractor on this project shall cooperate with other Contractors working within the rest area or adjacent to the limits of this project to the extent that the work can be carried out to the best advantage of all concerned.

**TWELVE MONTH GUARANTEE:**

(7-15-03)

108

SP1 G145

- (A) The Contractor shall guarantee materials and workmanship against latent and patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve months following the date of final acceptance of the work for maintenance and shall replace such defective materials and workmanship without cost to the Department. The Contractor will not be responsible for damage due to faulty design, normal wear and tear, for negligence on the part of the Department, and/or for use in excess of the design.
- (B) Where items of equipment or material carry a manufacturer's guarantee for any period in excess of twelve months, then the manufacturer's guarantee shall apply for that particular piece of equipment or material. The Department's first remedy shall be through the manufacturer although the Contractor is responsible for invoking the warranted repair work with the manufacturer. The Contractor's responsibility shall be limited to the term of the manufacturer's guarantee. NCDOT would be afforded the same warranty as provided by the Manufacturer.

This guarantee provision shall be invoked only for major components of work in which the Contractor would be wholly responsible for under the terms of the contract. Examples would include pavement structures, bridge components, and sign structures. This provision will not be used as a mechanism to force the Contractor to return to the project to make repairs or perform additional work that the Department would normally compensate the Contractor for. In addition, routine maintenance activities (i.e. mowing grass, debris removal, ruts in earth shoulders,) are not parts of this guarantee.

Appropriate provisions of the payment and/or performance bonds shall cover this guarantee for the project.

To ensure uniform application statewide the Division Engineer will forward details regarding the circumstances surrounding any proposed guarantee repairs to the Chief Engineer for review and approval prior to the work being performed.

**PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:**

(2-20-07) (Rev. 3-19-13)

105-16, 230, 801

SP1 G181

Water discharge from borrow pit sites shall not cause surface waters to exceed 50 NTUs (nephelometric turbidity unit) in streams not designated as trout waters and 10 NTUs in streams, lakes or reservoirs designated as trout waters. For lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTUs. If the turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased.

If during any operating day, the downstream water quality exceeds the standard, the Contractor shall do all of the following:

- (A) Either cease discharge or modify the discharge volume or turbidity levels to bring the downstream turbidity levels into compliance, or
- (B) Evaluate the upstream conditions to determine if the exceedance of the standard is due to natural background conditions. If the background turbidity measurements exceed the standard, operation of the pit and discharge can continue as long as the stream turbidity levels are not increased due to the discharge.
- (C) Measure and record the turbidity test results (time, date and sampler) at all defined sampling locations 30 minutes after startup and at a minimum, one additional sampling of all sampling locations during that 24-hour period in which the borrow pit is discharging.
- (D) Notify DWQ within 24 hours of any stream turbidity standard exceedances that are not brought into compliance.

During the Environmental Assessment required by Article 230-4 of the *2018 Standard Specifications*, the Contractor shall define the point at which the discharge enters into the State's surface waters and the appropriate sampling locations. Sampling locations shall include points upstream and downstream from the point at which the discharge enters these waters. Upstream sampling location shall be located so that it is not influenced by backwater conditions and represents natural background conditions. Downstream sampling location shall be located at the point where complete mixing of the discharge and receiving water has occurred.

The discharge shall be closely monitored when water from the dewatering activities is introduced into jurisdictional wetlands. Any time visible sedimentation (deposition of sediment) on the wetland surface is observed, the dewatering activity will be suspended until turbidity levels in the stilling basin can be reduced to a level where sediment deposition does not occur. Staining of wetland surfaces from suspended clay particles, occurring after evaporation or infiltration, does not constitute sedimentation. No activities shall occur in wetlands that adversely affect the functioning of a wetland. Visible sedimentation will be considered an indication of possible adverse impacts on wetland use.

The Engineer will perform independent turbidity tests on a random basis. These results will be maintained in a log within the project records. Records will include, at a minimum, turbidity test results, time, date and name of sampler. Should the Department's test results exceed those of the Contractor's test results, an immediate test shall be performed jointly with the results superseding the previous test results of both the Department and the Contractor.

The Contractor shall use the *NCDOT Turbidity Reduction Options for Borrow Pits Matrix*, available at:

<https://connect.ncdot.gov/resources/roadside/FieldOperationsDocuments/TurbidityReductionOptionSheet.pdf> to plan, design, construct, and maintain BMPs to address water quality standards. Tier I Methods include stilling basins which are standard compensatory BMPs. Other Tier I methods are noncompensatory and shall be used when needed to meet the stream turbidity standards. Tier II Methods are also noncompensatory and are options that may be needed for protection of rare or unique resources or where special environmental conditions exist at the site which have led to additional requirements being placed in the DWQ's 401 Certifications and approval letters, Isolated Wetland Permits, Riparian Buffer Authorization or a DOT Reclamation Plan's Environmental Assessment for the specific site. Should the Contractor exhaust all Tier I Methods on a site exclusive of rare or unique resources or special environmental conditions, Tier II Methods may be required by regulators on a case by case basis per supplemental agreement.

The Contractor may use cation exchange capacity (CEC) values from proposed site borings to plan and develop the bid for the project. CEC values exceeding 15 milliequivalents per 100 grams of soil may indicate a high potential for turbidity and should be avoided when dewatering into surface water is proposed.

No additional compensation for monitoring borrow pit discharge will be paid.



**PROJECT SPECIAL PROVISIONS****ROADWAY****BURNING RESTRICTIONS:**

(7-1-95)

200, 210, 215

SP2 R05

Open burning is not permitted on any portion of the right-of-way limits established for this project. Do not burn the clearing, grubbing or demolition debris designated for disposal and generated from the project at locations within the project limits, off the project limits or at any waste or borrow sites in this county. Dispose of the clearing, grubbing and demolition debris by means other than burning, according to state or local rules and regulations.

**BORROW EXCAVATION (Truck Measurement):**

(7-1-95)

230

SP2 R57

The borrow material used on this project will be measured for payment by truck measurement as provided in Article 230-5 of the *2018 Standard Specifications*.

**EROSION CONTROL****SAFETY FENCE AND JURISDICTIONAL FLAGGING:****Description**

*Safety Fence* shall consist of furnishing materials, installing and maintaining polyethylene or polypropylene fence along the outside riparian buffer, wetland, or water boundary, or other boundaries located within the construction corridor to mark the areas that have been approved to infringe within the buffer, wetland, endangered vegetation, culturally sensitive areas or water. The fence shall be installed prior to any land disturbing activities.

Interior boundaries for jurisdictional areas noted above shall be delineated by stakes and highly visible flagging.

Jurisdictional boundaries at staging areas, waste sites, or borrow pits, whether considered outside or interior boundaries shall be delineated by stakes and highly visible flagging.

**Materials****(A) Safety Fencing**

Polyethylene or polypropylene fence shall be a highly visible preconstructed safety fence approved by the Engineer. The fence material shall have an ultraviolet coating.

Either wood posts or steel posts may be used. Wood posts shall be hardwood with a wedge or pencil tip at one end, and shall be at least 5 ft. in length with a minimum nominal 2" x 2" cross section. Steel posts shall be at least 5 ft. in length, and have a minimum weight of 0.85 lb/ft of length.

**(B) Boundary Flagging**

Wooden stakes shall be 4 feet in length with a minimum nominal 3/4" x 1-3/4" cross section. The flagging shall be at least 1" in width. The flagging material shall be vinyl and shall be orange in color and highly visible.

**Construction Methods**

No additional clearing and grubbing is anticipated for the installation of this fence. The fence shall be erected to conform to the general contour of the ground.

**(A) Safety Fencing**

Posts shall be set at a maximum spacing of 10 ft., maintained in a vertical position and hand set or set with a post driver. Posts shall be installed a minimum of 2 ft. into the ground. If hand set, all backfill material shall be thoroughly tamped. Wood posts may be sharpened to a dull point if power driven. Posts damaged by power driving shall be removed and replaced prior to final

acceptance. The tops of all wood posts shall be cut at a 30-degree angle. The wood posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected.

The fence geotextile shall be attached to the wood posts with one 2" galvanized wire staple across each cable or to the steel posts with wire or other acceptable means.

Place construction stakes to establish the location of the safety fence in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications*. No direct pay will be made for the staking of the safety fence. All stakeouts for safety fence shall be considered incidental to the work being paid for as "Construction Surveying", except that where there is no pay item for construction surveying, all safety fence stakeout will be performed by state forces.

The Contractor shall be required to maintain the safety fence in a satisfactory condition for the duration of the project as determined by the Engineer.

(B) Boundary Flagging

Boundary flagging delineation of interior boundaries shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Interior boundaries may be staked on a tangent that runs parallel to buffer but must not encroach on the buffer at any location. Interior boundaries of hand clearing shall be identified with a different colored flagging to distinguish it from mechanized clearing.

Boundary flagging delineation of interior boundaries will be placed in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications*. No direct pay will be made for delineation of the interior boundaries. This delineation will be considered incidental to the work being paid for as *Construction Surveying*, except that where there is no pay item or construction surveying the cost of boundary flagging delineation shall be included in the unit prices bid for the various items in the contract. Installation for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Additional flagging may be placed on overhanging vegetation to enhance visibility but does not substitute for installation of stakes.

Installation of boundary flagging for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall be performed in accordance with Subarticle 230-4(B)(5) or Subarticle 802-2(F) of the *Standard Specifications*. No direct pay will be made for this delineation, as the cost of same shall be included in the unit prices bid for the various items in the contract.

The Contractor shall be required to maintain alternative stakes and highly visible flagging in a satisfactory condition for the duration of the project as determined by the Engineer.

**Measurement and Payment**

*Safety Fence* will be measured and paid as the actual number of linear feet of polyethylene or polypropylene fence installed in place and accepted. Such payment will be full compensation including but not limited to furnishing and installing fence geotextile with necessary posts and post bracing, staples, tie wires, tools, equipment and incidentals necessary to complete this work.

Payment will be made under:

**Pay Item**

Safety Fence

**Pay Unit**

Linear Foot

**WATTLE:**

(10-19-10) (Rev. 1-17-12)

1060,1630,1631

T1

**Description**

Wattles are tubular products consisting of excelsior fibers encased in synthetic netting. Wattles are used on slopes or channels to intercept runoff and act as a velocity break. Wattles are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of wattles, matting installation, and removing wattles.

**Materials**

Wattle shall meet the following specifications:

100% Curled Wood(Excelsior) Fibers	
Minimum Diameter	12 in.
Minimum Density	2.5 lb/ft <sup>3</sup> +/- 10%
Net Material	Synthetic
Net Openings	1 in. x 1 in.
Net Configuration	Totally Encased
Minimum Weight	20 lb. +/- 10% per 10 ft. length

Stakes shall be used as anchors.

Provide hardwood stakes a minimum of 2 feet long with a 2 inch x 2 inch nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving down into the underlying soil.

Matting shall meet the requirements of Article 1060-8 of the *2018 Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Provide staples made of 0.125 inch diameter new steel wire formed into a *u* shape not less than 12 inches in length with a throat of 1 inch in width.

**Construction Methods**

Wattles shall be secured to the soil by wire staples approximately every 1 linear foot and at the end of each section of wattle. A minimum of 4 stakes shall be installed on the downstream side of the wattle with a maximum spacing of 2 linear feet along the wattle, and according to the detail. Install a minimum of 2 stakes on the upstream side of the wattle according to the detail provided in the plans. Stakes shall be driven into the ground a minimum of 10 inches with no more than 2

inches projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Only install wattle(s) to a height in ditch so flow will not wash around wattle and scour ditch slopes and according to the detail provided in the plans and as directed. Overlap adjoining sections of wattles a minimum of 6 inches.

Installation of matting shall be in accordance with the detail provided in the plans, and in accordance with Article 1631-3 of the *2018 Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

The Contractor shall maintain the wattles until the project is accepted or until the wattles are removed, and shall remove and dispose of silt accumulations at the wattles when so directed in accordance with the requirements of Section 1630 of the *2018 Standard Specifications*.

### **Measurement and Payment**

*Wattle* will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Wattle*.

Matting will be measured and paid for in accordance with Article 1631-4 of the *2018 Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Payment will be made under:

**Pay Item**  
Wattle

**Pay Unit**  
Linear Foot

### **CONCRETE WASHOUT STRUCTURE:**

(12-01-15)

### **Description**

Concrete washout structures are enclosures above or below grade to contain concrete waste water and associated concrete mix from washing out ready-mix trucks, drums, pumps, or other equipment. Concrete washouts must collect and retain all the concrete washout water and solids, so that this material does not migrate to surface waters or into the ground water. These enclosures are not intended for concrete waste not associated with wash out operations.

The concrete washout structure may include constructed devices above or below ground and or commercially available devices designed specifically to capture concrete waste water.

### **Materials**

**Item**  
Temporary Silt Fence

**Section**  
1605

*Safety Fence* shall meet the specifications as provided elsewhere in this contract.

Geomembrane basin liner shall meet the following minimum physical properties for low permeability; it shall consist of a polypropylene or polyethylene 10 mil thick geomembrane. If the minimum setback dimensions can be achieved the liner is not required. (5 feet above groundwater, 50 feet from top of bank of perennial stream, other surface water body, or wetland.)

### **Construction Methods**

Build an enclosed earthen berm or excavate to form an enclosure in accordance with the details and as directed.

Install temporary silt fence around the perimeter of the enclosure in accordance with the details and as directed if structure is not located in an area where existing erosion and sedimentation control devices are capable to containing any loss of sediment.

Post a sign with the words "Concrete Washout" in close proximity of the concrete washout area, so it is clearly visible to site personnel.

The construction details for the above grade and below grade concrete washout structures can be found on the following web page link:

<https://connect.ncdot.gov/resources/roadside/SoilWaterDocuments/ConcreteWashoutStructuredeetail.pdf>

Alternate details for accommodating concrete washout may be submitted for review and approval.

The alternate details shall include the method used to retain and dispose of the concrete waste water within the project limits and in accordance with the minimum setback requirements. (5 feet above groundwater, 50 feet from top of bank of perennial stream, other surface water body, or wetland.)

### **Maintenance and Removal**

Maintain the concrete washout structure(s) to provide adequate holding capacity plus a minimum freeboard of 12 inches. Remove and dispose of hardened concrete and return the structure to a functional condition after reaching 75% capacity.

Inspect concrete washout structures for damage and maintain for effectiveness.

Remove the concrete washout structures and sign upon project completion. Grade the earth material to match the existing contours and permanently seed and mulch area.

### **Measurement and Payment**

*Concrete Washout Structure* will be paid for per each enclosure installed in accordance with the details. If alternate details are approved then those details will also be paid for per each approved and installed device.

*Temporary Silt Fence* will be measured and paid for in accordance with Article 1605-5 of the *Standard Specifications*.

No measurement will be made for other items or for over excavation or stockpiling.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Concrete Washout Structure	Each

# STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION



## DIVISION FOUR

County: NORTHAMPTON  
 WBS Element: 15RE.10.3  
 State ID#: 18-19070-01A  
 Description: NORTHAMPTON COUNTY REST AREA  
 RENOVATION  
 I-95  
 PLEASANT HILL, NC

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 Ginger Anderson, Architect  
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 Raleigh, NC 27603  
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### Plumbing, Mechanical & Electrical Engineer

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*Ben Burke*

9/18/2018 2:32:42 PM EDT

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9/18/2018



*James E. Struffolino*

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## **SECTION 01026 - PAYMENT AND COMPLETION PROCEDURES**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Schedule of values.
  - 2. Payment procedures.
  - 3. Completion procedures.
- B. Related Requirements Specified Elsewhere in the Project Manual: Overhead and profit distribution.

#### **1.02 CONTRACT CONDITIONS**

- A. See the conditions of the contract for additional requirements.
- B. Progress payments will be made on or about the 25<sup>th</sup> of each month.
- C. The Architect/Engineer will act upon the Contractor's application for payment within 5 days after receipt.
- D. The Owner will act upon the application for payment within 15 days after receipt.
- E. No payment will be made for materials or equipment stored off site unless specifically approved in advance, in writing by the owner. Submit copy of the owner's agreement to pay for such materials and equipment with the application for payment covering such materials and equipment.
- F. Payments may be withheld if the contractor fails to make dated submittals within the time periods specified.

#### **1.03 DEFINITIONS**

- A. Final Completion: The stage at which all incomplete and incorrect work has been completed or corrected in accordance with the contract documents.
- B. List of Incomplete Work: A comprehensive list of items to be completed or corrected, prepared by the Designer/Owner/Contractor for the purpose of obtaining certification of substantial completion. This list is also referred to as a "Pre-Final and Final Punch List."
- C. Schedule of Values: A detailed breakdown of the contract sum into individual cost items, which will serve as the basis for evaluation of applications for progress payments during construction.
- D. Substantial Completion: The time at which the work, or a portion of the work which the owner agrees to accept separately, is sufficiently complete in accordance with the contract documents so that the owner can occupy or use the work for its intended purpose.
- E. Time and Material Work: Work which will be paid for on the basis of the actual cost of the work, including materials, labor, equipment, and other costs as defined elsewhere, as documented by detailed records. This basis is also referred to using the terms "cost-plus," "cost of the work," "force account," and similar terms.

#### **1.04 SUBMITTALS**

- A. Schedule of Values: First application for payment will not be reviewed without schedule of values.
  - 1. Submit in size not larger than 8-1/2 by 11 inches.
  - 2. Submit 5 copies.
  - 3. Identify with:
    - a. Project name, Project number, Architect's name, Owner's name, Contractor's name and address, and Submittal date.

- B. Applications for Progress Payments: Submit sufficiently in advance of date established for the progress payment to allow for the processing indicated.

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

## **PART 3 – EXECUTION**

### **3.01 SCHEDULE OF VALUES**

- A. Prepare a schedule of values prior to the first application for payment.
- B. Schedule of Values: Break costs down into line items which will be comparable with line items in applications for payment.
  - 1. Coordinate line items in the schedule of values with portions of the contract documents which identify units or subdivisions of work; provide cross-referencing if necessary to clarify.
    - a. Specifically, correlate with the project manual table of contents.
  - 2. Divide major subcontracts into individual cost items.
  - 3. Where applications for payment are likely to include products purchased or fabricated but not yet installed, provide individual line items for material cost, installation cost, and other applicable phases of completion.
  - 4. Include the following information for each line item, using AIA G703, Continuation Sheet.
    - a. Item name.
    - b. Applicable specification section.
    - c. Dollar value, rounded off to the nearest whole dollar (with the total equal to the contract sum).
    - d. Proportion of the contract sum represented by this item, to the nearest one-hundredth percent (with the total adjusted to 100 percent).
  - 5. Provide the following supporting data for each line item:
    - a. Subcontractor's name.
    - b. Manufacturer or fabricator's name.
    - c. Supplier's name.
- C. Submit schedule of values not later than 10 days prior to submittal of first application for payment.
- D. The Architect/Engineer will notify the contractor if schedule is not satisfactory; revise and resubmit acceptable schedule.
- E. Submit a revised schedule of values when modifications change the contract sum or change individual line items.
  - 1. Make each modification a new line item.
  - 2. Show the following information for each line item:
    - a. All information required for original submittal.
    - b. Identification of modifications which have affected its value.
  - 3. Submit prior to next application for payment.

### **3.02 APPLICATIONS FOR PAYMENT**

- A. Application for Payment will be through hicams.
- B. Provide the following information with every application for payment which involves work completed on a time and material basis:
  - 1. Detailed records of work done, including:
    - a. Dates and times work was performed, and by whom.
    - b. Time records and wage rates paid.
    - c. Invoices and receipts for products.
  - 2. Provide similar detailed records for subcontracts.

- C. Transmit application for payment with a transmittal form itemizing supporting documents attached.

### **3.03 FIRST PAYMENT PROCEDURE**

- A. The first application for payment will not be reviewed until the following submittals have been received:
  - 1. Schedule of values.
  - 2. List of subcontractors, principal suppliers, and fabricators.
  - 3. Contractor's construction schedule. Monthly Progress Schedules are required, see Section 01200.
  - 4. Names of the contractor's principal staff assigned to the project.
  - 5. All submittals specified to occur prior to first application for payment or prior to first payment.

### **3.04 SUBSTANTIAL COMPLETION PROCEDURES**

- A. The architect will perform a Pre-Final Inspection with the contractor two weeks before substantial completion inspection, upon request of the contractor. Plumbing, Mechanical, & Electrical subcontractors shall be present for all Final Inspections.
- B. The architect will perform a Final Inspection with the contractor for substantial completion and verification that the Pre-Final Inspection Punchlist is complete, upon request of the contractor.
  - 1. Only one certificate of substantial completion will be issued, for the entire project.
- C. Submit the following with application for payment following substantial completion:
  - 1. Certificate of Substantial Completion; use AIA original current editions of G704.
  - 4. Final Inspection list of incomplete work.
  - 5. Other data required by the contract documents.

### **3.05 FINAL COMPLETION PROCEDURES**

- A. Request for Final Inspection and final application for payment may coincide.
- B. The architect/engineer will perform inspection for final completion, upon request of the contractor.
  - 1. Submit the following with request for inspection:
    - a. Previous inspection lists indicating completion of all items.
    - b. If any items cannot be completed, obtain prior approval of such delay.
- C. Do not submit request for Final Inspection until the following activities have been completed:
  - 1. Completion of all work, Pre-Final Inspection Punch List, except those items agreed upon by the owner.
  - 2. Final cleaning.
  - 3. All activities specified to occur between substantial completion and final completion.
- D. Do not submit request for final inspection until the following submittals have been completed:
  - 1. Startup reports; HVAC balance and test reports.
  - 2. Operation and maintenance data. Demonstration reports. Instruction reports.
  - 3. Water bacterial test report of new domestic water supply.
  - 4. Final Electrical Inspection and certification by the State Construction Office electrical inspector.
  - 5. Project record documents, record drawings or as-built drawings.
  - 6. All other outstanding specified submittals.
- E. Submit the following with the final application for payment:
  - 1. Certified copy of the previous list of items to be completed or corrected, stating that each has been completed or otherwise resolved for acceptance.
  - 2. Contractor's Affidavit of Payment of Debts and Claims; use AIA original current editions of G706
  - 3. Contractor's Affidavit of Release of Liens; use AIA original current editions of G706A.
  - 4. Consent of surety to final payment; use AIA original current editions of G707.

5. Final liquidated damages statement.
6. Certification that financial obligations to governing authorities and public utilities have been fulfilled.
7. Description of unsettled claims.
8. Other data required by the contract documents.

**END OF SECTION 01026**



# SECTION 01100- COMPENSATION FOR GENERAL CONSTRUCTION

INTERSTATE 95  
REST AREA AND WELCOME CENTER  
OCTOBER 2018  
NORTHAMPTON COUNTY, NORTH CAROLINA

## 1.1 COMPENSATION

- A. The work of furnishing all materials and constructing/renovating the existing Rest Area Building, the Welcome center, porch and vending building and picnic shelters in accordance with the plans and specifications, completed and accepted, will be paid for at the contract lump sum price for the "General Construction of Rest Area Building". Such price and payment will be full compensation for all work included in construction documents for renovating the Rest Area Building, the Welcome center, porch and vending building, including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"General Construction of Rest Area Building".....Lump Sum

INTERSTATE 95  
REST AREA AND WELCOME CENTER  
SEPTEMBER 2018  
NORTHAMPTON COUNTY, NORTH CAROLINA

DIVISION 15A- COMPENSATION FOR PLUMBING --

COMPENSATION

- A. The work of furnishing materials and constructing the Plumbing installation for the Rest Area Building and water service to the fountain in accordance with the plans and specifications, completed and accepted, will be paid for at the contract lump sum price for the "Plumbing Installation of Rest Area Building". Such price and payment will be full compensation for all work of constructing the Plumbing installation for the Rest Area Building as indicated within construction documents, including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"Plumbing Installation of Rest Area Building".....Lump Sum

INTERSTATE 95  
REST AREA AND WELCOME CENTER  
SEPTEMBER 2018  
NORTHAMPTON COUNTY, NORTH CAROLINA

DIVISION 15B- COMPENSATION FOR MECHANICAL

COMPENSATION

- A. The work of furnishing materials and constructing the Mechanical System for the Rest Area Building in accordance with the plans and specifications, completed and accepted, will be paid for at the contract lump sum price for the "Mechanical Installation for Rest Area Building". Such price and payment will be full compensation for all work of the Mechanical Installation for Rest Area Building, including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"Mechanical Installation for Rest Area Building".....Lump Sum

INTERSTATE 95  
REST AREA AND WELCOME CENTER  
SEPTEMBER 2018  
NORTHAMPTON COUNTY, NORTH CAROLINA

DIVISION 16- COMPENSATION FOR ELECTRICAL

COMPENSATION

- A. The work of furnishing materials and constructing the Electrical installation for the Rest Area Building, vending, fountain and porches in accordance with the plans and specifications, completed and accepted, will be paid for at the contract lump sum price for the "Electrical Installation for Rest Area Building". Such price and payment will be full compensation for all work of constructing the Electrical installation for the Rest Area Building, including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"Electrical Installation for Rest Area Building".....Lump Sum

## **SECTION 01151 - CONSTRUCTION AND DEMOLITION MATERIALS RECYCLING REQUIREMENTS**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. Section includes: Requirements and procedures for ensuring optimal diversion of demolition and construction waste materials generated by the Work from landfill disposal within the limits of the Construction Schedule and Contract Sum.
  - 1. State of North Carolina Executive Order 156, Section 1.b, states that "...all state agencies are to maximize their efforts to...reduce and recycle material recoverable from solid waste originating...from the construction and renovation of new facilities..."
  - 2. The Waste Reduction Goal of this Contract is that a minimum of 50% by weight of the construction and demolition materials generated in the Work be diverted from landfill disposal through a combination of re-use and recycling activities.
  - 3.. Requirements for submittal of Contractor's Construction Waste and Recycling Plan prior to the commencement of the Work.
  - 4. Contractor's quantitative reports for construction waste materials as a condition of approval of progress payments submitted to the Architect

#### **1.02 DEFINITIONS**

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste, resulting from construction, remodeling, repair, and demolition operations.
- B. Construction and Demolition Debris: Building materials and solid waste resulting from construction, remodeling, repair, cleanup, or demolition operations that are not hazardous. This term includes, but is not limited to, asphalt concrete, Portland cement concrete, brick, lumber, gypsum wallboard, cardboard and other associated packaging, roofing material, ceramic tile, carpeting, carpet pad, ceiling tile, plastic pipe, other plastic material, vinyl flooring, copper pipe, and steel. This will also include other jobsite materials such as cardboard packaging, sheet vinyl, plastic bottles, white paper, and aluminum cans.
- C. C&D Recycling Center. A facility that receives C&D material that has been separated for reuse. Recycling facilities are often part of the overall County waste management facilities.
- D. Disposal. Final deposition of construction and demolition material
- E. Mixed Debris Recycling Facility: A processing facility that accepts loads of commingled construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing the non-recyclable residual materials.
- F. Recycling: The process of sorting, cleansing, treating and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
- G. Reuse. The use, in the same or similar form as it was produced, of a material which might otherwise be discarded.
- H. Source-Separated: Materials, including commingled recyclables, that have been separated or kept separate from the solid waste stream at the point of generation, for the purpose of additional sorting or processing of those materials for reuse or recycling in order to return them to the economic mainstream in the form of raw materials for new, reused, or reconstituted products which meet the quality standards necessary to be used in the marketplace.
- I. Waste Hauler: A company that possesses a valid permit from the [local waste management authority to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal in [the locality].

### 1.03 SUBMITTALS

- A. Contractor's Construction Waste and Recycling Plan
1. Review Contract Documents and estimate the types and quantities of materials under the Work that are anticipated to be feasible for on-site processing, source separation for re-use or recycling. Indicate the procedures that will be implemented in this program to effect jobsite source separation, such as, identifying a convenient location where dumpsters would be located, putting signage to identify materials to be placed in dumpsters, etc.
  2. Prior to commencing the Work, submit Contractor's Construction Waste and Recycling Plan. Submit in format provided (**Section 01151A**). The Plan must include, but is not limited to the following:
    - a. Contractor's name and project identification information;
    - b. Procedures to be used;
    - c. Materials to be re-used and recycled;
    - d. Estimated quantities of materials;
    - e. Names and locations of re-use and recycling facilities/sites;
    - f. Tonnage calculations that demonstrate that Contractor will re-use and recycle a minimum 50% by weight of the construction waste materials generated in the Work.
    - g. Cost of local tip fees for non-recycled material/ton
    - h. Cost or revenue generated from recycled material, per category, per ton (note: cost and revenue are to be managed by the General Contractor as part of the Work; tonnage, cost, and savings information are to be provided to the Architect for tracking purposes only)
  2. Contractor's Construction Waste and Recycling Plan must be approved by the Architect prior to the start of Work.
  3. Contractor's Construction Waste and Recycling Plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.
- B. Contractor's Reuse, Recycling, and Disposal Report
1. Submit Contractor's Reuse, Recycling, and Disposal Report on the form provided (**Section 01151B**) with each application for progress payment. Failure to submit the form and its supporting documentation will render the application for progress payment incomplete and delay progress payments. If applicable, include manifests, weight tickets, receipts, and invoices specifically identifying the Project for re-used and recycled materials:
    - a. Reuse of building materials or salvage items on site
    - b. Salvaging building materials for reuse
    - c. Recycling source separated materials on site, with approval
    - d. Recycling source separated material at an off site recycling center
    - e. Delivery of soils or mixed inerts to an inerts landfill for disposal (inert fill).
    - f. Disposal at a landfill or transfer station (where no recycling takes place).
    - g. Other (describe).

Contractor's Reuse, Recycling, and Disposal Report must quantify all materials generated in the Work, disposed in landfills, or diverted from disposal through recycling. Indicate zero (0) if there is no quantity to report for a type of material. As indicated on the form:

1. Report disposal or recycling either in tons or in cubic yards: if scales are available at disposal or recycling facility, report in tons; otherwise, report in cubic yards. Report in units for salvage items when no tonnage or cubic yard measurement is feasible.
2. Indicate locations to which materials are delivered for reuse, salvage, recycling, accepted as daily cover, inert backfill, or disposal in landfills or transfer stations.

3. Provide legible copies of weigh tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that can legally accept the materials for the purpose of re-use, recycling, or disposal.
  - a. Indicate project title, project number, progress payment number, name of the company completing the Contractor's Report and compiling backup documentation, the printed name, signature, and daytime phone number of the person completing the form, the beginning and ending dates of the period covered on the Contractor's Report, and the date that the Contractor's Report is completed.
4. NCDOT General Services Division will provide a list of waste recycling sites, sorted by County and by Highway Division. It is the responsibility of the General Contractor to confirm the locations and manage the waste material.

## **PART 2 PRODUCTS (not used)**

## **PART 3 EXECUTION**

### **3.01 SALVAGE, RE-USE, RECYCLING AND PROCEDURES**

- A. Identify re-use, salvage, and recycling facilities.
- B. Develop and implement procedures to re-use, salvage, and recycle new construction and excavation materials, based on the Contract Documents, the Contractor's Construction Waste and Recycling Plan, estimated quantities of available materials, and availability of recycling facilities. Procedures may include on-site recycling, source separated recycling, and/or mixed debris recycling efforts.
  1. Identify materials that are feasible for salvage, determine requirements for site storage, and transportation of materials to a salvage facility.
  2. Source separate new construction, excavation and demolition materials including, but not limited to the following types:
    - a. Asphalt.
    - b. Concrete, concrete block, slump stone (decorative concrete block), and rocks.
    - c. Gypsum wallboard
    - d. Green materials (i.e. tree trimmings and land clearing debris).
    - e. Metal (ferrous and non-ferrous).
    - f. Miscellaneous Construction Debris.
    - g. Paper or cardboard.
    - h. Red Clay Brick.
    - Reuse or Salvage Materials
    - i. Soils.
    - Wire and Cable.
    - j. Wood studs
    - k. Plastic pipe
    - l. Ceiling tile
    - m. Ceramic tile
    - n. Carpet
    - o. Vinyl flooring
    - p. Other
  3. Miscellaneous Construction Debris: Develop and implement a program to transport loads of mixed (commingled) new construction materials that cannot be feasibly source separated to a mixed materials recycling facility.

**3.02 DISPOSAL OPERATIONS AND WASTE HAULING**

- A. Legally transport and dispose of materials that cannot be delivered to a source separated or mixed recycling facility to a transfer station or disposal facility that can legally accept the materials for the purpose of disposal.
- B. Use a permitted waste hauler or Contractor's trucking services and personnel. To confirm valid permitted status of waste haulers, contact the local solid waste authority.
- C. Become familiar with the conditions for acceptance of new construction, excavation and demolition materials at recycling facilities, prior to delivering materials. NCDOT General Services Division will work with the General Contractor on identifying sites that will accept recycled materials.
- D. Deliver to facilities that can legally accept new construction, excavation and demolition materials for purpose of re-use, recycling, composting, or disposal.
- E. Do not burn, bury or otherwise dispose of solid waste on the project job-site.

**3.03 REVENUE**

- A. Revenues or other savings obtained from recycled, re-used, or salvaged materials shall accrue to the General Contractor. Accounting of revenues or savings is for the Owner's tracking purposes only.

**END OF SECTION**



## **SECTION 01200 - PROGRESS DOCUMENTATION AND PROCEDURES**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Progress documentation requirements:
    - a. Contractor's construction schedule.
  - 2. Progress procedures:
    - a. Progress meetings.
- B. Contract time is indicated elsewhere.

#### **1.02 SUBMITTALS**

- A. Contractor's Construction Schedule.
  - 1. Submit within 14 days after execution of contract.
  - 2. Submit revised schedule with application for payment to the Division 4 Resident Engineer

#### **1.03 FORM OF SUBMITTALS**

- A. Schedules - General:
  - 1. Provide legend of symbols and abbreviations for each schedule.
  - 2. Use the same terminology as that used in the contract documents.
  - 3. When transparencies are submitted, use only media which will not fade or lose contrast over time.
- B. Bar Charts:
  - 1. Provide individual horizontal bars representing the duration of each major activity.
  - 2. Coordinate each element on the schedule with other construction activities.
  - 3. Show activities in proper sequence.
  - 4. Show percentage of completion of each activity.
  - 5. Include cost bar at top of chart, showing estimated and actual costs of work performed at the date of each application for payment.
  - 6. Use vertical lines to mark the time scale at not more than one week intervals.
  - 7. Prepare on reproducible transparency.
  - 8. Use sheets of sufficient number and width to show the full schedule clearly.

#### **1.04 COORDINATION**

- A. In preparation of schedules, take into account the time allowed or required for the Engineer's administrative procedures.

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

### **PART 3 - EXECUTION**

#### **3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE**

- A. Prepare and submit a construction schedule.
- B. Provide construction schedule in the form of bar charts:
  - 1. Where related activities must be performed in sequence, show relationship graphically.
  - 2. Indicate activities separately for:
    - a. Each separate building.
  - 3. Incorporate the submittal schedule specified elsewhere.
  - 4. Show dates of:
    - a. Each activity that influences the construction time.
    - b. Ordering dates for products requiring long lead time.
    - c. All submittals required.

- d. Completion of structure.
  - e. Completion of permanent enclosure.
  - f. Instruction of the owner's personnel in operation and maintenance of equipment and systems.
  - g. Substantial and final completion, with time frames for the Engineer's completion procedures.
5. In developing the schedule take into account:
- a. Work by owner.
  - b. Need for temporary heating, ventilating, or air-conditioning.
- C. The Engineer will notify the contractor if schedule is not satisfactory; revise and resubmit.
1. Resubmit within 7 days.
- D. Make and distribute copies of schedule to the Engineer, to subcontractors, and to other entities whose work will be influenced by schedule dates.
1. Hang a copy of the schedule up in each field office or meeting room.
- E. Update the schedule whenever changes occur or are made, or when new information is received, but not less often than at the same intervals at which applications for payment are made.
1. Indicate changes made since last issue; show actual dates for activities completed.
  2. Submit updated schedule with application for payment.
  3. Issue updated schedule with report of meeting at which revisions are made.
  4. Issue updated schedule in same manner as original schedule.

### **3.02 PROGRESS MEETINGS**

- A. Schedule and conduct periodic progress meetings during construction period.
1. Have meetings once a month.
  2. Notify the Engineer at least one week in advance of date of meeting; the Engineer.
- B. The following are required to attend:
1. Project superintendent.
  2. Major subcontractors and suppliers.
  3. Others who have an interest in the agenda.
  4. State inspectors.
- C. Prepare and distribute agenda prior to meetings; cover the following topics when applicable:
1. Review minutes of previous meeting.
  2. Status of submittals and impending submittals.
  3. Actual progress of activities in relation to the schedule.
  4. Actual and anticipated delays, their impact on the schedule, and corrective actions taken or proposed.
  5. Actual and potential problems.
  6. Status of change order work.
  7. Status of corrective work ordered by the Engineer.
  8. Progress expected to be made during the next period.

## **END OF SECTION 01200**

## **SECTION 01300 - SUBMITTALS**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Preparing and processing of submittals for review and action.
  - 2. Preparing and processing of informational submittals.
- B. Submit the following for the Architect/Engineer's review and action:
  - 1. Shop drawings.
  - 2. Product data.
  - 3. Samples.
- C. Submit the following as informational submittals:
  - 1. Reports.
- D. Specific submittals are described in individual sections.
- E. Do not commence work which requires review of any submittals until receipt of returned submittals with an acceptable action.
- F. Submit all submittals to the Engineer.
- G. Related Sections: The following are specified elsewhere in Division 1:
  - 1. Progress of work submittals:
    - a. Contractor's construction schedules.
  - 2. Quality control submittals:
    - a. Test reports.

#### **1.02 DEFINITIONS**

- A. "Shop drawings" are drawings and other data prepared, by the entity who is to do the work, specifically to show a portion of the work.
  - 1. Shop drawings also include:
    - a. Product data specifically prepared for this project.
    - b. Shop or plant inspection and test reports, when made on specific materials, products, or systems to be used in the work.
- B. "Product data submittals" are standard printed data which show or otherwise describe a product or system, or some other portion of the work.
- C. "Samples" are actual examples of the products or work to be installed.
- D. Informational Submittals: Submittals identified in the contract documents as to be submitted for information only.

#### **1.03 FORM OF SUBMITTALS**

- A. Sheets Larger Than 8-1/2 by 14 Inches:
  - 1. Maximum sheet size: 36 by 48 inches.
    - a. Exception: Full size pattern or template drawings.
  - 2. Number of copies:
    - a. Submittals for review:
      - 1. One correctable reproducible print, not folded and 6 copies] of blue- or black-line print(s).
      - 2. Reproducible will be returned.
- B. Small Sheets or Pages:
  - 1. Minimum sheet size: 8-1/2 by 11 inches.
  - 2. Maximum sheet size for opaque copies: 8-1/2 by 17 inches.
  - 3. Number of copies:
    - a. One (1) Electronic Submittal Copy: General Contractor to Email one (1) stamped and signed copy to the Architect, Resident Engineer, and Roadside Engineer.

- b. Electronic Submittal shall be in PDF. format.
- c. Architect and Engineer shall review, stamp and sign submittal; scan and return 1 set to the General Contractor, Resident Engineer, and Roadside Engineer for distribution to his subcontractors, suppliers, and retain 1 copy for his field office.
- C. If additional sets are needed by other entities involved in work represented by the samples, submit with original submittal.
- D. Copies in excess of the number requested will not be returned.

#### **1.04 COORDINATION OF SUBMITTALS**

- A. Coordinate submittals and activities that must be performed in sequence, so that the Engineer has enough information to properly review the submittals.
- B. Coordinate submittals of different types for the same product or system so that the Engineer has enough information to properly review each submittal.

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

## **PART 3 - EXECUTION**

### **3.01 TIMING OF SUBMITTALS**

- A. Transmit each submittal at or before the time indicated on the approved schedule of submittals.
  - 1. Prepare and submit for approval a schedule showing the required dates of submittal of all submittals.
  - 2. Organize the schedule by the applicable specification section number.
  - 3. Incorporate the contractor's construction schedule specified elsewhere.
  - 4. Submit within 14 days after commencement of the work.
  - 5. Revise and resubmit the schedule for approval when requested.
- B. Deliver each submittal requiring approval in time to allow for adequate review and processing time, including resubmittals if necessary; failure of the contractor in this respect will not be considered as grounds for an extension of the contract time.
- C. Deliver each informational submittal prior to start of the work involved, unless the submittal is of a type which cannot be prepared until after completion of the work; submit promptly.
- D. If a submittal must be processed within a certain time in order to maintain the progress of the work, state so clearly on the submittal.

### **3.02 SUBMITTAL PROCEDURES - GENERAL**

- A. Contractor Review: Sign each copy of each submittal certifying compliance with the requirements of the contract documents.
- B. Notify the Engineer, in writing and at time of submittal, of all points upon which the submittal does not conform to the requirements of the contract documents, if any.
- C. Preparation of Submittals:
  - 1. Label each copy of each submittal, with the following information:
    - a. Project name.
    - b. Date of submittal.
    - c. Contractor's name and address.
    - d. Engineer's name and address.
    - e. Subcontractor's name and address.
    - f. Other necessary identifying information.
  - 2. Pack submittals suitably for shipment.
  - 3. Submittals to receive Engineer's action marking:  
Provide blank space on the label or on the submittal itself for action marking; minimum 4 inches wide by 5 inches high.

- D. Transmittal of Submittals:
1. Submittals will be accepted from the contractor only. Submittals received from other entities will be returned without review or action.
  2. Submittals received without a transmittal form will be returned without review or action.
  3. Transmittal form: Similar to AIA G810.
  4. Fill out a separate transmittal form for each submittal; also include the following:
    - a. Other relevant information.
    - b. Requests for additional information.

### **3.03 SHOP DRAWINGS**

- A. Content: Include the following information:
1. Dimensions, at accurate scale.
  2. All field measurements that have been taken, at accurate scale.
  3. Names of specific products and materials used.
  4. Coordination requirements; show relationship to adjacent or critical work.
  5. Name of preparing firm.
- B. Preparation:
1. Identify as indicated for all submittals.
  2. Space for Engineer's action marking shall be adjacent to the title block.

### **3.04 PRODUCT DATA**

- A. When product data submittals are prepared specifically for this project (in the absence of standard printed information) submit such information as shop drawings and not as product data submittals.
- B. Content:
1. Submit manufacturer's standard printed data sheets.
  2. Show compliance with properties specified.
  3. Show compliance with the specific standards referenced.
  4. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
  5. Identify dimensions which have been verified by field measurement.
  6. Show special coordination requirements for the product.

### **3.05 SAMPLES**

- A. Samples:
1. Provide samples that are the same as proposed product.
  2. Where unavoidable variations must be expected, submit "range" samples, minimum of 3 units, and describe or identify variations among units of each set.
- B. Preparation:
1. Attach a description to each sample.
  2. Attach name of manufacturer or source to each sample.
- C. Keep final sample set(s) at the project site, available for use during progress of the work.

### **3.06 REVIEW OF SUBMITTALS**

- A. Submittals for approval will be reviewed, marked with appropriate action, and returned.
- B. Informational submittals: Submittals will be reviewed.
1. "X" action: No action taken.
  2. "Not Approved" action: Revise the submittal or prepare a new submittal complying with the comments made.
  3. A copy will be returned if submittal is unsatisfactory.

**3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION**

- A. Submittals will be returned to the contractor by mail.
- B. Perform resubmittals in the same manner as original submittals; indicate all changes other than those requested by the Engineer.
- C. Distribution:
  - 1. Make extra copies for operation and maintenance data submittals, as required.

**END OF SECTION 01300**

## **SECTION 02072 - DEMOLITION FOR REMODELING**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
1. Demolition and removal of portions of the existing Rest Area building or structure; including exterior and interior siding/sheathing/drywall/tile walls, windows, doors and frames, drywall ceilings, wall & roof fiberglass insulation, roofing, roof framing, toilet partition/accessories, display cases, plumbing, mechanical heating and cooling equipment, electrical systems.
    - a. Site Clearing including sidewalks, shrub and root removal are by the Contractor; (see Landscape Spec's).
    - b. See Section 01151 for the Construction and Demolition Materials Recycling Requirements.
  2. Owner shall have the right to salvage the Contractor removed automatic sliding doors, display cases, toilet fixtures, and toilet partitions.
    - a. Removal of existing small shrubbery (may be by NCDOT, Division office).

#### **1.02 SUBMITTALS**

- A. Project Record Documents:
1. Identify location of capped utilities.
  2. Submit form Sections 01151A and 01151B per Section 01151 for the Construction and Demolition Materials Recycling Requirements.

#### **1.03 PROJECT CONDITIONS**

- A. Existing Conditions:
1. After the project is begun, the contractor is responsible for the condition of structures. The owner does not warrant that the condition of structures will not have changed since the time of inspection for bidding purposes.

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

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that utilities have been disconnected and sealed.
- B. Survey existing conditions and correlate with drawings and specifications to determine extent of demolition required; see Mechanical and Electrical drawings. Salvage costs shall be reflected in the Contractor's bid.
- C. Insofar as is practicable, arrange operations to reveal unknown or concealed structural conditions for examination and verification before removal or demolition.

#### **3.02 PREPARATION**

- A. Protection:
1. Provide for the protection of persons passing around or through the area of demolition.

2. Perform demolition so as to prevent damage to adjacent improvements and facilities to remain.
- B. Construct and maintain shoring, bracing, and supports as necessary to ensure the stability of structures.

### **3.03 UTILITY SERVICES**

- A. Arrange with utility companies and shut off indicated utilities serving structures.
- B. Disconnect and cap indicated utilities before starting demolition operations.
- C. Identify location of capped utilities on project record documents.

### **3.04 POLLUTION CONTROLS**

- A. Observe environmental protection regulations.
- B. Do not allow water usage that results in freezing or flooding.

### **3.05 DEMOLITION - GENERAL**

- A. Remove: Unless items are otherwise indicated to be reinstalled or salvaged, remove and scrap.
- B. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare for service; reinstall in the same location (or in the location indicated).
- C. Remove and Install New: Remove and dispose of items indicated and install new items in the same location (or in the location indicated).
- D. Remove and Salvage: Items indicated to be salvaged will remain the Owner's property. Carefully remove and clean items indicated to be salvaged; protect against damage; Owner may salvage some of the toilet fixtures, and toilet partitions.
- E. Remove and Scrap: Remove and dispose of items indicated in Section 01151 for the Construction and Demolition Materials Recycling Requirements.
  1. Items of value to the contractor: Do not store removed items on site.
- F. Existing to Remain: Construction or items indicated to remain shall be protected against damage during demolition operations. Where practicable, and with the architect's permission, the contractor may elect to remove items to a suitable storage location during demolition and then properly clean and reinstall the items.
- G. Perform work in a systematic manner.
- H. Perform selective demolition using methods which are least likely to damage work to remain and which will provide proper surfaces for patching.

### **3.06 DEMOLITION ON OR BELOW GRADE**

- A. Where portions of concrete slabs-on-grade are to be removed, first outline the portion with a concrete saw to a depth of at least 1 inch.

### **3.07 FILLING BELOW-GRADE AREAS AND VOIDS**

- A. Below-grade areas and voids resulting from demolition of structures shall be filled or excavated further, as appropriate, according to requirements specified elsewhere in Division 4.



**3.08 DISPOSAL OF DEMOLISHED MATERIALS**

- A. Promptly dispose of materials resulting from demolition operations. Do not allow materials to accumulate on site. See Section 01151 for the Construction and Demolition Materials Recycling Requirements.
- B. Transport concrete or masonry debris resulting from demolition operations and dispose off the Owner's property.
- C. Transport all other materials resulting from demolition operations and legally dispose of off-site.
- D. Do not burn removed materials on project site.
- F. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

**3.09 CLEANING**

- A. Clean soil, smudges, and dust from surfaces to remain.

**END OF SECTION 02072**

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## **SECTION 03300 – CAST IN PLACE CONCRETE**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes: Cast-in-place concrete and concrete curing.
  - 1. Sidewalks, see Roadside Environmental concrete section.
  - 2. Leveling of concrete slabs.

#### **1.02 SUBMITTALS**

- A. Product Data: Submit manufacturer's product data / Mix Design to the Resident Engineer:
  - 1. Concrete mix, reinforcing, admixtures and curing compound.

#### **1.03 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:
  - 1. Sidewalks, curb ramps, steps, curb & gutters, and parking lot paving shall comply with **NCDOT Standard Specifications** dated January 2012, Divisions 7 and 8; Sections 710, 846 and 848; Class "A" concrete for Portland Cement Production and Delivery.
  - 2. ACI 301 & ACI 318.
- B. Testing Agency Services:
  - 1. NCDOT's testing agency will conduct tests and perform other services specified for quality control during construction.

### **PART 2 - PRODUCTS**

#### **2.01 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C 150, and as follows:
  - 1. Type I, except where other type is specifically permitted or required.
    - a. Type I may be replaced by Type III (high early strength) for concrete placed during cold weather.
- B. Water: ASTM C 94 and Potable.
- C. Aggregates: Normal weight concrete: ASTM C 33.
  - 1. Maximum coarse aggregate size:  $\frac{3}{4}$ ".
- D. Admixtures - General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.
- E. Air-Entraining Admixture: ASTM C 260 and certified by manufacturer for compatibility with other mix components.
- F. Water-Reducing Admixture: ASTM C 494, Type A.

#### **2.02 MISCELLANEOUS MATERIALS AND ACCESSORIES**

- A. Moisture-Retaining Cover: ASTM C 171, and as follows:
  - 1. Polyethylene film.

#### **2.03 CONCRETE MIX DESIGN**

- A. Proportioning of Normal Weight Concrete: Comply with recommendations of ACI 211.1.
- B. Specified Compressive Strength  $f_c$  at 28 Days for Locations as Indicated on Drawings:
  - 1. Interior Slabs: 4000 psi.

2. Footings: 3000 psi.
- C. Admixtures:
  1. Do not use admixtures not specified or approved.

## **PART 3 - EXECUTION**

### **3.01 EXISTING SLAB PREP**

- A. General: Remove mud bed as indicated on drawings. Clean surface as needed. Apply bonding agent.

### **3.02 JOINT CONSTRUCTION**

- A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance, as acceptable to the Engineer.
  1. Keyways: Provide keyways not less than 1-1/2 inches deep.
  2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.
- B. Control Joints: Construct contraction joints in slabs poured on grade to form panels of sizes indicated on drawings, but not more than 12 feet apart in either direction.
  1. Saw cuts: Form control joints by means of saw cuts one-fourth slab depth.

### **3.03 CONCRETE PLACEMENT**

- A. Inspection: Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.
  1. Wood forms: Moisten immediately before placing concrete in locations where form coatings are not used.
- B. Placement - General: Comply with requirements of ACI 304 and as follows:
  1. Schedule continuous placement of concrete to prevent the formation of cold joints.
  2. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
  3. Deposit concrete as close as possible to its final location, to avoid segregation.
- C. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
  1. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
  2. Do not use vibrators to move concrete laterally.
- D. Slab Placement: Schedule continuous placement and consolidation of concrete within planned construction joints.
  1. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds, or other means acceptable to Engineer.
  2. Strike off and level concrete slab surfaces, using highway straightedges, darbies, or bull floats before bleed water can collect on surface. Do not work concrete further until finishing operations are commenced.

### **3.04 FINISHING FORMED SURFACES**

- A. Repairs, General: Repair surface defects, including tie holes, immediately after removing formwork.
  1. Smooth rubbed finish: Apply to surfaces indicated no later than 24 hours after form removal.

- a. Wet concrete surfaces to be finished and rub with Carborundum brick or other abrasive until uniform color and texture are achieved.
- b. Do not apply separate grout mixture.

### **3.05 FINISHING SLABS**

- A. Finishing Operations - General:
  1. Do not directly apply water to slab surface or dust with cement.
  2. Use hand or powered equipment only as recommended in ACI 302.1R.
  3. Screeding: Strikeoff to required grade and within surface tolerances indicated. Verify conformance to surface tolerances. Correct deficiencies while concrete is still plastic.
  4. Bull Floating: Immediately following screeding, bull float or darby before bleed water appears to eliminate ridges, fill in voids, and embed coarse aggregate. Recheck and correct surface tolerances.
  5. Final floating: Float to embed coarse aggregate, to eliminate ridges, to compact concrete, to consolidate mortar at surface, and to achieve uniform, sandy texture. Recheck and correct surface tolerances.
  6. Troweling: Trowel immediately following final floating. Apply first troweling with power trowel except in confined areas, and apply subsequent trowelings with hand trowels. Wait between trowelings to allow concrete to harden. Do not over trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over it. Consolidate concrete surface by final troweling operation. Completed surface shall be free of trowel marks, uniform in texture and appearance, and within surface tolerance specified.
    - a. Grind smooth surface defects which would telegraph through final floor covering system.
- B. Coordinate appearance and texture of required final finishes with the Engineer before application.
- C. Broomed Float Finish: After floating and when water sheen has practically disappeared, apply uniform transverse corrugations approximately 1/16 inch deep, without tearing surface.
- D. Trowel Finish: As specified above.
- E. Trowel and Fine Broom Finish: Follow trowel finishing operation immediately with fine brooming to achieve slightly scarified surface.
- F. Slab Surface Tolerances:
  1. Achieve flat, level planes except where grades are indicated. Slope uniformly to drains.
  2. Floated finishes: Depressions between high spots shall not exceed 5/16 inch under a 10-foot straightedge.
  3. Troweled finishes: Achieve level surface plane so that depressions between high spots do not exceed the following dimension, using a 10-foot straightedge:
    - a. 1/8 inch.
- G. Slab Finish Schedule: Apply finishes in the following typical locations and as otherwise shown on the drawings:
  1. Trowel finish:
    - a. Exposed interior floors not otherwise scheduled.
    - b. Surfaces to receive resilient tile.
  2. Trowel and fine broom: Surfaces to receive terrazzo.
  3. Broom float finish: Exterior slabs and stairs.

### **3.06 CONCRETE CURING AND PROTECTION**

- A. General:
  1. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.
  2. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case.

- B. Curing Period:
  - 1. Not less than 7 days for standard cements and mixes.
  - 2. Not less than 4 days for high early strength concrete using Type III cement.
- C. Formed Surfaces: Cure formed concrete surfaces by moist curing with forms in place for full curing period or until forms are removed.
- D. Surfaces Not in Contact with Forms:
  - 1. Start initial curing as soon as free water has disappeared, but before surface is dry.
  - 2. Keep continuously moist for not less than 3 days by uninterrupted use of any of the following:
    - a. Water ponding.
    - b. Water-saturated sand.
    - c. Water-fog spray.
    - d. Saturated burlap: Provide 4-inch minimum overlap at joints.
  - 3. Begin final curing procedures immediately following initial curing and before concrete has dried.
  - 4. Continue final curing to end of curing period.
- E. Avoid rapid drying at end of curing period.
- F. Protect slabs during construction process, especially from spillage.

### **3.07 QUALITY CONTROL TESTING DURING CONSTRUCTION**

- A. Composite Sampling, and Making and Curing of Specimens: ASTM C 172 and ASTM C 31.
- B. Slump: ASTM C 143. One test per batch.
  - 1. Modify sampling to comply with ASTM C 94.
- C. Air Content of Normal Weight Concrete: ASTM C 173 or ASTM C 231. One test per strength test performed on air-entrained concrete.
- D. Compressive Strength Tests: ASTM C 39.
  - 1. Testing for acceptance of potential strength of as-delivered concrete:
    - a. Obtain samples on a statistically sound, random basis.
    - b. Minimum frequency:
      - 1. One set per 100 cubic yards or fraction thereof for each day's pour of each concrete class.
      - 2. One set per 3500 square feet of slab or wall area or fraction thereof for each day's pour of each concrete class.

**END OF SECTION 03310**

## **SECTION 04220 – CONCRETE UNIT MASONRY**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Concrete masonry units foundation walls.
  - 2. Mortar and grout, reinforcement, anchorage, and accessories.

### **PART 2 - PRODUCTS**

#### **2.01 CONCRETE MASONRY UNITS**

- A. Concrete Block: Comply with referenced standards for types required to match existing, and as follows:
  - 1. Size: Standard units with nominal dimensions of 16" long, 8" high, and 4", 6" & 8" thick.
  - 2. Special shapes: Provide special block types where required for corners, control joints, headers, lintels, and other special conditions, whether or not specifically indicated on the drawings as special.
    - a. Outside corners: Square-edged units except where otherwise indicated.
  - 3. Hollow load-bearing units: ASTM C 90, and as follows:
    - a. Standard weight.
    - b. 2000 psi net compressive strength.
    - c. Exposed faces: Manufacturer's standard color and texture.

#### **2.02 MORTAR AND GROUT MATERIALS**

- A. Portland Cement: ASTM C 150, Type I.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate for Mortar: ASTM C 144.
- D. Water: Potable.

#### **2.03 REINFORCEMENT AND ANCHORAGE**

- A. Joint Reinforcement and Anchorage Materials: Comply with the following general requirements for materials required in joint reinforcement and anchorage devices:
  - 1. Steel wire: ASTM A 82.
    - a. Hot-dip galvanizing (after fabrication): ASTM A 153, Class B-2.
      - 1. Use: Exterior locations or in contact with earth.
  - 2. Hot-dip galvanized steel sheet: ASTM A 635 or ASTM A 366; galvanizing in compliance with ASTM A 153, Class B.
    - a. Use: Anchors and miscellaneous sheet metal in masonry accessories at exterior exposures.
- B. Joint Reinforcement: Welded-wire units prefabricated into straight lengths of not less than 10 feet, with deformed continuous side rods and plain cross rods.
  - 1. Width: Approximately two inches less than nominal wall width, providing not less than 5/8 inch mortar coverage on exterior exposures and 1/2 inch elsewhere.
  - 2. Wire sizes:
    - a. Side rod diameter: 0.1483 inch.
    - b. Cross rod diameter: 0.1483 inch.
  - 3. Configuration:

- a. Applications of single unit width: Ladder design, cross rods at not more than 16 inches on center.
- b. Corners: Prefabricated L- and T-shaped units.

## **2.04 MISCELLANEOUS MASONRY ACCESSORIES**

- A. Bond Breaker Strips: ASTM D 226, Type I; No. 15 asphalt felt.
- B. Sealant and Backer Rod: As specified in Division 7.
- C. Masonry Veneer Anchors at Wood Studs: Adjustable, 2-piece assemblies, for attachment over sheathing to wood studs, allowing vertical and horizontal movement and capable of withstanding a 100-lbf load in tension or compression without deforming.
- D. Flexible Sheet Flashing: Perm-A-Barrier Wall Flashing by W. R. Grace & Company or Keystone Flashing Co. or Polyguard Products Inc. or approved equal, 40 mil thick x 18" wide rolls.

## **2.05 MORTAR AND GROUT MIXES**

- A. Mortar for Unit Masonry: ASTM C 270, Proportion Specification.
  1. Limit cementitious materials to lime and portland cement.
  2. Masonry below grade and in contact with earth: Type M or S.
  3. Locations indicated on the drawings: Type S.
  4. Applications as follows: Type N.
    - a. Exterior, above-grade veneer.
    - b. Locations for which another mortar type has not been specifically indicated.
- B. Grout fill for masonry: ASTM C476, 28-day compressive strength = 3000 psi

# **PART 3 - EXECUTION**

## **3.01 INSTALLATION PROCEDURES**

- A. Comply with manufacturer's installation instructions for the stone veneer selected with a stacked appearance.
- B. Concrete Masonry Units: Do not wet concrete masonry units prior to laying.
- C. Cutting: Where cutting is required, use power saws to provide clean, sharp, unchipped edges.
  1. Do not use wet cutting techniques with concrete unit masonry.

## **3.02 LAYING MASONRY UNITS**

- A. Hollow Masonry Units: Install so that face shells are solidly mortared, horizontally and vertically. Bed webs solidly in mortar at starting course.
- B. Joints: Make mortar joints visually and dimensionally consistent.
  1. Except as otherwise indicated, maintain mortar joint widths of 3/8 inch.
- C. Exposed Joints: Using concave jointer slightly larger than joint width, tool exposed joints before mortar has assumed final set.

## **3.03 JOINT REINFORCEMENT, SINGLE-WYTHE WALLS**

- A. General: Provide continuous horizontal joint reinforcement for specific single-wythe masonry walls indicated. Lap reinforcing a minimum of 6 inches.
- B. Vertical Spacing: Not more than 16 inches on center.



**3.04 CLEANING AND PROTECTION**

- A. Clean masonry after mortar is thoroughly set and cured.
  - 1. Scrape off adhered mortar particles by hand, using non-metallic tools.
  - 2. Comply with directions of concrete unit masonry manufacturer and NCMA Tek Bulletin No. 45 for cleaning CMU.
- B. Protection: Institute protective measures as required to ensure that unit masonry work will be clean and undamaged at substantial completion.

**END OF SECTION 04220**

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## **SECTION 05120 - STRUCTURAL STEEL**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
1. Fabrication and erection of structural steel framing members, as defined in AISC Code and as indicated on the drawings.
  2. Shop painting.

#### **1.02 SUBMITTALS**

- A. Product Data: Producer's or manufacturer's information for products as follows, including sufficient data to show compliance with specified requirements:
1. Mill test reports for each type of structural steel furnished.
  2. Specifications for primer paint, including manufacturer's data on chemical composition, adhesion of spray fireproofing, and dry film thickness per applied coat.
  3. Specifications for nonshrink grout.
- B. Shop Drawings: Complete drawings for structural steel, including information on location, type, and size of all connections, distinguishing between those made in the shop and those made in the field.

#### **1.03 QUALITY ASSURANCE**

- A. Welding Procedures: Establish that joint welding procedures are prequalified or test in accordance with American Welding Society (AWS) qualification procedures.
- B. Regulatory Requirements: Unless other requirements of governing authorities or particular requirements of this specification are more stringent, comply with provisions of the following:
1. AISC "Code of Standard Practice for Steel Buildings and Bridges."
  2. AISC "Specification for Structural Steel Buildings—ANSI/AISC 360-05, with Commentary and Supplements.
  3. AWS D1.1, "Structural Welding Code - Steel."
- C. Testing and Inspection Agency: The owner will engage an independent testing and inspection agency to perform testing, inspect and evaluate connections, and prepare test reports.
1. Correct deficiencies in the structural steel work identified by the testing and inspection agency at no additional expense to the owner. Subsequent tests to confirm the adequacy of corrected work will be at the contractor's expense.

### **PART 2 - PRODUCTS**

#### **2.01 STEEL MATERIALS**

- A. Structural Steel Members: ASTM A 36.
- B. Steel Pipe: ASTM A 53, Type and grade: Type E, Grade B.
- C. Cold-Formed Structural Tubing: ASTM A 500, Grade B or C.
- D. Anchor Bolts: ASTM F1554, Grade 36, or ASTM A36 rod; ASTM A 36 steel plate washers.
- E. Carbon Steel Bolts and Nuts: ASTM A 307, Grade A.
- F. High-Strength Bolts, Nuts, and Washers: ASTM A 325.
1. Type 1, plain (medium carbon steel).

#### **2.02 MISCELLANEOUS MATERIALS**

- A. Welding Electrodes and Fluxes: AWS D1.1; types as required by materials being welded.

- B. Nonshrink Grout: Prepackaged material requiring only the addition of water and complying with ASTM C 1107, and as follows:
  - 1. Natural aggregate (nonmetallic) type.
- C. Shop Primer: Rust-inhibitive, lead and chromate free, low VOC primer, complying with FS TT-P-664, or equivalent.

### **2.03 FABRICATION**

- A. Shop Assembly - General: Comply with requirements of AISC Specifications. Shop fabricate and assemble to maximum degree possible.
- B. Connections:
  - 1. Shop connections: Welded or bolted, as required.
  - 2. Field connections: Welded or bolted, as required.
  - 3. Bolts: High-strength steel bolts, except as otherwise indicated.
    - a. Bolting: Comply with requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - 4. Welds: Comply with requirements of AWS Code for welding procedures and quality of welds, including appearance.
- C. Finishing: Accurately mill ends of columns and other members which must transmit loads in bearing.

### **2.04 SHOP COATING - PAINT**

- A. Shop prime all steel members.
- B. Preparation: Thoroughly clean steel surfaces to be shop primed, removing loose rust, loose mill scale, dirt, oil, and grease. Clean steel in accordance with SSPC procedures as follows:
  - 1. Power tool or blast cleaning: SSPC SP-3, -5, -6, or 10.
- C. Painting: As soon as possible after cleaning, apply rust-inhibiting gray primer paint in accordance with instructions of paint manufacturer, at a rate sufficient to provide a finished thickness of not less than 1.5 mils and an average thickness of 2.0 mils.

### **2.05 SHOP QUALITY CONTROL**

- A. Testing and Inspection:
  - 1. General: Provide access to testing and inspection agency so that specified testing and inspection can be safely accomplished.
  - 2. Shop bolted connections: Comply with testing and verification procedures in AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - 3. Shop welded connections: Inspect and test shop-fabricated welds as follows:
    - a. Visually inspect all welds.

## **PART 3 - EXECUTION**

### **3.01 ERECTION**

- A. General: Erect structural steel in compliance with AISC Code and Specifications.
- B. Assembly:
  - 1. Set structural members accurately to locations and elevations indicated, within tolerances established in AISC Code, before making final connections.
  - 2. Do not use thermal cutting to correct fabrication errors on any major structural member.
- C. Columns and Bearing Surfaces:
  - 1. Clean bearing and contact surfaces before assembly. Slightly roughen concrete and masonry surfaces to improve bond.
  - 2. Set base and bearing plates accurately, using metal wedges, shims, or setting nuts as required.
  - 3. After tightening anchor bolts and ensuring that structure is plumb, grout solidly between plates and bearing surfaces.

- D. Bolting:
  - 1. Carbon steel bolts: Use only for temporary bracing during erection, unless otherwise specifically permitted by contract documents.
  - 2. High-strength bolts: Comply with requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- E. Welding:
  - 1. Perform field welding in accordance with AWS "Structural Welding Code - Steel."
  - 2. Tighten and leave in place erection bolts used in field-welded construction.

### **3.02 FIELD QUALITY CONTROL**

- A. Testing and Inspection:
  - 1. General: Provide access to testing and inspection agency so that specified testing and inspection can be safely accomplished.
  - 2. Field-bolted connections: Comply with testing and verification procedures in AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  - 3. Field-welded connections: Inspect and test field-fabricated welds as follows:
    - a. Visually inspect all field welds.

**END OF SECTION 05120**

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## **SECTION 054400 - COLD-FORMED METAL FRAMING**

### **PART 1 – GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Cold-formed metal framing for walls.
- B. Cold-formed metal framing for ceiling.
- C. Bridging, bracing, clips and other accessories.

#### **1.2 RELATED SECTIONS**

- A. Section 07160 – Bituminous Waterproofing.
- B. Section 09260 - Gypsum Board Systems.
- C. Section 09252 – Cement Backer Board systems.

#### **1.3 REFERENCES**

- A. ASTM International (ASTM):
  - 1. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 2. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - 3. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
  - 4. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
  - 5. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inches to 0.112 inches in thickness.
  - 6. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- B. AISI - Standard for Cold-Formed Steel Framing General Provisions.
- C. AISI - North American Specification for the Design of Cold-Formed Steel Structural Members.
- D. AWS D.1.3 - Structural Welding Code - Sheet Steel.

#### **1.4 DESIGN REQUIREMENTS**

- A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.
- B. Design loads: As indicated on the Structural Drawings.

#### **1.5 QUALITY ASSURANCE**

- A. Contractor shall provide effective, full time quality control over all fabrication and erection complying with the pertinent codes and regulations of government agencies having jurisdiction.
- B. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
- C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, and manufacturer's installation instructions.

- D. Welding Standards: Comply with applicable provisions AWS D1.1 "Structural Welding Code - Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."
- E. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Protect and store materials protected from exposure to rain, snow or other harmful weather conditions. Products to be handled per AISI's "Code of Standard Practice".

## **1.7 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

# **PART 2 PRODUCTS**

## **2.1 MANUFACTURERS**

- A. Acceptable Manufacturers
  - 1. ClarkDietrich Building Systems
  - 2. Aegis Metal Framing
  - 3. Craco Metals.
  - 4. MBA Metal Framing.
  - 5. Southeastern Metals.
  - 6. SCAFCO Corporation.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600 – Substitution Procedure.

## **2.2 COMPONENTS**

- A. Structural Studs: Cold-formed galvanized steel C-studs.
  - 1. Sizes: As indicated on drawings.
- B. Structural Runner Track: Cold formed galvanized steel sheet
  - 1. Material thickness to match stud/joist thickness unless design dictates heavier thickness.
- C. Slotted Deflection Track:
- D. Deflection Clips
- E. Clip Angles
- F. Support Clips
- G. U-Channel
- H. Furring Channel.
- I. Bridging/Spacer Bar
- J. Framing Component Accessories: Provide the following accessories as required for a complete system.
  - 1. Flat strapping.
  - 2. Angles, plates, sheets.
  - 3. Custom brake-formed shapes.
- K. Fasteners: Self-drilling, self-tapping screws; Steel, complying with ASTM C 1513; Galvanized coating, plated or oil-phosphate coated complying with ASTM B 633 as needed for required corrosion resistance.
- L. Touch-Up Paint: Complying with ASTM A 780 - Standard Practice for Repair of



Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. Zinc rich, containing 95-percent metallic zinc, ZRC 350 as manufactured by ZRC Worldwide, Marshfield, MA.

## 2.3 MATERIALS

- A. Cold-Formed Steel Sheet: Complying with ASTM A 1003/A 1003M; unless indicated otherwise.
- B. Galvanized Coating: G60 coating weight minimum, complying with ASTM C 955.

## 2.4 FABRICATION

- A. General: Framing components may be pre-assembled into panels prior to erecting.
- B. Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.
- C. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.
- D. Provide insulation as specified elsewhere in all double jamb studs and double header members, which will not be accessible to the insulation contractor.
- E. Axially Loaded Studs:
  - 1. Install studs to have full bearing against inside track web (1/8 inches (3.2 mm) maximum gap) prior to stud and track attachment.
  - 2. Splices in axially loaded studs are not permitted.
- F. Fasteners: Fasten components using self-tapping screws or welding.
- G. Welding: Welding is permitted on 18 gauge or heavier material only.
  - 1. Specify welding configuration and size on the Structural Calculation submittal.
  - 2. Qualify welding operators in accordance with Section 6.0 of AWS D.1.3.
  - 3. Touch up all welds with zinc-rich paint in compliance with ASTM A 780.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 ERECTION

- A. General Erection Requirements:
  - 1. Install cold-formed framing in accordance with requirements of ASTM C 1007.
  - 2. Weld in compliance with AWS D.1.3.
  - 3. Install in compliance with applicable sections of the AISI's Standard for Cold-Formed Steel Framing General Provisions.
- B. Wall Systems:
  - 1. Erect framing and panels plumb, level and square in strict accordance with approved shop drawings.
  - 2. Handle and lift prefabricated panels in a manner so as not to cause distortion in any member.
  - 3. Anchor runner track securely to the supporting structure as shown on the erection drawings. Install concrete anchors only after full compressive strength has been achieved. Provide a sill sealer or gasket barrier between all

- concrete and steel connections.
4. Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or butt-weld or splice them together.
  5. Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks except when vertical movement is specified.
  6. Install jack studs or cripples below window sills, above window and door heads, at freestanding stair rails and elsewhere to furnish support, securely attached to supporting members.
  7. Attach wall stud bridging in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations.
  8. Frame wall openings to include headers and supporting studs as shown in the drawings.
  9. Provide temporary bracing until erection is completed.
  10. Provide stud walls at locations indicated on plans as "shear walls" for frame stability and lateral load resistance.
  11. Where indicated in the drawings, provide for structural vertical movement using a vertical slide clip or other means in accordance with manufacturer's recommendations.
- C. Steel Joists:
1. Locate joists directly over bearing studs within 3/4 inch (19 mm) or provide a suitable load distribution member at the top track.
  2. Provide web stiffeners at reaction points where indicated in drawings.
  3. Provide joist bridging as shown in drawings.
  4. Provide end blocking where joist ends are not otherwise restrained from rotation.

### 3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

## **SECTION 055100 - FIXED METAL LADDERS**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Fixed aluminum ship's ladders.
- B. Fasteners and installation accessories.

#### **1.2 RELATED SECTIONS**

- A. Section 06 10 00 - Rough Carpentry: Blocking in metal wall studs and partitions for anchorage of access ladders

#### **1.3 REFERENCES**

- A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.
- B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2001.
- C. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2001.
- D. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2002.
- E. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.
- F. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2000.
- G. ASTM B 308 - Standard Specification for Aluminum - Alloy T6061-T6 Standard Structural; 2002
- H. ASTM B 308M - Standard Specification for Aluminum - Alloy T6061-T6 Standard Structural; 2002
- I. OSHA 29 CFR Standard 1910.27 - Fixed ladders; Occupational Safety and Health Standards; current edition

#### **1.4 SUBMITTALS**

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Detailed drawings showing complete dimensions, all materials, mounting attachments, and fabrication details.

#### **1.5 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in the engineering and manufacturing of metal ladders, with not less than fifty years of experience.

#### **1.6 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard limited five-year warranty against defects in materials and workmanship.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. ALACO Ladder Co.,
- B. Precision Ladders, LLC.,
- C. O'Keeffe's Inc.
- D. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

### **2.2 MATERIALS**

- A. Extruded Aluminum Profiles: ASTM B 221/B 221M, ASTM B 210, ASTM B 308/B 308M, Alloy 6061-T6; standard mill finish.
- B. Aluminum Sheet and Plate: ASTM B 209/B 209M, Alloy 6061-T6; standard mill finish.
- C. Fasteners: Aluminum solid aircraft rivets rated at 300 lbs (1335 N) shear strength.
- D. Cast fittings, connectors and rung ends: Cast Aluminum alloy 356

### **2.3 LADDERS**

- A. Ladders - General: Comply with ANSI A14.3 and OSHA regulations.
- B. Ship's Ladders: 24 inches (610 mm) wide.
  - 1. Capacity: 500 lbs (225 kg).
    - a. Slope: 80 degrees; 3-inch (76 mm) wide aluminum steps mounted on 12 inch (305 mm) centers to 2-7/8 inch (73 mm) aluminum side rails.
  - 2. Fasten each step with not less than eight aluminum aircraft rivets.
  - 3. Provide handrails of 1-1/4 in (32 mm) round serrated aluminum tubing with cast or extruded aluminum fittings.
  - 4. Furnish ladder with four mounting brackets.

### **2.4 FINISHES**

- A. Provide all aluminum in standard mill finish.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and approved shop drawings, and in compliance with ANSI A14.3 and OSHA 1910.27.

### **3.3 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

## **SECTION 06100 - ROUGH CARPENTRY**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Rough carpentry for:
    - a. Wood framing and sheathing for the renovation of the existing rest area.
    - b. Miscellaneous lumber for attachment and support of other work.
  - 2. Preservative treatment.

#### **1.02 SUBMITTALS**

- A. Product Data:
- B. Framing Connectors and Supports: Submit manufacturer's standard data demonstrating compliance with building code requirements.
- C. Treated Wood: Treating plant's instructions for use, including storage, cutting, and finishing.
  - 1. Pressure preservative treatment: Treating plant's certification of compliance with specified standards and stating process employed and preservative retention values.
    - a. Treatment for above-ground use: Certification of kiln drying after treatment.

#### **1.03 QUALITY ASSURANCE**

- A. Inspection Agencies:
  - 1. SPIB: Southern Pine Inspection Bureau; for all structural framing of roof joists and headers.

### **PART 2 – PRODUCTS**

#### **2.01 DIMENSION LUMBER**

- A. Size: Provide nominal sizes indicated, complying with NIST PS 20 except where actual sizes are specifically required. Provide continuous members; splicing is not acceptable.
  - 1. Surfacing: Dressed lumber (S4S).
  - 2. Moisture content: Kiln-dry or MC15 (15 percent maximum moisture content).
- C. Joist and Small Beam Framing -- 2 x 6 through 2 x 12:
  - 1. Species: Spruce-Pine-Fir (SPF), Grade: No. 2.
- D. Miscellaneous Lumber: Provide dimension lumber and boards necessary for the support of work specified in other sections, whether or not specifically indicated, and including but not limited to blocking, nailers, etc.
  - 1. Lumber: S4S, No. 2 or better, 15 percent maximum (kiln-dry).

#### **2.02 CONSTRUCTION PANELS**

- 2. A. Roof Sheathing: Oriented Strand Board sheathing: APA Rated, OSB Structural Panels, Exposure 1 (exterior glue), PS-2 or APA PRP-108 performance standards, 40/20 APA rated, and 5/8" thick.
- B. Wall Sheathing: Oriented Strand Board (OSB), square edged, APA Rated (exterior glue) sheathing panels with nailing pattern recommended by the manufacturer for shear walls, and nominal 1/2" thick.

#### **2.03 MISCELLANEOUS MATERIALS**

- A. Fasteners: Provide as required by applicable codes and as otherwise indicated.
  - 1. Provide fasteners with a hot-dip zinc coating (ASTM A 153) for treated lumber and where wood is in ground contact, subjected to high relative humidity, or exposed to weather.
- B. Framing Connectors and Supports: Prefabricated, formed steel units; hot-dip galvanized finish unless otherwise indicated; type and size as required; approved by applicable codes.
  - 1. The following manufacturer's products, or approved equal, provided they comply the the requirements of the contract documents, will be among those considered acceptable:

- a. Cleveland Steel Specialty Company.
- b. Simpson Strong-Tie Company.
- c. United Steel Products (USP) Company.
- C. Saturated Building Felt (30#)
- D. Sill Sealer Gaskets: Glass fiber insulation strips; uncompressed thickness, 1 inch (1/32 inch compressed); width to match sill members.

## **2.04 WOOD TREATMENT BY PRESSURE PROCESS**

- A. Aboveground Lumber: AWPB LP-2 (waterborne preservatives).
  - 1. Kiln dried after treatment to 19 percent maximum moisture content.
  - 2. Treat the following:
    - a. Wood in contact with masonry or concrete.
    - b. Sill plate.
    - c. Other members indicated.
- B. Fasteners for Preservative Treated Wood: Hot-dip galvanized steel (ASTM A153).

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION - GENERAL**

- A. Arrange work to use full length pieces except where lengths would exceed commercially available lengths. Discard pieces with defects that would lower the required strength or appearance of the work.
- B. Cut and fit members accurately. Install plumb and true to line and level.
- C. Fasten carpentry in accordance with applicable codes and recognized standards.
- D. Where exposed, countersink nails and fill flush with suitable wood filler.

### **3.02 MISCELLANEOUS CARPENTRY**

- A. Provide miscellaneous blocking, nailers, grounds, and framing as shown and as required for support of facing materials, fixtures, specialty items, and trim. Cut and shape to the required size. Provide in locations required by other work.
- B. Use countersunk fasteners appropriate to applied loading.

### **3.03 WOOD FRAMING - GENERAL**

- A. Comply with sizes, spacing, and configurations indicated. Where not specifically indicated, comply with applicable codes and NFPA "Manual for Wood Frame Construction." Splice members only where specifically indicated or approved.
- B. Space fasteners as indicated. Where not specifically indicated, comply with applicable codes and the "Recommended Nailing Schedule" of NFPA "Manual for Wood Frame Construction" and "National Design Specification for Wood Construction."

### **3.04 INSTALLATION OF CONSTRUCTION PANELS**

- A. Employ the following fastening methods:
  - 1. Nail roof and wall sheathing to framing.
    - a. Provide solid blocking under panel edges other than intact tongue and groove edges.

### **3.05 AIR INFILTRATION BARRIER**

- A. Install air infiltration barrier in accordance with manufacturer's instructions.

## **END OF SECTION 06100**

## SECTION 06192 - WOOD TRUSSES

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Provide prefabricated and pre-engineered wood trusses:
  - 1. Gable-shaped trusses. (attic type where noted)

#### 1.02 SUBMITTALS

- A. Submit for approval shop drawings, product data.

#### 1.03 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for ten years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
- B. Standards: TPI, Design Specification for Metal Plate Connected Wood Trusses; TPI, Design Specification for Metal Plate Connected Parallel Chord Wood Trusses.
- C. Design Engineering: Registered engineer in the State of North Carolina.
- D. Comply with NER 392 (UL sheet).

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Wood Trusses:
  - 1. Lumber Standard: PS 20 American Softwood Lumber Standard.
  - 2. Species: Manufacturer's option.
  - 3. Dressing: Dressed four sides.
  - 4. Moisture Content: Seasoned, 19 percent maximum.
  - 5. Grade for Chord Members: No. 1.
  - 6. Grade for Web Members: No. 3 or Stud Grade.
- B. Connectors, Fasteners, and Metal Framing Anchors:
  - 1. Connectors: Hot-dip galvanized steel sheet, ASTM A 446, Grade A; ASTM A 525, G60.
  - 2. Connectors: Electrolytic zinc-coated steel sheet, ASTM A 446, Grade A; ASTM A 591, Coating Class C.
  - 3. Nails, Wire, Brads, and Staples: FS FF-N-105.
  - 4. Power Driven Fasteners: National Evaluation Report NER-272.
  - 5. Wood Screws: ANSI B18.6.1.
  - 6. Lag Bolts: ANSI B18.2.1.
  - 7. Bolts: ASTM A 307, Grade A; ASTM A 563.
  - 8. Metal Framing Anchors: Hot-dip galvanized steel sheet, ASTM A 446, Grade A; ASTM A 525, G60.

**PART 3 - EXECUTION****3.01 *INSTALLATION***

- A. Comply with recommendations of TPI Design Specifications for Metal Plate Connected Wood Trusses.
- B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections.
- C. Restore damaged components. Clean and protect work from damage.

**END OF SECTION**



## **SECTION 06200 - FINISH CARPENTRY**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Window and door trim
- B. Fiber-cement lap siding, siding panels, and trim see Section 07462.

#### **1.02 SUBMITTALS**

- A. Plastic Laminate:
  - 1. Product data.
  - 2. Samples for verification: 8- by 10-inch piece of each type, pattern, and color.
- B. Coordinate installation of woodwork with other work to avoid damage.

### **PART 2 - PRODUCTS**

#### **2.01 WOODWORK**

- A. All Woodwork Finishes: As indicated on drawings.

#### **2.02 WOOD MATERIALS**

- A. Lumber: Species and grade as indicated; lumber ready for installation shall comply with WM 4, "General Requirements For Wood Molding," Wood Molding and Millwork Producers (WMMP).
  - 1. Specie(s):
    - a. "Pine": Plain sawn Spruce or Idaho white pine at window extensions and window trim
  - 2. Softwood: Comply with NIST PS 20 and grade in accordance with the grading rules of the grading and inspection agency applicable to the species.
  - 3. For transparent finish, use only solid pieces of lumber; WM 4 N-grade.
  - 4. For opaque finish, pieces which are glued up may be used; WM 4 N- or P-grade.
  - 5. Moisture content: Not greater than that required by applicable grading rules; provide kiln-dried lumber.
  - 6. Provide lumber dressed on all exposed faces, unless otherwise indicated.
  - 7. Do not use twisted, warped, bowed, or otherwise defective lumber.
  - 8. Sizes indicated are nominal, unless otherwise indicated.
  - 9. Do not mark or color lumber, except where such marking will be concealed in finish work.
- B. Plywood: Types, grades, and cores as indicated.
  - 1. Medium density overlaid plywood: NBS PS 1, Special Exterior MDO.
  - 1. Plywood in concealed locations: Comply with NBS PS 1, Grade C minimum.

#### **2.03 MELAMINE SHELVING:**

- A. Shelving: 3/4" thick premium MDF, Medium Density Fiber boards

#### **2.04 FABRICATION**

- A. Fabricate in sizes and shapes indicated and using details indicated.
- B. Complete fabrication and assembly in shop.
  - 1. Ease edges of solid lumber members where indicated, using:
    - a. 1/16-inch radius for members 1 inch or less nominal thickness.

- b. 1/8-inch radius for members more than 1 inch nominal thickness.
- C. Where woodwork is indicated to be field finished, sand smooth, fill nail holes, clean thoroughly, and otherwise prepare for finishing.
- D. Standing and Running Trim: Miter exposed ends of members to match profile.
  - 1. Rout out backs of flat members over 2 inches wide, unless ends are exposed.
  - 2. Kerf backs of flat members over 4 inches wide, except where ends are exposed.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Verify that blocking and backings have been installed at appropriate locations for anchorage.

### **3.02 INSTALLATION – GENERAL**

- A. Do not begin installation of interior woodwork until potentially damaging construction operations are complete in the installation area.
- B. Make joints neatly, with uniform appearance.
- C. Install woodwork in correct location, plumb and level, without rack or warp.
  - 1. Where adjoining surfaces are flush, install with maximum 1/16-inch offset.
  - 2. Where adjoining surfaces are separated by a reveal, install with maximum 1/8-inch offset.
- D. Cut woodwork precisely to fit.
- E. Secure woodwork to blocking or use anchors indicated.
  - 1. Where anchorage method is not indicated, conceal all fasteners where possible.
  - 2. Where exposed nailing is required or indicated, use finishing nails, countersink, and fill.
- F. Repair damaged and defective woodwork to eliminate visual and functional defects; where repair is not possible, replace woodwork.
- G. Standing and Running Trim: Use longest pieces available and as few joints as possible.
  - 1. Stagger joints in built-up trim members. Miter all vertical joints tight at 45 degrees at interior T&G Cedar wall siding and fascia corners. Miter external and miter internal corners.
  - 2. Use diagonal (scarfed) joints in lengths of trim.
  - 3. Cope or miter at inside corners and miter at outside corners; fit tightly.
  - 4. Allowed variation in plumb and level: Not more than 1/8 inch in 8 feet.
  - 5. Install by blind-nailing where possible. Use face-nailing with fine finishing nails countersunk and filled at starter course only.
- H. Panel Type Paneling:
  - 1. Arrange panels for best appearance.
  - 2. Install with tight joints, unless otherwise indicated.
    - 1. Install by face-nailing with fine finishing nails countersunk and filled.

### **3.03 PROTECTION**

- A. Protect woodwork from damage and maintain design environmental conditions.

**END OF SECTION 06200**

## SECTION 06651 - SOLID SURFACE FABRICATIONS

### PART 1 — GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following horizontal and trim solid surface product types:
1. Changing tables
  2. Benches
  3. Windowsills & seats
  4. Cove backsplashes
- B. Related Sections include the following:
1. Division 6 Section "Rough Carpentry" for Blocking.

#### 1.3 DEFINITION

- A. Solid surface is defined as nonporous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

#### 1.4 SUBMITTALS

- A. Product data:
1. For each type of product indicated.
  2. Product data for the following:
    - a. Chemical-resistant tops: chlorine bleach
- B. Shop drawings:
1. Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices and other components.
    - a. Show full-size details, edge details, thermoforming requirements, attachments, etc.
    - b. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other Sections.
- C. Samples:
1. For each type of product indicated.
    - a. Submit minimum 6-inch by 6-inch sample in specified gloss.
    - b. Cut sample and seam together for representation of inconspicuous seam.
    - c. Indicate full range of color and pattern variation.
  2. Approved samples will be retained as a standard for work.
- D. Product data:
1. Indicate product description, fabrication information and compliance with specified performance requirements.
- E. Maintenance data:
1. Submit manufacturer's care and maintenance data, including repair and cleaning instructions.
    - a. Maintenance kit for finishes shall be submitted.
  2. Include in project closeout documents.

## 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service performance.
- B. Fabricator/installer qualifications:
  - 1. Work of this section shall be by a certified fabricator/installer, certified in writing by the manufacturer.
- C. Applicable standards:
  - 1. Standards of the following, as referenced herein:
    - a. American National Standards Institute (ANSI)
    - b. American Society for Testing and Materials (ASTM)
    - c. National Electrical Manufacturers Association (NEMA)
    - d. NSF International
  - 2. Fire test response characteristics:
    - a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
      - 1) Flame Spread Index: 25 or less.
      - 2) Smoke Developed Index: 450 or less.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation.
- B. Store components indoors prior to installation.
- C. Handle materials to prevent damage to finished surfaces.
  - 1. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

## 1.7 WARRANTY

- A. Provide manufacturer's warranty against defects in materials.
  - 1. Warranty shall provide material and labor to repair or replace defective materials.
  - 2. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.
- B. Manufacturer's warranty period:
  - 1. Ten years from date of substantial completion.

## 1.8 MAINTENANCE

- A. Provide maintenance requirements as specified by the manufacturer.

# PART 2 — PRODUCTS

## 2.1 MATERIALS

- A. Solid polymer components
  - 1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.

2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

- B. Thickness: 1/2 inch
- C. Edge treatment: Bullnose
- D. Backsplash: Coved.
- E. Sidesplash: Applied.

## 2.2. PERFORMANCE CHARACTERISTICS:

Property	Typical Result	Test
Tensile Strength	6,000 psi	ASTM D 638
Tensile Modulus	$1.5 \times 10^{-6}$ psi	ASTM D 638
Tensile Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000 psi	ASTM D 790
Flexural Modulus	$1.2 \times 10^{-6}$ psi	ASTM D 790
Hardness	>85	Rockwell "M" Scale
	56	ASTM D 785 Barcol Impressor
Thermal Expansion	$3.02 \times 10^{-5}$ in./in./°C ( $1.80 \times 10^{-5}$ in./in./°F)	ASTM D 2583 ASTM D 696
Gloss (60° Gardner)	5–75 (matte—highly polished)	ANSI Z124
Light Resistance	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3
Wear and Cleanability	Passes	ANSI Z124.3 & Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 & Z124.6
Fungus and Bacteria Resistance	Does not support microbial growth	ASTM G21&G22
Boiling Water Resistance	No visible change	NEMA LD 3-2000 Method 3.5
High Temperature Resistance	No change	NEMA LD 3-2000 Method 3.6
Izod Impact (Notched Specimen)	0.28 ft.-lbs./in. of notch	ASTM D 256 (Method A)
Ball Impact Resistance: Sheets	No fracture—1/2 lb. ball: 1/4" slab—36" drop 1/2" slab—144" drop	NEMA LD 3-2000 Method 3.8
Weatherability	$\Delta E^*_{94} < 5$ in 1,000 hrs.	ASTM G 155
Specific Gravity †	1.7	
Water Absorption	Long-term 0.4% (3/4") 0.6% (1/2") 0.8% (1/4")	ASTM D 570
Toxicity	99 (solid colors) 66 (patterned colors)	Pittsburgh Protocol Test ("LC50" Test)
Flammability	All colors (Class I and Class A)	ASTM E 84, NFPA 255 & UL 723
Flame Spread Index	<25	
Smoke Developed Index	<25	

† Approximate weight per square foot: 1/4" (6 mm) 2.2 lbs., 1/2" (12.3 mm) 4.4 lbs.

Shapes meet or exceed the ANSI Z124.3 and ANSI Z124.6 standards for plastic sinks and lavatories. NEMA results based on the NEMA LD 3-2000

## 2.3 ACCESSORIES

- A. Joint adhesive:
  - 1. Manufacturer's standard one- or two-part adhesive kit to create inconspicuous, nonporous joints.
- B. Sealant:
  - 1. Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51-compliant (food zone — any type), UL-listed silicone sealant in colors matching components.

## 2.4 FACTORY FABRICATION

- A. Shop assembly
  - 1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions and technical bulletins.
  - 2. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
    - a. Reinforce with strip of solid polymer material, 2" wide.
  - 3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
  - 4. Rout and finish component edges with clean, sharp returns.
    - a. Rout cutouts, radii and contours to template.
    - b. Smooth edges.
    - c. Repair or reject defective and inaccurate work.

## 2.5 FINISHES

- A. Select from the manufacturer's standard color chart.
  - 1. Corian, basis of design, color to be selected
- B. Other acceptable manufacturers (color to be selected by architect)
  - 1. Wilsonart-Gibraltar
  - 2. Avonite

## PART 3 — EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
  - 1. Provide product in the largest pieces available.
  - 2. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.
    - a. Exposed joints/seams shall not be allowed.

3. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
  4. Cut and finish component edges with clean, sharp returns.
  5. Rout radii and contours to template.
  6. Anchor securely to base cabinets or other supports.
  7. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop.
  8. Carefully dress joints smooth, remove surface scratches and clean entire surface.
  9. Install countertops with no more than 1/8-inch (3 mm) sag, bow or other variation from a straight line.
- B. Coved backsplashes and applied sidesplashes:
1. Install applied sidesplashes using manufacturer's standard color-matched silicone sealant.
  2. Adhere applied sidesplashes to countertops using manufacturer's standard color-matched silicone sealant.

### **3.3 REPAIR**

- A. Repair or replace damaged work which cannot be repaired to architect's satisfaction.

### **3.4 CLEANING AND PROTECTION**

- A. Keep components clean during installation.  
B. Remove adhesives, sealants and other stains.

**END OF SECTION**

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## SECTION 07130 - SHEET WATERPROOFING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Self-adhering sheet waterproofing membranes.

#### 1.2 RELATED SECTIONS

- A. Section 03300 - Concrete.
- B. Section 04220 - CMU.
- C. Section 06100 - Rough carpentry.
- D. Section 07210 - Thermal Insulation.

#### 1.3 REFERENCES

- A. ASTM International:
  - 1. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
  - 2. ASTM D 779 - Standard Test Method for Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry Indicator Method.
  - 3. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
  - 4. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
  - 5. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
- B. International Code Council - Evaluation Service (ICC-ES):
  - 1. ICC-ES AC 38 - Acceptance Criteria for Water-Resistive Barriers.
  - 2. ICC-ES ESR 2783 - Evaluation Report.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Submit shop drawings including details of construction and relationship with adjacent construction.
- D. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- E. Warranty: Submit manufacturer's standard warranty.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced in installation of specified material type with working knowledge of specified products and Project specific application requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage:
  - 1. Store materials in clean, dry, heated area indoors in accordance with manufacturer's instructions.
  - 2. Store cartons on end and protect from moisture and damage.
  - 3. Protect from temperatures above 100 degrees F (38 degrees C).
  - 4. Do not remove rolls from cartons until application.

## 1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

## 1.8 WARRANTY

- A. Limited Warranty:
  - 1. Manufacturer warrants materials to be free from leaks caused by defects in material or manufacturing for a period of 5 years from the date of purchase when applied according to published directions.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. MFM Building Products Corp., Web: [www.mfmbp.com](http://www.mfmbp.com)
  - 2. W.R. Meadows, Inc., Web: [www.wrmeadows.com](http://www.wrmeadows.com)
  - 3. Tamko Building Products, Inc., Web: [www.tamko.com](http://www.tamko.com)
- B. Requests for substitutions will be considered by Architect upon written request.

### 2.2 WATERPROOFING MEMBRANES

- A. Product: Underlayment
  - 1. Description: Prefabricated self-adhering sheet-type waterproofing membrane.
  - 2. Composition: High-tensile polyester film coated with a layer of specially formulated rubberized asphalt adhesive.
  - 3. Release Liners: Protect asphalt, removed as membrane is installed.
  - 4. Technical Properties:
    - a. Installation Temperature Range: Greater than 50 degrees F (10 degrees C).
    - b. Material Color: Black.
    - c. Material Thickness (ASTM D 1970): 40 Mils (1.0 mm) Nominal.
    - d. Flexibility at -20 degrees F (-29 degrees C) (ASTM D 1970): Pass.
    - e. Vapor Permeance (ASTM E 96): 0.08 g/m2 Maximum.
    - f. Nail Sealability (ASTM D 1970): Pass.
    - g. Tensile (ASTM D 412): 37 lbf/in2 (0.04 ksi).
    - h. Elongation (ASTM D 412): 135 percent Minimum.
- B. Product: Waterproofing membrane for basement walls.
  - 1. Description: Prefabricated, 40 mil (1 mm) self adhering sheet-type waterproofing membrane.
  - 2. Composition: Multi-layer high-strength polymer film that is coated with a layer of specially formulated rubberized asphalt adhesive.
  - 3. Release Liners: Protect asphalt, removed as membrane is installed.
  - 4. Technical Properties:
    - a. Tested to ICC-ES AC 38, ICC-ES ESR 2783.
    - b. Material Thickness (ASTM D 1970): 40 Mils (1.0 mm) Nominal.
    - c. Pliability (ICC-ES AC 38): Pass.
    - d. Vapor Permeance (ASTM E 96): 0.02 g/m2 Maximum.
    - e. Water Resistance (ASTM D 779): Greater than 30 hours
    - f. Nail Sealability (ASTM D 1970): Pass.
    - g. Tensile MD (ASTM D 882): 21 lbf/in2 (0.02 ksi).
    - h. Tensile CMD (ASTM D 882): 28 lbf/in2 (0.03 ksi).
    - i. Installation Temperature Range: Greater than 50 degrees F (10 degrees C).
    - j. Material Color: Black.

## 2.3 ACCESSORIES

- A. Adhesive: MFM Spray Adhesive as manufactured by MFM Building Products Corp.
- B. Primer: Asphalt-based commercial primer.
- C. Termination Bar.

## PART 3 EXECUTION

### 3.1 EXAMINATION AND PREPARATION

- A. Inspect and prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions.
- B. Clean surfaces thoroughly prior to installation. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions including the following:
  - 1. Apply in clear, dry weather.
  - 2. Surface must be clean, dry and free from oil.
  - 3. Masonry must be clean, fully cured and primed with an asphalt primer.
  - 4. Prime weathered surfaces as necessary - clean, dry, wood and metal surfaces do not require priming.
  - 5. Use 3 inches (76 mm) side laps and 6 inches (152 mm) head laps.
  - 6. Apply uniform pressure with a 2 to 3 inches (51 to 76 mm) hand roller to entire surface.
  - 7. Do not install over solvent-based sealants unless fully cured - active solvents may liquefy bottom adhesive surface.
  - 8. Test for compatibility with caulks and sealants.
  - 9. Do not install over flexible vinyl gaskets.
  - 10. Do not expose installed product to direct sunlight for more than 90 days.

### 3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

## END OF SECTION 07130

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## **SECTION 07160 - BITUMINOUS DAMPPROOFING**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Substrate preparation.
  - 2. Bituminous dampproofing for new foundation walls.
  - 3. Edge and penetration detailing material.

#### **1.02 SUBMITTALS**

- A. Product Data: Technical product information and installation instructions which demonstrate that products comply with project requirements.

#### **1.03 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver dampproofing materials to project site in factory-sealed containers.
- B. Store materials in dry, well-ventilated space.

#### **1.04 SITE CONDITIONS**

- A. Install dampproofing only when site weather conditions are acceptable per manufacturer's recommendations.
- B. Ventilation: Provide sufficient ventilation during application and curing of dampproofing to prevent buildup of toxic or flammable fumes.

### **PART 2 - PRODUCTS**

#### **2.01 BITUMINOUS DAMPPROOFING MATERIALS**

- A. Cold-Applied Cut-Back Semimastic Asphalt: Solvent-based asphaltic dampproofing mastic of brushing (medium) consistency, fibrated, meeting the requirements of ASTM D 4479, Type I; asbestos free.

#### **2.02 INSTALLATION ACCESSORIES**

- A. Reinforcing Fabric: Woven or nonwoven glass fiber, treated with organic binders and coated for compatibility with dampproofing bitumen.
- B. Detailing Mastic: Asphalt-based plastic roof cement, trowel consistency, meeting the requirements of ASTM D 4586.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that surfaces are smooth, sound, clean, and dry, and that elements which will penetrate dampproofing have been completed and are rigidly installed.

#### **3.02 PREPARATION**

- A. Remove honeycomb, aggregate pockets, fins, ridges, and projecting rough areas.
- B. Fill cracks, holes, depressions, and irregularities with latex patching mortar or detailing mastic as recommended by membrane manufacturer.
- C. Form fillets (cants) at inside corners and around projecting elements using latex patching mortar or detailing mastic.

**3.03 INSTALLATION - GENERAL**

- A. Comply with dampproofing manufacturer's instructions for handling, preparation, application, and protection of dampproofing materials.

**3.04 BELOW-GRADE DAMPPROOFING**

- A. Form flashings at outside corners, changes in plane, and penetrations. Apply coating of dampproofing or detailing mastic, embed layer of fiberglass reinforcing extending at least 12 inches onto dampproofing surface, and topcoat with another layer of dampproofing or detailing mastic.
- B. Apply a uniform coat of semimastic dampproofing using spray applicator, brush, or mop. Coverage, 4-1/2 to 5-1/2 gallons per 100 square feet to provide minimum 30-mil dry film thickness.
- C. Apply a "touch-up" coating over areas where coating is thin or has not formed a smooth lustrous surface.

**3.05 INSPECTION**

- A. Before covering or backfilling dampproofing, notify the Engineer that the dampproofing is ready for inspection.

**3.06 PROTECTION AND CLEANING**

- A. Take measures required to protect completed dampproofing after installation.
- B. Clean spillage and soiling from adjacent surfaces using cleaning agents and procedures recommended by the manufacturer of the surface.

**END OF SECTION 07160**

## **SECTION 07210 - THERMAL INSULATION**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Foam-plastic board insulation.
    - a. Extruded-Polystyrene Board Insulation
    - b. Polyisocyanurate Board Insulation
  - 2. Vapor retarders.

#### **1.2 SUBMITTALS**

- A. Submit under provisions of Section 013300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

#### **1.3 QUALITY ASSURANCE**

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
  - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
  - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

### **PART 2 - PRODUCTS**

#### **2.1 FOAM-PLASTIC BOARD INSULATION**

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Owens Corning.
  - b. Dow Chemical Company (The).
2. Type IV, 1.6 lb/cu. Ft.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 1, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Atlas Roofing Corporation.
    - b. Dow Chemical Company (The).
    - c. Rmax, Inc.
- C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates or by specified mechanical masonry anchors.

## 2.2 VAPOR RETARDERS

- A. Vapor Retarders: as needed per product. System to be approved by architect.
  1. Products: Subject to compliance with requirements for complete air barrier
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

## 2.3 INSULATION FASTENERS

- A. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
  1. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.
  2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.
- B. Masonry Veneer Anchor per drawings.

# PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

## 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.



- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### **3.3 INSTALLATION OF BELOW-GRADE INSULATION**

- A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
  - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in from exterior walls.

### **3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION**

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

### **3.5 INSTALLATION OF VAPOR RETARDERS**

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
  - 1. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
  - 2. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

### **3.6 PROTECTION**

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

**END OF SECTION 072100**

## **SECTION 07211 - FOAMED-IN-PLACE INSULATION**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Foamed-in-place insulation.
  - 1. At perimeter of floors and ceilings.

#### **1.02 REFERENCE STANDARDS**

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.
- C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2010.
- D. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2003.

#### **1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, insulation properties, and preparation requirements.
- C. Certificates: Certify that products of this section meet or exceed specified requirements.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum one years of experience.

#### **1.05 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for concealment limitations.

#### **1.06 FIELD CONDITIONS**

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
- B. Do not apply foam when temperature is within 5 F of dew point.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Foamed-In-Place Insulation:
  - 1. BASF Polyurethane Foam Enterprises LLC: [www.basf.us](http://www.basf.us).
  - 2. Bayer MaterialScience; EcoBay CC : [www.spf.bayermaterialscience.com](http://www.spf.bayermaterialscience.com).
  - 3. Demilec (USA) LLC; HeatLoc Soy-200: [www.demilecusa.com](http://www.demilecusa.com).
  - 4. Icynene Inc; Icynene LD-C-50: [www.icynene.com](http://www.icynene.com).
  - 5. NCFI Polyurethanes: [www.ncfi.com](http://www.ncfi.com).
  - 6. Substitutions: must be requested in writing.

## 2.02 MATERIALS

- A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
  - 1. Aged Thermal Resistance (R-value): 6.5 (deg F hr sq ft)/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
  - 2. Water Vapor Permeance: Vapor retarder; 1 perm, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
  - 3. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
  - 4. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.5 psf.
  - 5. Closed Cell Content: At least 90 percent.
  - 6. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation adhesion.

### 3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

### 3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Apply to a minimum cured thickness of 3 at walls and 6 inch at ceilings/roofs.
- D. Patch damaged areas.
- E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
- F. Trim excess away for applied trim or remove as required for continuous sealant bead.

### 3.04 FIELD QUALITY CONTROL

- A. Inspection will include verification of insulation thickness and density.

### 3.05 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

## END OF SECTION

## **SECTION 07213 – FIBERGLASS INSULATION**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Blown-in/loose-fill insulation
  - 2. Attic blanket insulation
  - 3. Sound Attenuation Blanket

#### **1.02 DEFINITIONS**

- A. Thermal Resistance (R-value): The temperature difference in degrees F between the two surfaces of a material of given thickness, required to make 1 Btu of energy flow through 1 square foot of the material in 1 hour.

#### **1.03 SUBMITTALS**

- A. Product Data: Submit for each product specified in this section.

#### **1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Minimize period between product delivery and actual installation. Protect against exposure to flame, sparks, or excessive heat. Minimize exposure to sunlight. Keep dry.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Blown-in/loose-fill Insulation:
  - 1. See drawings for required R-values
  - 2. Noncombustible and passes requirements of ASTM E136
  - 3. Conforms to the requirements of ASTM C764 Type I.
- B. Attic Blanket Insulation
  - 1. See drawings for required R-values
  - 2. Noncombustible and passes requirements of ASTM E136
  - 3. Conforms to the requirements of ASTM C764 Type I.
- C. Sound Attenuation Blanket
  - 1. Unfaced
  - 2. Conforms to the requirements of ASTM C665, type I and ASTM E136

#### **2.02 ACCESSORIES**

- A. Provide accessories as necessary to properly install specified products.
  - 1. Air Barrier.
  - 2. Friction fit wall supports
  - 3. Attic Rafter Vent Baffle
  - 4. Soffit Dam-rigid foam board

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Comply with insulation manufacturer's recommendations and installation sequence. Provide permanent placement and support of insulation.
- B. Install materials in a manner which will maximize continuity of thermal envelope. Use a single layer of insulation wherever possible to achieve indicated requirements, unless otherwise indicated.
- C. Loose-fill Insulation:
  - 1. Application: Light-gage metal truss construction:
    - a. Loose-fill insulation: blown-in between and above framing members.
    - b. Support attic insulation with air barrier.
    - c. Provide attic rafter vent baffles
- D. Sound Attenuation blanket:
  - 1. Provide supplemental support as needed.

**END OF SECTION 07210**

## SECTION 07310 - ASPHALT SHINGLES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Asphalt roofing shingles.
- B. Leak barrier and moisture shedding roof deck protection.
- C. Underlayment.
- D. Metal flashing associated with shingle roofing.

#### 1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry.
- B. Section 07 62 00 - Sheet Metal Flashing and Trim.

#### 1.3 REFERENCES

- A. American Society of Civil Engineers (ASCE): ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- B. Asphalt Roofing Manufacturers Association (ARMA).
- C. ASTM International (ASTM):
  - 1. ASTM D 3018 - Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
  - 2. ASTM D 3161 - Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).
  - 3. ASTM D 3462 - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
  - 4. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 5. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 6. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.
  - 7. ASTM C 1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
  - 8. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
  - 9. ASTM E 903 - Standard Test Method for Solar Absorption, Reflectance and Transmission of Materials Using Integrating Spheres.
- D. National Roofing Contractors Association (NRCA).
- E. Sheet Metal and Air Conditioning Contractors National Association, 1nc. (SMACNA) - Architectural Sheet Metal Manual.
- F. Underwriters Laboratory (UL)
  - 1. UL 790 - Tests for Fire Resistance of Roof Covering Materials.
  - 2. UL 997 - Wind Resistance of Prepared Roof Covering Materials.

#### 1.4 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of roofing terms related to this section.

## 1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Color Samples for Architect selection.
- C. Product Data: Manufacturer's data sheets on each product to be used, showing compliance with requirements.
- D. Installation Instructions: Manufacturer's installation instructions, showing required preparation and installation procedures.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Provide all primary roofing products, including shingles, underlayment, leak barrier, and ventilation, by a single manufacturer.
- B. Installer Qualifications: Installer must be approved by manufacturer for installation of all roofing products to be installed under this section.

## 1.7 REGULATORY REQUIREMENTS

- A. Provide a roofing system achieving an Underwriters Laboratories (UL) Class A fire classification.
- B. Install all roofing products in accordance with all federal, state and local building codes.
- C. All work shall be performed in a manner consistent with current OSHA guidelines.

## 1.8 PRE-INSTALLATION MEETINGS

- A. Convene a pre-installation meeting a minimum two weeks prior to starting work of this section.
  - 1. Contractor shall schedule and arrange meeting and meeting place and notify attendees.
  - 2. Mandatory Attendees: Roofing installer and manufacturer's steep slope technical representative (not sales agent).
  - 3. Optional Attendees: Owner's representative, Architect's representative, prime Contractor's representative.
  - 4. Review all pertinent requirements for achieving the warranty specified below and set schedule for final warranty inspection.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened labeled packaging until ready for installation.
- B. Store products in a covered, ventilated area, at temperature not more than 110 degrees F; do not store near steam pipes, radiators, or in sunlight.
- C. Store bundles on flat surface to maximum height recommended by manufacturer; store rolls on end.
- D. Store and dispose of solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.10 WEATHER CONDITIONS

- A. Proceed with work only when existing and forecasted weather conditions will permit work to be performed in accordance with roofing shingle manufacturer's recommendations.



## 1.11 WARRANTY

- A. Provide manufacturer's standard limited warranty:
  - 1. Provide to the Owner the manufacturer's warranty.
    - a. Warranty Duration: 25 years.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: CertainTeed, John Mansville, GAF or approved equal

### 2.2 SHINGLES

- A. Architectural Shingles:
  - 1. Granule surfaced, self-sealing asphalt shingle with a strong fiberglass reinforced Micro Weave core and StainGuard protection, which prevents pronounced discoloration from blue-green algae through formulation/unique blends of granules.
  - 2. Extra thick tabs and bold profile provide a bold unique appearance with a 7.5in. exposure.
  - 3. UL 790 Class A rated with UL 997 Wind Resistance Label; ASTM D 7158, Class H; ASTM D 3161, Type 1; ASTM D 3018, Type 1; ASTM D 3462; AC438 compliant; CSA 123.5-98; Dade County Approved, Florida Building Code Approved, Texas Dept of Insurance Approved, ICC Report Approval.
  - 4. Color: As selected from manufacturer's full range.

### 2.3 HIP AND RIDGE SHINGLES

- A. Distinctive self-sealing hip and ridge cap shingle complementing the color of selected roof shingle.

### 2.4 STARTER STRIPS

- A. Self sealing starter shingle designed for premium roof shingles.

### 2.5 LEAK BARRIER

- A. Self-adhering, self-sealing, bituminous leak barrier surfaced with fine, skid-resistant granules. Approved by UL and ICC.

### 2.6 UNDERLAYMENT

- A. Premium, water repellent, breather type non-asphaltic underlayment. UV stabilized polypropylene construction. Meets or exceeds ASTM D226 and D4869. Approved by ICC.

### 2.7 ROOFING CEMENT

- A. Asphalt Plastic Roofing Cement meeting the requirements of ASTM D 4586, Type I or II.

## 2.8 ROOF ACCESSORIES

- A. Paint: Exterior acrylic rust resistant aerosol roof accessory paint. Each 6 oz can is available in boxes of 6 and in color to compliment the roof. Shingle-Match Roof Accessory Paint by GAF.
- B. Compression Collars: UV stable solid molded PVC compression collar, Kynar PVDF coated 24 gauge galvanized flange, Ultimate Pipe Flashing by Lifetime Tool.

## 2.9 VENTILATION

- A. Ridge Vents:
  - 1. Flexible rigid plastic ridge ventilator designed to allow the passage of hot air from vented insulation panels, while resisting snow infiltration.

## 2.10 NAILS

- A. Nails: Standard round wire, zinc-coated steel or aluminum; 10 to 12 gauge, smooth, barbed or deformed shank, with heads 3/8 inch (9mm) to 7/16 inch (11mm) in diameter. Length must be sufficient to penetrate into solid wood at least 3/4 inch (19mm) or through plywood or oriented strand board by at least 1/8 inch (3.18mm).

## 2.11 METAL FLASHING

- A. Aluminum: 0.032-inch (0.8mm) aluminum sheet, complying with ASTM B 209.

# PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Do not begin installation until roof deck has been properly prepared.
- B. If roof deck preparation is the responsibility of another installer, notify Architect or building owner of unsatisfactory preparation before proceeding.

## 3.2 PREPARATION OF SUBSTRATE

- A. Clean deck surfaces thoroughly prior to installation of leak barrier and roof deck protection.
- B. At areas to receive leak barrier, fill knot holes and cracks with latex filler.

## 3.3 VENTILATED ROOF INSULATION PANELS INSTALLATION

- A. The structural roof deck shown in the plans shall be smooth and level and free of water or debris before the nail base insulation is installed. Apply vapor retarder if required.
- B. Installation shall follow the manufacturers written installation instructions.
- C. Fasten with approved fasteners to the supporting roof deck shown in the plans.
- D. Protect nail base insulation work from exposure to moisture damage and deterioration, primarily by prompt installation of the roofing, sheet metal and waterproofing work

## 3.4 INSTALLATION OF UNDERLAYMENT

- A. Install using methods recommended by manufacturer in accordance with local building code.

When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.

- B. Eaves:
1. Place eave edge metal flashing tight with fascia boards; lap joints 2 inches and seal with plastic cement; nail at top of flange.
  2. On roofs with slope between 2:12 and 4:12, install leak barrier up the slope from eave edge to 36 inches from the edge or at least 24 inches beyond the interior face of the warm exterior wall, whichever is greater; lap ends 6 inches and bond.
- C. Valleys:
1. Install leak barrier at least 36 inches wide centered on valley; lap ends 6 inches and seal.
  2. Where valleys are indicated to be "open valleys", install metal flashing over leak barrier before roof deck protection is installed; DO NOT NAIL THROUGH metal flashing; secure by nailing at 18 inches on center just beyond edge of flashing so that nail heads hold down edge.
- D. Hips and Ridges:
1. Install leak barrier along entire lengths. If ridge vents are to be installed, position the leak barrier so that the ridge slots will not be covered.
- E. Roof Deck:
1. Install one layer of roof deck protection over entire area not protected by eave or valley membrane; run sheets horizontally lapped so water sheds; nail in place.
  2. On roofs sloped at more than 4 in 12, lap horizontal edges at least 2 inches and at least 2 inches over eave protection membrane.
  3. On roofs sloped between 2 in 12 and 4 in 12, lap horizontal edges at least 19 inches and at least 19 inches over eave protection membrane.
  4. Lap ends at least 4 inches; stagger end laps of each layer at least 36 inches.
  5. Lap roof deck protection over valley protection at least 6 inches
- F. Penetrations:
1. At vent pipes, install a 24 inch square piece of leak barrier lapping over roof deck protection; seal tightly to pipe.
  2. At vertical walls, install leak barrier extending at least 6 inches up the wall and 12 inches on to the roof surface lapping over roof deck protection.
  3. At rake edges, install metal edge flashing over leak barrier and roof deck protection; set tight to rake boards; lap joints at least 2 inches and seal with plastic cement; secure with nails.
  4. At hips and ridges, install leak barrier along entire lengths. If ridge vents are to be installed, position the leak barrier so that the ridge slots are not covered.

### 3.5 INSTALLATION OF SHINGLES

- A. Install in accordance with manufacturer's instructions and requirements of local building code.
1. Avoid breakage of shingles by avoiding dropping bundles on edge, by separating shingles carefully (not by "breaking" over ridge or bundles), and by taking extra precautions in temperatures below 40 degrees F.
  2. Handle carefully in hot weather to avoid damaging shingle edges.
  3. Secure with 4 to 6 nails per shingle; use number of nails required by manufacturer or by code, whichever is greater. Nails must be long enough to penetrate through plywood or OSB, or 3/4 inch into dimensional lumber.
- B. Install hip and ridge shingles as required by the manufacturer. At ridges, install hip and ridge shingles over ridge or ridge vent material.
- C. Make valleys using "woven valley" technique.
1. Run shingles from both roof slopes at least 12 inches (305 mm) across center of

- valley, lapping alternate sides in a woven pattern.
2. Nail not closer than 6 inches (150 mm) to center of valley.
- D. All penetrations are to be flashed according to manufacturer, ARMA and NRCA application instructions and construction details.

### **3.6 INSTALLATION OF VENTILATION**

- A. Code Requirements: Ventilation shall meet or exceed current FHA, HUD and local code requirements.
- B. Ridge Vents:
1. Cut continuous vent slot through sheathing, stopping 6 inches (150 mm) from each end of ridge.
  2. On roofs without ridge board, make slot 2 inches (50 mm) wide, centered on ridge.
  3. On roofs with ridge board, make two slots 1-3/4 inches (89 mm) wide, one on each side.
  4. Install ridge vent material full length of ridge, including uncut areas.
  5. Butt ends of lengths of ridge vent material and join using plastic cement.
  6. Install eave vents in sufficient quantity to equal or exceed the ridge vent area, calculated as specified by manufacturer.
  7. Install ridge shingles over ridge vent material; use nails of specified length; do not drive nails home, leaving 3/4 inch (19 mm) slot open between ridge and roof shingles.

### **3.7 PROTECTION**

- A. Stage work progress so that traffic is minimized over completed roofing.
- B. Protect installed products until completion of project

**END OF SECTION**

## **SECTION 07462 – FIBER CEMENT SIDING**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Fiber cement horizontal siding, panels, single, trim, and accessories;

#### **1.2 RELATED SECTIONS**

- A. Section 06100 - Rough Carpentry: Wood framing and bracing.
- B. Section 06100 - Rough Carpentry: Sheathing.

#### **1.3 REFERENCES**

- A. ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.
- B. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

#### **1.4 SUBMITTALS**

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm), representing actual product, color, and patterns.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.8 WARRANTY

- A. Product Warranty: Limited, non-pro-rated product warranty.
  - 1. Horizontal siding for 30 years.
  - 2. Trim boards for 15 years.
- B. Workmanship Warranty: Application limited warranty for 2 years.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
  - 1. James Hardie-Artisan Lap and Accent Trim, Hardi Panel and Hardi-trim
  - 2. CertainTeed
  - 3. Nichiha
- B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

### 2.2 SIDING

- A. Siding requirement for Materials:
  - 1. Fiber-cement Siding - complies with ASTM C 1186 Type A Grade II.
  - 2. Fiber-cement Siding - complies with ASTM E 136 as a noncombustible material.
  - 3. Fiber-cement Siding - complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
  - 4. Warnock Hersey Product Listing.
  - 5. Manufacturer's Technical Data Sheet.
- B. Horizontal Siding:
  - 1. Type: Heavy Lap siding with 5 inches exposure.
- C. Trim:
  - 1. Trim boards
    - a. Product: Batten Boards, 2-1/2 inch (63 mm) width, smooth texture.
    - b. Product: 5/4 Boards, width varies, smooth texture
    - c. Product: 1-1/2" thick trim for adjacent to heavy lap siding
    - d. Length: 12 feet (3658 mm).

### 2.3 FASTENERS

- A. Framing Fasteners: see manf. requirements
- B. Masonry Walls:
  - 1. Masonry Walls: Aerico Stud Nail, ET&F ASM No.-144-125, 0.14 inch (3.6 mm) shank by 0.30 inch (7.6 mm) head by 2 inches (51 mm) long corrosion resistant nails.

### 2.4 FINISHES

- A. Factory Primer: Provide factory applied universal primer.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Install a water-resistive barrier is required in accordance with local building code requirements.
- D. The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.
- E. Openings and penetrations to be properly flashed

### **3.3 INSTALLATION - Siding**

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Starting: Install a minimum 1/4 inch (6 mm) thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches (32 mm) wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
- C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- D. Align vertical joints of the planks over framing members.
- E. Maintain clearance between siding and adjacent finished grade.
- F. Locate splices at least one stud cavity away from window and door openings.
- G. Use off-stud metal joiner in strict accordance with manufacturer's installation instructions.
- H. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.
- I. Face nail to sheathing.
- J. Locate splices at least 12 inches (305 mm) away from window and door openings.

### **3.4 INSTALLATION – Trim Boards**

- A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
- B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch (19 mm) or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- C. Place fasteners no closer than 3/4 inch (19 mm) and no further than 2 inches (51 mm) from side edge of trim board and no closer than 1 inch (25 mm) from end. Fasten maximum 16 inches (406 mm) on center.
- D. Maintain clearance between trim and adjacent finished grade.
- E. Trim inside corner with a single board trim both side of corner.
- F. Outside Corner Board Attach Trim on both sides of corner with 16 gage corrosion resistant finish nail 1/2 inch (13 mm) from edge spaced 16 inches (406 mm) apart, weather cut each end spaced minimum 12 inches (305 mm) apart.
- G. Allow 1/8 inch gap between trim and siding.
- H. Seal gap with high quality, paint-able caulk.

- I. Shim frieze board as required to align with corner trim..
- J. Fasten through overlapping boards. Do not nail between lap joints.
- K. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten HardieTrim boards to HardieTrim boards.
- L. Shim frieze board as required to align with corner trim.

### **3.5 FINISHING**

- A. Finish primed siding with a two coat high quality, alkali resistant primer and one coat of either, 100 percent acrylic or latex or oil based, exterior grade topcoats or two coats high quality alkali resistant 100 percent acrylic or latex, exterior grade topcoat within 90 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.
- B. Finish factory primed siding with a two coat of high quality 100 percent acrylic or latex or oil based exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

### **3.6 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION



## **SECTION 07625 - SHEET METAL GUTTERS AND DOWNSPOUTS**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Gutters and downspouts for the renovated **Rest Area and Welcome Center building**.

#### **1.02 SUBMITTALS**

- A. Product Data.
- B. Samples: Submit 3x6 -inch samples of each type of metal and finish required.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Prefinished Aluminum Sheet: ASTM B 209, manufacturer's standard alloy and temper for indicated applications.
  - 1. Minimum thickness: 0.027 inch thick, unless indicated otherwise.
  - 2. Finish: 70 percent "Kynar 500" or "Hylar 5000" resin finish over epoxy primer; minimum system thickness 1.0 mil. Provide manufacturer's standard prime coat on underside.
    - a. Color: to be determined.
  - 3. Provide strippable plastic protective film on prefinished surface.

#### **2.02 ACCESSORY MATERIALS**

- A. Fasteners: Corrosion-resistant metal of same material as the material being fastened, or other material recommended by sheet metal manufacturer. Match finish and color of exposed fastener heads to finish and color of sheet material being fastened.
- B. Joint Adhesive: Two-component noncorrosive epoxy adhesive, recommended by metal manufacturer for sealing of nonmoving joints.
- C. Bituminous Coating: Heavy bodied, sulfur-free, asphalt-based paint; FS TT-C-494.

#### **2.03 FABRICATION - GENERAL**

- A. Form sheet metal to match profiles indicated, substantially free from oil-canning, fish-mouths, and other defects.
- B. Comply with SMACNA "Engineer rural Sheet Metal Manual" for applications indicated.
- C. Conceal fasteners and expansion provisions wherever possible.
  - 1. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- D. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
  - 1. Gage: As recommended by SMACNA or metal manufacturer for application, but in no case less than gage of metal being secured.

#### **2.04 GUTTERS AND DOWNSPOUTS**

- A. Fabricate from prefinished aluminum sheet.
  - 1. Gutter: see roof plan for size.
  - 2. Downspouts: see roof plan for size.
- B. Provide expansion joints in gutters at spacing not to exceed 30 feet.
- C. Provide sheet metal baffles 6 inches high with legs 18 inches long at gutter corners below roof valleys.
- D. Gutter Supports: Brackets.
- E. Downspout Supports: Brackets.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. General: Except as indicated otherwise, comply with sheet metal manufacturer's installation instructions and recommendations in the SMACNA "Architectural Sheet Metal Manual."

### **3.02 CLEANING AND PROTECTION**

- A. Repair or replace work which is damaged or defaced, as directed by the Engineer.
- B. Protect sheet metal work as recommended by the installer so that completed work will be clean, secured, and without damage at substantial completion.

**END OF SECTION 07625**

## **SECTION 07900 - JOINT SEALERS**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. The sealing of joints indicated on schedule at the end of this section.
  - 2. The sealing of other joints indicated on drawings.
- B. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with same sealer, whether indicated on drawings to be sealed or not.

#### **1.02 DEFINITIONS**

- A. Substrates:
  - 1. M-type substrates: Concrete, concrete masonry units, brick, mortar, natural stone. The term "masonry" means brick, stone, and concrete masonry work.
  - 2. G-type substrates: Glass and transparent plastic glazing sheets.
  - 3. A-type substrates: Metals, porcelain, glazed tile, and smooth plastics.
  - 4. O-type substrates: Wood, unglazed tile; substrates not included under other categories.

#### **1.03 SUBMITTALS**

- A. Product data.
- B. Samples for Color Selection. (Products exposed to view only.)

#### **1.04 PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install sealers if any of the following conditions exist:
  - 1. Air or substrate temperature exceeds the range recommended by sealer manufacturers.
  - 2. Substrate is wet, damp, or covered with snow, ice, or frost.
- B. Dimensional Limitations: Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify the Engineer and get sealer manufacturer's recommendations for alternative procedures.

#### **1.05 WARRANTY**

- A. Submit Manufacturer's written warranty for failures in sealer work that occur within 5 years after substantial completion, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Failure is defined as failure to remain weather-tight due to faulty materials. Correction is limited to replacement of sealers.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS - GENERAL**

- A. General: Provide only products which are recommended and approved by their manufacturer for the specific use to which they are put and which comply with all requirements of the contract documents.
  - 1. Provide only materials which are compatible with each other and with joint substrates.
  - 2. Colors of exposed sealers: As selected by the Engineer from manufacturer's standard colors.
- B. Manufacturers: Products of the manufacturers listed or approved equal, provided they comply with requirements of the contract documents will be among those considered acceptable.
  - 1. Silicone sealants:

- a. Dow Corning Corporation.
- b. Pecora Corporation.
- c. GE Silicones.

## **2.02 ELASTOMERIC SEALANTS**

- A. Elastomeric Sealants - General: Chemically curing elastomeric sealants of types indicated, complying with ASTM C 920, including specific Type, Grade, Class, and Uses indicated, as well as all other requirements specified.
  1. Where movement capability exceeding that measured by ASTM C 920 is specified, sealant shall withstand the total movement indicated while remaining in compliance with the other requirements specified, when tested in accord with ASTM C 719, with base joint width measured at the time of application.
  2. For M-type substrates: Comply with requirements for Use M.
  3. For G-type substrates: Comply with requirements for Use G.
  4. For A-type substrates: Comply with requirements for Use A.
  5. For O-type substrates: Comply with requirements for Use M (minimum) and Use O for the particular substrate.
- B. Medium Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 25 percent but less than 50 percent in both extension and compression.
- C. Mildew-Resistant Silicone Sealant: One-part, Type S, Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates, color to match glazed wall tile.

## **2.03 SILICONE-LATEX SEALANTS**

- A. Silicone-Latex Emulsion Sealant: One-part, nonsag, mildew-resistant, paintable at H.M. frames and gray to match wall tile; complying with ASTM C 834 use at fiber-cement siding and panel joints.

## **2.04 SEALANT BACKERS**

- A. Backers - General: Nonstaining; recommended or approved by sealant manufacturer for specific use.

# **PART 3 - EXECUTION**

## **3.01 PREPARATION**

- A. Do not begin joint sealer work until unsatisfactory conditions have been corrected.
- B. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces which would be damaged by contact or by cleanup. Remove tape as soon as practical.

## **3.02 INSTALLATION**

- A. Comply with sealer manufacturers' installation instructions and recommendations, except where more restrictive requirements are specified.

## **3.03 SCHEDULE OF JOINT SEALERS**

- A. Exterior Joints at fiber-cement siding and panel joints.
  1. Use Silicone-Latex sealants, paintable type.
  2. Joint shape: Concave joint configuration.
- B. Interior inside corners of all glazed tile walls; Mildew-Resistant Silicone Sealant color to match tile.
- C. Interior Joints for Which No Other Sealer Is Indicated:
  1. Use one of the following sealants:

- a. Use Silicone-Latex sealants, paintable type.
  - b. Mildew-resistant silicone sealant at all ceramic tile corners (color to match gray wall tile) and at fixtures.
2. Use bond-breaker tape.
  3. Joint shape: Concave joint configuration.

**END OF SECTION 07900**

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## **SECTION 08110 - STEEL DOORS AND FRAMES**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Standard steel doors and frames.

#### **1.02 REFERENCES**

- A. SDI 100-1991 -- Recommended Specifications: Standard Steel Doors and Frames; Steel Door Institute; 1991.

#### **1.03 SUBMITTALS**

- A. Product Data: Submit manufacturer's printed product information indicating compliance with specified requirements.
- B. Shop Drawings: Submit drawings for fabrication and installation of specified items, coordinated with opening schedule included in contract documents.

#### **1.04 QUALITY ASSURANCE**

- A. Quality Standard: Comply with SDI 100.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products in crates or cartons suitable for storage at the site.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Manufacturers: Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
  - 1. Benchmark Commercial Door Products.
  - 2. Curries Company/Essex Industries, Inc.
  - 3. Steelcraft Manufacturing Company/Masco Industries.

#### **2.02 MATERIALS**

- A. Steel Sheets, Hot-Rolled: ASTM A 569 and ASTM A 568, commercial quality, pickled and oiled.
- B. Steel Sheets, Cold-Rolled: ASTM A 366 and ASTM A 568, commercial quality, matte finish exposed, oiled.
- C. Steel Sheets, Galvanized: ASTM A 591, electrolytic zinc-coated, Class A, mill phosphatized.
- D. Anchorages: Galvanized steel, minimum 18 gage.
- E. Fasteners and Inserts: Units standard with manufacturer.
  - 1. Exterior walls: ASTM A 153, hot-dip galvanized, Class C or D.
- F. Primer Paint: Manufacturer's standard rust-inhibitive coating, suitable to receive finish coatings specified.

#### **2.03 FABRICATION**

- A. Exposed Door Faces: Fabricate from cold-rolled steel.
- B. Frames: Fabricate from cold-rolled or hot-rolled steel.

- C. Seal top and bottom edges integrally with door construction, or use minimum 16 gage steel channels to form flush closure.
- D. Exposed Screws and Bolts: Where required, provide only countersunk, flat Phillips-head fasteners.
- E. Hardware Preparation: Comply with DHI A115 series specifications.
  - 1. Locations: Comply with final shop drawings.
- F. Shop Painting:
  - 1. Primer: Apply primer evenly to achieve full protection of all exposed surfaces.

## **2.04 STEEL DOORS**

- A. General: Fabricate steel doors in accordance with requirements of SDI 100.
- B. Interior Doors:
  - 1. Heavy-Duty, Model 1 - Full Flush.
  - 2. Minimum thickness: 16 gage exterior with insulated cores at exterior.
- C. Exterior doors: Provide exterior doors in accordance with ANSI/SDI A250.8 and in the configuration and size as indicated on the door schedule:
  - 1. Extra heavy-duty 1-3/4 inches, Model 1 - Full flush
  - 2. Minimum thickness: 16 gage exterior with insulated cores at exterior.

## **2.05 STEEL FRAMES**

- A. General: Fabricate steel frames for scheduled openings, in styles and profiles as shown, using concealed fasteners.
  - 1. Minimum thickness: 14 gage exterior.
  - 2. Construction: Mitered and welded corners; foam frames for insulated installation.
- B. Guards: Weld protective covers to back of hardware openings at locations where grout, plaster, or other materials might interfere with hardware operation.

# **PART 3 - EXECUTION**

## **3.01 INSTALLATION**

- A. General: Install steel doors, frames, and accessories to comply with manufacturer's recommendations.
  - 1. Comply with detailed installation requirements of final shop drawings.
- B. Frame Installation: General: Adhere to provisions of SDI 105.
  - 1. Seal all exterior door frames with polyurethane foam sealant.
  - 2. Anchors: Provide 3 wall anchors per jamb at hinge and strike levels and minimum 18 gage base anchors.
  - 3. Fire-rated openings: Comply with requirements of NFPA 80.
- C. Door Installation:
  - 1. General: Comply with requirements and clearances specified in SDI 100.

## **3.02 ADJUST AND CLEAN**

- A. Touch-Up: At locations where primer has been abraded or minor rusting has occurred, sand smooth and spray-apply compatible primer.
- B. Final Operating Adjustments: Check hardware at all openings for proper operation of doors, making final corrections as required to assure that work of this section is complete and undamaged.

# **END OF SECTION 08110**



## SECTION 08211 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Solid core veneer-faced doors.
- B. Related Requirements:
  - 1. Section 088000 "Glazing" for glass view panels in flush wood doors for factory installation.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core, edge construction and factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
  - 1. Requirements for veneer matching.
  - 2. Doors to be factory finished and finish requirements.
- C. Samples for Initial Selection
- D. Sample Warranty.
- E. Test Data
  - 1. Submit test data indicating compliance with the Sound Transmission Class (STC) requirements.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
  - 1. A qualified manufacturer that is a member in good standing of the Window and Door Manufacturers Association.
- B. Installer Qualifications: Minimum 2 years experience installing similar products.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package factory-finished doors individually in manufacturer's standard plastic bags, stretch wrap, or cardboard cartons.
- C. Mark each door on top rail with opening number used on Shop Drawings. Include manufacturer's order number and date of manufacture.

#### 1.4 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

## 1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Warping (bow, cup, or twist) more than **1/4 inch** in a **42-by-84-inch** section.
    - b. Telegraphing of core construction in face veneers exceeding **0.01 inch in a 3-inch** span.
  - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Marshfield Door Systems
  - 2. Algoma Hardwoods, Inc.
  - 3. Eggers Industries.
  - 4. Assa Abloy
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

### 2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A-11, "Architectural Wood Flush Doors."
- B. WDMA I.S.1-A Performance Grade:
  - 1. Heavy Duty unless otherwise indicated.
- C. Wood-Based Particleboard-Core Doors:
  - 1. Provide wood-based particleboard core doors with a minimum density per ANSI A208.1, Grade LD-2 as required to meet WDMA Performance Duty level specified without added blocking.

### 2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors
  - 1. Veneer Grade: AA.
  - 2. Species: Cherry
  - 3. Cut: Plain sliced.
  - 4. Match between Veneer Leaves: Book match.
  - 5. Assembly of Veneer Leaves on Door Faces: Running match.
  - 6. Pair and Set Match: Provide for doors hung in same opening
  - 7. Transom Match: Continuous match.
  - 8. Core: Wood-based Particleboard, fire-resistant composite, or specialty core as required per Article 2.2 and schedule.
  - 9. Construction: Five plies. Stiles and rails are bonded to core, and then entire unit is abrasive planed before veneering.
  - 10. WDMA I.S.1-A Performance Grade: As specified in Article 2.2.

## 2.4 LIGHT FRAMES AND LOUVERS

- A. Factory Glazing: Refer to Section 088000 "Glazing" for glass view panels in flush wood doors. Factory install glass. Fill glazing bead nail holes in factory finished doors.
- B. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard flush wood beads unless otherwise indicated.
  - 1. Wood Species: Same species as door
  - 2. Profile: Lipped tapered beads.

## 2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
  - 1. Comply with NFPA 80 requirements for fire-rated doors.
- B. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
- C. Openings: Factory cut and trim openings through doors.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated.

## 2.6 SHOP PRIMING

- A. Doors for Transparent Finish: Factory finish door faces and vertical stile edges with stain (if required).

## 2.7 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish faces and vertical edges, seal top and bottom edges as required for warranty purposes
- B. Factory finish doors.
- C. Transparent Finish:
  - 1. Grade: Custom.
  - 2. Finish: Manufacturer's standard UV cured polyurethane, equal to WDMA TR-6 catalyzed polyurethane.
  - 3. Staining: As selected by Architect from manufacturer's full range
  - 4. Sheen: Satin.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
  - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs. Any deficiencies must be corrected prior to door installation.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: per schedule and manufacturers requirements.
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
  - 1. Install fire-rated doors according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
  - 1. Clearances: Provide **1/8 inch** at heads, jambs, and between pairs of doors. Provide **1/8 inch** from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide **1/4 inch (6.4 mm)** from bottom of door to top of threshold unless otherwise indicated.
    - a. Comply with NFPA 80 for fire-rated doors.
  - 2. Bevel non-fire-rated doors **1/8 inch in 2 inches (3-1/2 degrees)** at lock and hinge edges.
  - 3. Trim bottom rail only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory-Finished Doors: Do not trim factory finished doors for width.

### 3.3 ADJUSTING

- A. Operation: Correct any deficiency that prohibits the door from swinging or operating freely. Do not remove hinge screws after initial insertion. Shims used for alignment purposes must be inserted between hinge and frame. Do not insert shims between hinge and door.
- B. To prevent stile failure, insure that door closers are properly adjusted and do not limit the door opening swing. Limit door opening swing only with a properly located stop.
- C. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

**END OF SECTION**

## **SECTION 08310- ACCESS DOORS AND FRAMES**

### **PART 1 GENERAL**

#### **1.1 RELATED SECTIONS**

- A. Section 06100 - Rough Carpentry: Roof framing and opening support.

#### **1.2 SUBMITTALS**

- A. Submit under provisions of Section 01300.
- B. Manufacturer's data sheets, including:

#### **1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Store attic access door hatch in manufacturer's unopened packaging until ready for installation.
- B. Store attic access door hatch until installation inside under cover in dry area out of direct sunlight.

#### **1.4 WARRANTY**

- A. Limited Warranty: One year against defective material and workmanship, covering parts only, no labor or freight. Defective parts, if deemed so by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant which warrants same.

### **PART 2 PRODUCTS**

#### **2.1 ACCESS DOOR AND FRAME**

- A. Non-rated attic access doors and frames
  1. Door: White mineral board face, extruded polystyrene (EPS) R-42 core 10" thick and rubber sealing gasket over top of EPS core. Door is pre-finished.
  2. Frame: plywood frame is installed in a wood framed rough opening. Frame is 12" tall and provides insulation dam.
  3. Trim: Tapered wood trim is pre-finished.
  4. Handles: Two recessed handles
  5. Seal: for air leakage
  6. Rigid insulation board
- B. Stainless steel vertical access door
  1. Door: 16 ga. Rounded safety corners, insulated (U factor 0.50 max.)
  2. Frame: 14 ga. With continuous concealed hinge
  3. Lock: Mortise cylinder, 4 keys included
  4. Seal: for air leakage

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- B. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

### **3.3 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

## **END OF SECTION**

## SECTION 08410-METAL-FRAMED STOREFRONTS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Aluminum-framed storefront doors, sidelight, and door hardware.
- B. Perimeter sealant.

#### 1.02 REFERENCES

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 1997.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 1998.
- C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2002.
- D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 1996.
- E. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 1996.
- F. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991.
- G. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1997.
- H. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1996.

#### 1.03 PERFORMANCE REQUIREMENTS

- A. Design and size components to withstand the following load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
  - 1. Design Wind Loads: Comply with requirements of ASCE 7.
  - 2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
- C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.
- D. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 2.86 lbf/sq ft.
- E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
- F. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
- G. Windborne Debris Resistance: Provide glazed windows capable of resisting impact from windborne debris, based on pass/fail criteria as determined from testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996, and

requirements of authorities having jurisdiction.

#### **1.04 SUBMITTALS**

- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

#### **1.05 DELIVERY, STORAGE, AND PROTECTION**

- A. Handle products of this section in accordance with AAMA CW-10. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings, which bond to aluminum when exposed to sunlight or weather.

#### **1.06 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Kawneer Company; Product Tri-Fab 450 and 451; [www.kawneer.com](http://www.kawneer.com).
- B. Other Acceptable Manufacturers:
  - 1. United States Aluminum Corp.
  - 2. Vistawall Architectural Products: [www.vistawall.com](http://www.vistawall.com).

#### **2.02 COMPONENTS**

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
  - 1. Finish: High performance organic coating.
  - 2. Color: White, to be confirmed with architect.
- B. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior at exterior doors only, drainage holes and internal weep drainage system.
  - 1. Framing members for interior applications need not be thermally broken.
  - 2. Glazing stops: Flush.
  - 3. Cross-Section: 1-3/4 x 4-1/2 inch nominal dimension.
- C. Doors: Glazed aluminum.
  - 1. Thickness: 1-3/4 inches.
  - 2. Top Rail: 4 inches wide.
  - 3. Vertical Stiles: 4-1/2 inches wide.
  - 4. Bottom Rail: 12 inches wide.
  - 5. Glazing Stops: Beveled.
  - 6. Finish: Same as storefront.



**2.03 MATERIALS**

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
- C. Perimeter Sealant: Type 1 specified in Section 07900.
- D. Glass: As specified in Section 08800.
  - 1. Glass in Exterior Framing and Doors: Type 2, 1" insulated glass.
- E. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- F. U-Factor: 0.45 max. and SHGC: 0.33 max.

**2.04 FINISHES**

- A. High Performance Organic Finish: AAMA 2604; multiple coats, thermally cured fluoropolymer system, 20-year finish.

**2.05 HARDWARE**

- A. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- B. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- C. Pivots: Center type; top and bottom; provide on all doors.
- D. Push/Pull Set: 1" bar, Hager No.160; provide on all doors.
- E. Threshold: Aluminum, 1/4" high maximum; provide on all doors.
- F. Closers: Surface mounted on interior.
  - 1. Provide on all doors.
- G. Locks: Double cylinder mortise lock with key inside; keyed cylinder outside.
  - 1. Provide on all doors.

**2.06 FABRICATION**

- A. Fabricate 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 conceal from view.
- E. Reinforce components internally for door hardware.
- F. Reinforce framing members for imposed loads.
- G. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
  - 1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

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

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

**3.02 INSTALLATION**

- A. Install wall system in accordance with manufacturer's 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, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- 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. Set thresholds in bed of mastic and secure.
- J. Install hardware using templates provided.
- K. Install glass in accordance with Section 08800, using glazing method required to achieve performance criteria.
- L. Install perimeter sealant in accordance with Section 07900.

### **3.03 ERECTION TOLERANCES**

- A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

### **3.04 ADJUSTING**

- A. Adjust operating hardware for smooth operation.

### **3.05 CLEANING AND PROTECTION**

- A. Remove protective material from pre-finished 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 method acceptable to sealant manufacturer.
- D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

## **END OF SECTION**

## **SECTION 08710 - DOOR HARDWARE**

### **PART 1 - GENERAL**

#### **1.01 SUBMITTALS**

- A. Product Data.
- B. Final Hardware Schedule.
- C. Keying Schedule: Separate schedule showing how each lock is keyed.

#### **1.02 REQUIREMENTS**

- A. Hardware shall comply with the requirements of NCSBC 2013-chapter 11 and ANSI A117.1-2009.

### **PART 2 - PRODUCTS**

- A. Latching and Locking Devices: Mortise locks, unless otherwise indicated, with appropriate locking function; provide on every door.

#### **2.01 MATERIALS – GENERAL**

- A. Manufacturers:
  - 1. Where a particular manufacturer's product is specified, products of other manufacturers will be considered for substitution.
- B. Fasteners: Provide hardware prepared by the manufacturer with fastener holes for machine screws, unless otherwise indicated.
  - 1. Provide all fasteners required for secure installation.
  - 2. Select fasteners appropriate to substrate and material being fastened.
  - 3. Use wood screws for installation in wood.
  - 4. Use fasteners impervious to corrosion outdoors and on exterior doors.
  - 5. Exposed screws: Match hardware finish.
- C. Finish on All Exposed Metal Items: Satin chrome plated (626).
  - 1. Exceptions:
    - a. Plates and bars: Satin stainless steel (630).
    - b. Hinges: Where steel hinges are acceptable, use matching plated finish.
    - c. As indicated for specific items.

#### **2.02 LOCKS, LATCHES, AND BOLTS**

- A. Mortise Locksets and Latchsets:
  - 1. Comply with requirements of BHMA A156.13, Operational Grade 2.
    - a. Security Grade 1.
  - 2. Trim: Cast lever with escutcheon plate.
- B. Strikes: Provide strike for each latch bolt and lock bolt.
  - 1. Finish to match other hardware on door.
  - 2. Use wrought box strikes with curved lips unless otherwise indicated.
  - 3. Open strike plates may be used on interior wood door frames.

#### **2.03 LOCK CYLINDERS AND KEYING**

- A. Keying: Obtain the owner's keying instructions.
  - 1. Match existing master key system.
  - 2. Provide standard cylinders for locks on all doors, unless otherwise indicated.
- B. Cylinders: Minimum 7-pin pin tumbler cylinders.
  - 1. Construction: All parts brass, bronze, nickel silver or stainless steel.
  - 2. Cylinders made by manufacturers other than the lockset manufacturer will not be acceptable.
- C. Keys: Nickel silver.
  - 1. Stamp each key with manufacturer's change symbol.
  - 2. Provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
  - 3. Provide 3 of each change key. Master key system shall match existing: 5 master keys.

## 2.04 DOOR CONTROL DEVICES

- A. Closers - General:
  - 1. Use closers of sizes recommended by manufacturer, unless a larger size is specified.
  - 2. Size closer or adjust closer opening force to comply with applicable codes.
- B. Surface-Mounted Closers:
  - 1. Comply with requirements of BHMA A156.4, Grade 2.
    - a. Provide the following features:
      - 1. PT 4D: Adjustable hydraulic back check.
      - 2. PT 4F: Delayed action.
  - 2. Style: CO2021.
  - 3. Parallel arms: Provide for all closers; use larger size than normal.
    - 1. Finish: Metallic paint finish, color similar to metal hardware on same door.
- C. ElectroHydraulic automatic operators.
  - 1. Comply with ANSI 156.19 (knowing act activated)
- D. Wall/Floor-Mounted Stops/holders: Comply with requirements of ANSI A156.16.
  - 1. Floor-mounted stops: Style: L12121.
  - 2. Resilient bumpers: Gray.

## 2.05 SEALS AND THRESHOLDS

- A. Weatherstripping:
  - 1. At jambs and head: Replaceable bumper in surface-mounted extruded aluminum housing.
    - a. Bumper: Solid neoprene, hollow bulb or loop.
  - 2. At bottom: Replaceable sweep in surface-mounted extruded aluminum housing.
    - a. Sweep: Solid neoprene.
  - 3. Housing finish: Natural anodized.
- B. Thresholds: Ribbed aluminum.
  - 1. Select style to suit changes in elevation and to fit door hardware and frames.
  - 2. Interlocking hook type threshold: Hook strip on bottom of door, interlocking with top lip of threshold.
    - a. At doors that swing in, provide internal drain and drain pan.
- C. Sealant for Setting Thresholds: Butyl-rubber or butyl-polyisobutylene sealant.

## 2.06 ARCHITECTURAL DOOR TRIM

- A. Manufacturers:
  - 1. Architectural door trim: Products of the following manufacturers, or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
    - a. Yale Security, Inc.

- b. Hiawatha, Inc.
  - c. H. B. Ives, a Harrow Company.
  - d. Rockwood Manufacturing Company.
  - e. Triangle Brass Manufacturing Company, Inc.
- B. Push / pulls:
1. Decorative pulls: 1 inch round bars, radius ends, vertical(pull side) and horizontal(push side), 12 & 32 inches long respectively.
  2. Pull handles which are not mounted on plates: Fasten with through-bolts concealed under plate on opposite side.
  3. Where matching handles or bars are installed on each side of door, mount back-to-back with concealed fasteners.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Factory- or shop-prepare all work for installation of hardware.

### 3.02 INSTALLATION

- A. Follow hardware manufacturer's recommendations and instructions.
- B. Mount at heights specified in the Door and Hardware Institute's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  1. Exception(s): As required by applicable regulations.
- C. Install hardware in correct location, plumb and level.
- D. Reinforce substrates as required for secure attachment and proper operation.
- E. Thresholds: Apply continuous bead of sealant to all contact surfaces before installing.

### 3.03 ADJUSTMENT

- A. Adjust each operable unit for correct function and smooth, free operation.
- B. Adjust door closers to overcome air pressure produced by HVAC systems.
- C. If hardware adjustment is completed more than one month before substantial completion, readjust hardware not more than one week before substantial completion.

### 3.04 CONTRACT CLOSEOUT

- A. Deliver all keys to the owner.

## PART 4 - SCHEDULE

Manufacturers Code Name:

Ad	Adams Rite	Na	National Guard
Gl	Glynn Johnson	Ro	Rockwood
Ha	Hager	Sa	Sargent
Mc	McKinney	Sc	Schlage

Group # 1

Automatic sliding door with break away operation

Group # 2

3 Hinges	TA 2314 4 1/2 X 4 1/2	US32D	Mc	Pemko or Ives Equivalent
1 Lockset	8237-27 LNJ X 3 Keys	US32D	Sa	Schlage or Best Access Equivalent

1 Closer	281 PS	26D	Sa	LCN or Dorma Equivalent
1 Saddle Threshold	425 E X 36"	AL	Na	Pemko or Hager Equivalent
Neoprene gasket				
Drip cap				
Group #3				
3 Hinges	TA 2314 4 1/2 X 4 1/2	US32D	Mc	Pemko or Ives Equivalent
1 Passage set	8200-66 LNJ X	US32D	Sa	Schlage or Sargent Equivalent
2 Protection Plate	K1050 10" X 34"	US32D	Ro	Von Duprin or Hager Equivalent
3 Door Silencer	GJ64	Gray	Gl	Ives or Rockwood Equivalent
1 Wall Bumper	409	US32d	Ro	Ives or Rockwood Equivalent
Group #4				
3 Hinges	TA 2314 4 1/2 X 4 1/2	US32D	Mc	Pemko or Ives Equivalent
1 Lockset	8237-27 LNJ X 3 Keys	US32D	Sa	Schlage or Best Access Equivalent
1 Closer	281 PS	26D	Sa	LCN or Dorma Equivalent
2 Protection Plate	K1050 10" X 34"	US32D	Ro	Von Duprin or Hager Equivalent
3 Door Silencer	GJ64	Gray	Gl	Ives or Rockwood Equivalent
1 Wall Bumper	409	US32d	Ro	Ives or Baldwin Equivalent
1 Half saddle threshold	350	AL	Na	Pemko or Hager Equivalent
Group #5				
3 Hinges	TA 2314 4 1/2 X 4 1/2	US32D	Mc	Pemko or Ives Equivalent
1 Passage set	8200-66 LNJ X	US32D	Sa	Schlage or Sargent Equivalent
1 Closer	281 PS	26D	Sa	LCN or Dorma Equivalent
1 Protection Plate	K1050 10" X 34"	US32D	Ro	Von Duprin or Hager Equivalent
3 Door Silencer	GJ64	Gray	Gl	Ives or Rockwood Equivalent
1 Wall Bumper	409	US32d	Ro	Ives or Rockwood Equivalent
Group # 6				
3 Hinges	TA 2314 4 1/2 X 4 1/2	US32D	Mc	Pemko or Ives Equivalent
1 ADA cup pull	27P	US32D	Ha	Don-Jo or Burns Manuf. Equivalent
1 Thumb Turn Daedbolt	B663P	626	Sc	Adams Rite or Sargent Equivalent
1 Cylinder	B600	626	Sc	Adams Rite or Sargent Equivalent
1 Closer	281 O	26D	Sa	LCN or Dorma Equivalent
2 Protection Plate	K1050 10" X 34"	US32d	Ro	Von Duprin or Hager Equivalent
3 Door Silencer	GJ64	Gray	Gl	Ives or Rockwood Equivalent
1 Half saddle threshold	350	AL	Na	Pemko or Hager Equivalent
Group #7				
2 Continuous Hinge	MCK-12HD 83	BZ	Mc	Pemko or Ives Equivalent
2 Flush Bolts	555	US10B	Ro	Ives or Hager Equivalent
1 Deadlock	MS1851SW	313	Ad	Schlage or Sargent Equivalent
1 Thumb Turn Cyl	4066 X 1 1\8"	313	Ad	Schlage or Sargent Equivalent
1 Mortise Cylinder	21 41 1 1/8 Gmk X 3 Keys	US10B	Sa	Schlage or Adams Rite Equivalent
2 Push/Pull Set	RM252 X 33"	US10B	Ro	Ives or Hager Equivalent
2 Closer	281 PS	US10B	Sa	LCN or Dorma Equivalent
1 Saddle Threshold	425 E X 72"	AL	Na	Pemko or Hager Equivalent
Neoprene gasket				
Group #8				
2 Closer	281 PS	US10B	Sa	LCN or Dorma Equivalent
1 Door Operator	4640		LCN	Dorma or Assa Abloy Equivalent
1 Cylinder	4642-3071CS		LCN	Dorma or Assa Abloy Equivalent
1 Arm	3077L with metal cover		LCN	Dorma or Assa Abloy Equivalent
1 Control Box Assembly	4640-3462		LCN	Dorma or Assa Abloy Equivalent
2 Push pads				
existing door hardware to remain				

## END OF SECTION 08710

## **SECTION 08800 – GLAZING**

### **PART 1 – GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Insulated, display, and obscure glass.
  - 2. Glazing accessories.
- B. Types of work in this section include work for:
  - 1. Exterior entry door and sidelights; see Section 08410-Metal-Framed Storefronts.
  - 2. Sliding glass entry door; see Section 08460.

#### **1.02 PERFORMANCE REQUIREMENTS**

- A. Exterior Glazing: Provide glazing assemblies which will withstand normal conditions without failure, loss of weathertightness, or deterioration.
- B. Deterioration includes:
  - 1. For insulating glass:
    - a. Moisture or dirt between panes.
    - b. Development of condensation between panes.
    - c. Damage to internal coating, if any.
    - d. Development of other visible indication of seal failure.
  - 2. For laminated glass: Development of visible delamination.

#### **1.03 SUBMITTALS**

- A. Product Data.
- B. Insulating Unit Warranty.

#### **1.04 WARRANTY**

- A. Warranty on Insulating Glass: Fabricator's standard warranty for 5 years.

### **PART 2 – PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Manufacturers:
  - 1. Laminated glass: Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
    - a. Falconer-Lewistown, Inc.
    - b. Globe Amerada Glass Company.
    - c. Guardian Industries Corporation.
    - d. Viracon, Inc.

#### **2.02 GLASS TYPES**

- A. Glass Types - General: Provide glass types fabricated of the glass products indicated.

1. Exterior glass thickness: 6 mm (1/4 inch nominal), unless otherwise indicated.
  2. Where safety glazing is required by governing authorities, provide certified safety glazing.
  3. Cut or drill holes in laminated units.
- B. Glass Type I - 1: Sealed insulating units at sliding and storefront entry doors and sidelights.
1. Total thickness: 1 inch, nominal.
  2. Exterior and Interior pane: **Laminated glass.**
    - a. Two-ply.
    - b. Thickness of plies: 6 mm.
    - c. All plies: **Heat-strengthened float glass.**
    - d. Color: Outer and inner ply: Clear.
    - e. Interlayer thickness: 0.05 inch.
    - f. Shading coefficient: 0.91.
    - g. Winter U-value: 0.32, minimum.
- C. Glass Type SG - 2: Display case Polycarbonate sheet, with mar-resistant coating; thickness: ¼ inch.
1. Provide certified safety glazing and use at display cases.
  2. Color: Clear.
    1. Acceptable glazing methods: Sealant, both sides.
- D. Glass Type SG - 3: Obscure glass at Unisex Restroom door; thickness: ¼ inch safety glass.

### 2.03 BASIC GLASS PRODUCTS

- A. Sealed Insulating Units: Factory-assembled multiple panes separated by and sealed to spacers forming air-tight, dehydrated air space(s).
1. ASTM E 774, Class B.
  2. Spacer seals: Manufacturer's standard.
  3. Exception: For structural adhesive glazed units use only a dual seal system, using materials determined by structural adhesive manufacturer to be compatible with structural adhesive.
- B. Float Glass: Quality q3, unless otherwise indicated.
1. Heat-strengthened: ASTM C 1048, Kind HS, Type I.
- C. Laminated Units: Multiple plies laminated together with interlayer, using heat and pressure, without air pockets or contaminants between plies.
1. Interlayer for all-glass units: Polyvinyl butyral sheet, specifically designed for lamination and with demonstrated long-term ability to maintain physical and visual properties under installed conditions.
- D. Polycarbonate Sheet: Rigid, flat polycarbonate sheet; thicknesses as indicated.
1. Flammability: Average extent of burning less than 1 inch, when tested in accordance with ASTM D 635, using the thickness of material to be used on the project.
  3. UV- and mar-resistant coating: Apply on all surfaces exposed to air.
- A. Window Grilles: Provide coated aluminum grilles with in lights match exterior color of frame.

### 2.04 INSTALLATION MATERIALS

- A. Installation Materials - General: Select products which have appropriate performance characteristics as recommended by glass and glazing materials manufacturers and which are compatible with all materials with which they will come into contact.
- B. Heel and Toe Bead Sealant: Noncuring, nonskinning, minimum 75 percent solids, butyl or polyisobutylene rubber, complying with 802.3, Type II ductile back bedding compound, as described in AAMA 800.



## **PART 3 – EXECUTION**

### **3.01 INSTALLATION - GENERAL**

- A. Comply with recommendations for installation contained in the FGMA "Glazing Manual" and "Sealant Manual" except when specifically not recommended or prohibited by the glass or glazing material manufacturer; comply with manufacturer's recommendations.
- B. Protect glazing from edge damage during handling and installation.
- C. Do not install glass that has edge damage or defects that reduce glass strength or performance or diminish appearance.

### **3.02 GLAZING IN FRAMES**

- A. Use continuous heel or toe bead at all exterior glazing.
- B. Do not block weep holes.
- C. Structural Adhesive Glazing: Perform glazing in strict accordance with instructions of structural glazing adhesive manufacturer and additional requirements elsewhere in the contract documents.

### **3.03 PROTECTION AND CLEANING**

- A. Cover exposed polycarbonate surfaces with heavy paper secured with tape, without touching glazing.
  - 1. Clean polycarbonate surfaces using only methods recommended by manufacturer.

## **END OF SECTION 08800**

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## SECTION 08900 – LOUVERS AND VENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Fixed, extruded-aluminum wall louvers.
- B. See Division 8 Section "Steel Doors and Frames" for louvers in hollow-metal doors.
- C. See Division 15 Sections for louvers that are a part of mechanical equipment.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Design: Design louvers, including comprehensive engineering analysis by a qualified engineer, using structural performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.
  - 1. Wind Loads: Determine loads based on a uniform pressure of 30 lb./sq. ft. (1435 Pa), acting inward or outward.
- C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
- C. Samples: For each type of metal finish required.
- D. Submittal: For louvers indicated to comply with structural performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product Test Reports: Based on tests performed according to AMCA 500-L.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221M, Alloy 6063-T5.
- B. Aluminum Sheet: ASTM B 209M, Alloy 3003 with temper as required for forming.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
  - 1. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.

## 2.2 FABRICATION, GENERAL

- A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

## 2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal High Performance Drainable-Blade Louver
1. Basis-of-Design Product: Architectural Louvers; Model E6DP. Subject to compliance with requirements, provide the specified product or comparable product by one of the following:
    - a. Manufacturers of equivalent products submitted and approved in accordance with Section 01630 - Product Substitution Procedures.
  2. Louver Depth: 6 inches (150 mm)
  3. Blade Profile: Drainable blade with front gutter for water diversion to jambs
  4. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm) for blades and frames.
  5. Louver Performance Ratings:
    - a. Free Area: Not less than 9.2 sq. ft. (0.85 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
    - b. Point of Beginning Water Penetration: Not less than 1046 fpm (5.4 m/s).
    - c. Air Performance: Not more than 0.13-inch wg (25-Pa) static pressure drop at 1000 fpm (5.1-m/s) free-area velocity.
  6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

## 2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
- B. Louver Screen Frames: Same kind and form of metal as indicated for louver to which screens are attached.
- C. Louver Screening: Same kind of metal as indicated for louver.
1. Insect Screening: Aluminum, 16 x 18 square mesh, 0.011-inch (0.28-mm) wire.
  2. Bird Screening: Flattened, expanded aluminum, 3/4 by 0.050 inch (19 by 1.27 mm) thick.

## 2.5 ALUMINUM FINISHES

- A. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather-tight connection.
- C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Repair damaged finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory and refinish entire unit or provide new units.
- E. Protect galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint.

**END OF SECTION 08 90 00**

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## **SECTION 09252 - CEMENTITIOUS BACKER BOARD**

### **PART 1 GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Fiber cement backer board panels.

#### **1.2 RELATED SECTIONS**

- A. Section 06100 - Rough Carpentry: framing and bracing.
- B. Section 09260 - Gypsum Board: Vapor barrier material and installation requirements.

#### **1.3 REFERENCES**

- A. ANSI 108/A118/A136 - American National Standards for the Installation of Ceramic Tile.
- B. ANSI A108.11 - Installation of Cementitious Backer Units.
- C. ANSI A118.4 - Specifications for Latex Portland Cement Mortar
- D. ANSI A118.9- Cementitious Baker Units.
- E. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile
- F. ASTM C1288 - Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets.

#### **1.4 SUBMITTALS**

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches (100 by 150 mm) square, representing actual product, color, and patterns.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store boards flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

#### **1.7 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.8 WARRANTY

- A. Product Warranty: limited product warranty against manufacturing defects:
  - 1. 1/2 inch (13 mm) nominal cement board for 20 years.
- B. Workmanship Warranty: application limited warranty for 2 years.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer:
  - 1. James Hardie Building Products, Inc.,
  - 2. National Gypsum
  - 3. Durock
- B. Requests for approval of equal substitutions will be considered in accordance with provisions of Section 01600.

### 2.2 BACKERBOARD

- A. Type: thickness varies
- B. Material shall meet the following building code compliance:
  - 1. Non-asbestos fiber-cement board to comply with ASTM C1288 and ANSI A118.9.
  - 2. Board shall meet the building code compliance National Evaluation Report No. NER 405.

### 2.3 FASTENERS

- A. Metal Framing fasteners
  - 1. Metal framing: 1-1/2 inches (32 mm) No. 8 by 0.375 inch (9.5 mm) HD self-drilling, corrosion resistant ribbed wafer head screws.

## PART 3 EXECUTION

### 3.1 EXAMINATION

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

### 3.2 WALL FRAMING

- A. Either vertical or horizontal, nominal 2 inches by 4 inches ( 51 mm by 102 mm) metal framing spaced a maximum of 24 inches (610 mm) on center with end joints staggered from adjacent courses in both vertical and horizontal applications.
- B. To comply with ANSI A108.11, either vertical or horizontal, nominal 2 inches by 4 inches ( 51 mm by 102 mm) metal framing spaced a maximum of 16 inches (406 mm) on center with end joints staggered from adjacent courses in both vertical and horizontal applications.
- C. Install a vapor barrier.
  - 1. Comply with building code regarding vapor barrier requirements.
  - 2. Repair any punctures or tears in vapor barrier prior to the installation of the board.



### 3.3 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.4 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Install sheets with 1/8 inch (3 mm) gap between sheets.
- B. Place fasteners 8 inches (152 mm) on center no closer than 3/8 inch (9.5 mm) from board edges and 2 inches (51 mm) from board corners.
- C. Boards shall be placed with a minimum 1/4 inch (6 mm) clearance from the floor surfaces and other horizontal tile termination locations, including above tub edges. This gap shall be free of adhesive and grout and filled with a flexible sealant.
- D. Boards shall be placed with a minimum 1/8 inch (3 mm) clearance from wall and cabinet bases, and other horizontal tile termination locations, including above tub edges. This gap shall be free of adhesive and grout and filled with a flexible sealant.
- E. Joints shall be reinforced with 2 inches (51 mm) wide, high-strength, coated, alkali-resistant, glass fiber reinforcing tape embedded into the wet mastic or modified thinset mortar and allowed to dry thoroughly.
- F. For large tiled areas, movement/control joints shall be provided in accordance with ANSI A108, Section AN-3.7 or as indicated on drawings.
- G. Wall tiles complying with ANSI A137.1 are attached to the board with flexible Type I mastic adhesives complying with ANSI A136.1, or acrylic or latex-modified thinset mortars complying with ANSI A118.4, in accordance with ANSI A108.

END OF SECTION

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## **SECTION 09260 - GYPSUM BOARD SYSTEMS**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Gypsum wallboard and ceiling board.
  - 2. Drywall finishing.

#### **1.02 QUALITY ASSURANCE**

- A. Regulatory Requirements: Where required, provide fire-rated assemblies as listed in the following:
  - 1. Underwriters Laboratories Inc.'s (UL) "Fire Resistance Directory."

### **PART 2 - PRODUCTS**

#### **2.01 GYPSUM BOARD**

- A. Gypsum Wallboard and Ceiling Board: ASTM C 36; maximum lengths available to minimize end-to-end butt joints in each area receiving finished gypsum board.
  - 1. Edges: Tapered.
  - 2. Thickness: 5/8 inch, except as otherwise shown (fire-resistant type).
- B. Manufacturers: Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable:
  - 1. Domtar Gypsum.
  - 2. Georgia-Pacific Corporation.
  - 3. Gold Bond Building Products, a National Gypsum Division.
  - 4. USG Corporation.

#### **2.02 TRIM AND ACCESSORIES**

- A. General: Except as otherwise specifically indicated, provide trim and accessories by manufacturer of gypsum board materials, made of galvanized steel or zinc alloy and configured for concealment in joint compound.

#### **2.03 JOINT TREATMENT**

- A. General: Provide products by manufacturer of gypsum boards. Comply with ASTM C 475 and with manufacturer's recommendations for specific project conditions.
- B. Joint Tape: Manufacturer's standard paper reinforcing tape.
- C. Setting Type Joint Compound: Chemical hardening type, for the following applications:
  - 1. Exterior use: Prefilling and topping.
- D. Drying Type Joint Compound: Vinyl-based type for interior use, and as follows:
  - 1. All-purpose type, for both embedding tape and as topping.

#### **2.04 MISCELLANEOUS MATERIALS**

- A. General: Provide miscellaneous materials as produced or recommended by manufacturer of gypsum products.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION OF GYPSUM BOARD**

- A. General: Comply with ASTM C 840 and GA-216 except where exceeded by other requirements.
  - 1. Wherever possible, install gypsum board to minimize butt end joints.
  - 2. Apply ceiling boards prior to installation of wallboards. Arrange to minimize butt end joints near center of ceiling area.
  - 3. Install wallboards in a manner which will minimize butt end joints in center of wall area. Stagger vertical joints on opposite sides of walls.
- B. Installation on Metal Framing:
  - 1. Single-layer application: Install gypsum board by the following method:
    - a. Screw attachment.

### **3.02 FINISHING**

- A. General: Comply with ASTM C 840 and GA-216 except where exceeded by other requirements.
- B. Finish gypsum board in accordance with the following level of finish per GA-214, except where indicated otherwise on the drawings:
  - 1. Level 3: Embed tape in joint compound at all joints and interior angles. Provide two separate coats of compound at all joints, angles, fastener heads, and accessories. Provide smooth surfaces free of tool marks and ridges.

## **END OF SECTION 09260**

## SECTION 09300 - TILE

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Porcelain wall tiles-plane.
  - 2. Porcelain wall tiles.

#### 1.02 SUBMITTALS

- A. Samples for Verification: Submit each tile type selected mounted on a minimum 12 inch square board with joints filled using selected grout.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS - GENERAL

- A. Colors, Textures, and Patterns, Tile, Grout, and Other Products: **Colors shall match the colors indicated below and as shown on drawings**, as manufactured by **manufacturers listed below**. Colors manufactured by a tile company other than that specified, must be approved as equal in color and texture by the Architect and the Roadside Unit. A manufacture other than specified shall submit an actual sample comparison submittal board with their **substitution samples** mounted alongside the specified tile samples for consideration as an equal tile product by the Architect and the Roadside Unit; the proposed substitution submittal board **shall be submitted 10 days prior to the receipt of bids to**

**Ginger Anderson**  
**Weeks Turner Architecture**  
**319 Chapanoke Road, S. 120**  
**Raleigh, NC 27603**

- 1. Tile trim and accessories: Match color and finish of adjoining flat tile.

#### 2.02 TILE PRODUCTS

- A. **Wall Tile:**
  - 1. The design is based on the following product:
    - a. Type 1-Sink & urinal walls-Stone Peak, 60"x60" Plane, Zebrino Blulette,Polished
    - b. Type 2-other restroom walls-Stone Peak, 12"x 24" Zebrino Blulette,Polished
    - c. Type 3-Border in restrooms-3x9 random mosaic with nickel mini pencil trims  
Mosaic colors: Precious Gems essentials, Sail AR71, Sea AR37, Tourmaline AR23  
Fossil AR48 in equal proportions
    - d. Type 4- Lobby wainscot –Aspire, 10x16 with 2" bullnose, Blanco Glazed
  - 2. Trim units: Match color and finish of accent/floor tile:
    - a. Shapes and sizes: Manufacturer's standard, as indicated; coordinated with indicated size and coursing of adjoining flat tile, where applicable:

#### 2.03 SETTING MATERIALS

- A. **Latex-Portland Cement Mortar:** Two-component, dry grout mix and liquid latex additive, field-mixed; complying with ANSI A118.4, for floors and walls.
  - 1. All components premeasured and prepackaged.
  - 2. Liquid latex additive: Manufacturer's standard water emulsion.
  - 3. Mix in accordance with manufacturer's recommendations.

#### 2.04 GROUTING MATERIALS

- A. 100% Solids Epoxy Grout; complying with ANSI A118.3.
  - 1. Mix in accordance with manufacturer's recommendations.
  - 2. Colors: TBD
- B. Approved equals: Custom Building Products or Bonsal or Hydroment

**2.05 SEALANTS**

- A. Compatibility: Provide elastomeric sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates for project performance conditions; color shall match wall tile grout color.
- B. Masonry / Silicone Sealant: Impregnating masonry sealer for interior and exterior manufactured stone surfaces and grout or ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and O (for nonporous substrates) with added fungicide.

**2.06 MISCELLANEOUS MATERIALS**

- A. Cementitious Backer Units: See section 09252
- B. Tile Cleaner: Product specifically acceptable to tile manufacturer and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation or Ceramic Tile Institute.
- C. Stainless steel bullnose edge protection-1/4" radius (Schluter RONDEC or approved equal) Installed per manufacturers recommendations.

**PART 3 - EXECUTION****3.01 INSTALLATION - GENERAL**

- A. Tile Installation Standard: ANSI A108 series, for setting and grouting materials listed.
- B. Installation Methods: Comply with TCA "Handbook for Ceramic Tile Installation" for type of applications indicated. Tile Over Tile, TR712: Prepare existing tile floor as specified in the TCA Handbook.
- C. Cementitious Backer Units: Install in accordance with ANSI A108.11.
- D. Some materials may require extended lead times. Contractor shall be responsible for appropriate order and delivery time for custom order products.
- E. Oversized tiles will require special attention including but not limited to delivery and installation.

**3.02 TILE APPLICATIONS**

- A. Interior Wall, 1/2" Thin-Bed for large tile units:
  - 1. Tile: Glazed wall.
  - 2. Installation method:
    - a. Cementitious backer units on studs: TCA W244.
    - b. Bond coat: Latex-portland cement mortar, ANSI A108.5.
  - 1. Grout: Latex-portland cement.
- B. Tolerances: Maximum variation in floor and wall finished surface/sub-structures shall not exceed 1/8" in 10'-0" from the required tile surface plane. All individual tile edges shall align with adjacent tile edges and no greater than a 1/64" offset variation shall be acceptable.

**3.03 CLEANING AND PROTECTION**

- A. Clean tile surfaces after installation is complete.
- B. Protection: Apply neutral protective cleaner to tile after installation if recommended by tile manufacturer. Overlay completed tile installation with Kraft paper for protection from subsequent construction activities.

**3.04 MAINTENANCE**

- A. Extra Materials: At time of completing installation, deliver stock of maintenance materials to the owner. Furnish products matching those actually installed, packaged for storage and clearly labeled.
  - 1. Wall Tile: 2 percent of each variety installed and/or a minimum of 10 units of each accent color or trim units, which ever is the greatest quantity.

**END OF SECTION 09300**

## SECTION 09662 – EPOXY TERRAZZO FLOORING

### PART 1 – GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and division 1 specification sections, apply to this section.
- B. General contractor or other is to provide water, 220 volt single phase 100 amp breaker & 480 volt 3 phase 60 amp breaker electrical services with hookups and disconnects within 200 feet of any terrazzo area are to be provided by others at no cost to this subcontractor.
- C. Testing should be conducted according to ASTM F2170 only (determining relative humidity in concrete slabs using in situ probes. This test should be conducted by an independent tester.)

#### 1.02 SUMMARY

- A. Section Includes:
  - 1. Thin-set epoxy terrazzo flooring including preparation of substrates
  - 2. Thin-set precast epoxy terrazzo wall base units
  - 3. Related accessories
- B. Related Sections:
  - 1. Section 03300, Cast-in-Place Concrete
  - 2. Section 04200, Unit Masonry
  - 3. Section 07900, Joint Sealants
  - 4. Section 09900, Painting

#### 1.03 SUBMITTALS

- A. Manufacturer's product data for each type of terrazzo and accessory: System will be evaluated on the basis of standards. For tests not listed in published data, manufacturer shall supply missing data according to standard referenced.
  - 1. Physical properties
  - 2. Performance properties
  - 3. Specified tests
  - 4. Material Safety Data Sheet
  - 5. Manufacturer's standard warranty
- B. Shop Drawings: Include terrazzo installation requirements. Include plans, elevations, sections, component details, and attachments to other work. Show layout of the following:
  - 1. Divider strips
  - 2. Control- and expansion-joint strips
  - 3. Base and border strips
  - 4. Precast terrazzo jointing and edge configurations including anchorage details
  - 5. Terrazzo patterns
- C. Samples for initial selection: Manufacturer's color plates showing the full range of colors and patterns available for each terrazzo type indicated.
- D. Samples for Verification: Match architect's samples for each type, material, color, and pattern of terrazzo and accessory required showing the full range of color, texture, and pattern variations expected. Label each terrazzo sample to identify manufacturer's matrix color and aggregate types, sizes, and proportions. Prepare samples of same thickness and from same material to be used for the work in size indicated below:
  - 1. Epoxy Terrazzo: Minimum 6" x 6" (152.4 mm x 152.4 mm) sample of each color and type of terrazzo.
  - 2. Precast Epoxy Terrazzo: Minimum 6" x 6" (152.4 mm x 152.4 mm) sample of each color and type of terrazzo.

3. Blended Epoxy Terrazzo: Minimum 12"x24" sample of the 5 color blend
  4. Accessories: 6" length (152.4 mm) of each kind of divider strip, stop strip, and control joint strip required.
- E. Manufacturer Experience:
1. Submit proof of Associate membership in NTMA.
  2. Provide a list of at least 5 epoxy terrazzo projects installed during the previous 5 years using material being submitted for this project and of the same scope, complexity, and at least 75% of the square footage.
  3. Manufacturer must provide history of providing primary epoxy materials for a minimum of 10 years to a minimum of 5 terrazzo contractors/installers over that same period.
- F. Qualification Data: For qualified Installer.
1. Submit proof of Contractor membership in NTMA and provide a list of at least 5 epoxy terrazzo projects installed during the previous 5 years using material being submitted for this project and of the same scope, complexity, and at least 75% of the square footage.
  2. **Terrazzo contractor must prequalify prior to bid date.**
- G. Material Test Reports: For moisture and / or relative humidity of substrate
- H. Maintenance Data: Submit 5 copies of NTMA maintenance recommendations and 5 copies of manufacturer's instructions

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who is acceptable to architect and epoxy terrazzo manufacturer to install manufacturer's products.
1. Engage a terrazzo contractor with a minimum of 5 epoxy terrazzo projects installed during the previous 5 years using material being submitted for this project and of the same scope, complexity, and at least 75% of the square footage.
  2. Engage an installer who is a Contractor member of NTMA
- B. Source Limitations:
1. Obtain primary epoxy terrazzo flooring system materials including membranes, primers, moisture vapor primers, resins, and hardening agents from a single manufacturer with proof of NTMA membership
  2. Manufacturer must provide history of providing primary materials for a minimum of 10 years
  3. Obtain aggregates, divider strips, sealers, cleaners from source recommended by primary materials manufacturer
- C. Pre-installation Conference: Conduct conference at project site to comply with requirements in section 01200 – Project Meetings. Review methods and procedures related to terrazzo including, but not limited to, the following:
1. Inspect and discuss installation procedures, joint details, jobsite conditions, substrate specification, vapor barrier details, and coordination with other trades
  2. Review and finalize construction, schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays
  3. Review special terrazzo designs and patterns
  4. Review dust control procedures
  5. Review plans for concrete curing and site drying to enable timely achievement of suitable slab moisture conditions
- D. NTMA Standards: Comply with NTMA's "Terrazzo Specifications and Design Guide" and with written recommendations for terrazzo type indicated unless more stringent requirements are specified
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution
1. Build mockups for terrazzo including accessories
    - a. Size: Minimum 100 sq. ft. (9.3 sq. m.) of typical poured-in-place flooring and base condition for each color and pattern **in locations to be directed by Architect**
    - b. Approved mockup may become part of the completed work if undisturbed at time of substantial completion



## 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in supplier's original wrappings and containers, labeled with source or manufacturer name, material, or product brand name, and lot number, if any.
- B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  - 1. Storage temperatures should be between 60°F to 80°F

## 1.06 PROJECT CONDITIONS

- A. Terrazzo contractor shall, prior to surface preparation:
  - 1. Evaluate slab condition, including slab moisture content and extent of any required repairs.
  - 2. Maintain the ambient room temperature at 60°F and floor/slab at 50°F or above for a period extending 72 hours before, during, and after floor installation. Concrete to receive epoxy terrazzo shall have cured for at least 28 days and be free of all curing compounds (unless moisture vapor primer is incorporated into the system). Test concrete substrate to determine acceptable moisture levels prior to installation.
- B. Acceptable Substrates:
  - 1. Flatness tolerance: Concrete subfloor shall be flat with a maximum variation from level of  $\frac{1}{4}$ " in any 10 feet. Any irregularity of the surface requiring patching and / or leveling shall be done using an appropriate terrazzo fill and selected aggregates as recommended by NTMA resin systems.
  - 2. Concrete floor shall be prepared mechanically by shot blasting. Grinding of slab is not sufficient surface preparation. Surface preparation results should achieve a CSP3-CSP4 profile according to International Concrete Repair Institute Guideline No. 03732.
  - 3. Concrete floor shall receive a steel trowel finish.
  - 4. Concrete shall be cured a minimum of 28 days. No curing agents are to be used in areas to receive terrazzo.
  - 5. With existing concrete, the vapor barrier is unknown. For moisture control, slab to be treated with a moisture vapor primer.
  - 6. Saw cutting of control joints must be done between 12 – 24 hours after placement of the structural concrete and at a minimum of  $\frac{1}{2}$  the concrete thickness.
- C. General contractor or owner to provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during terrazzo installation.
- D. General contractor or owner to provide protection from other trades prior to final acceptance by Owner.
- E. It is preferred that any drywall be installed after the terrazzo is rough ground. If schedule dictates otherwise, be installed  $\frac{3}{4}$ " above the terrazzo thickness to prevent wicking during the polish grinding wet process.

## PART 2 – PRODUCTS

### 2.01 EPOXY TERRAZZO

- A. Basis of Design Products: Subject to compliance with requirements, provide products by Master Terrazzo Technologies, Levittown, PA or comparable products by one of the following:
  - 1. Quadrant Chemical Corp.
  - 2. General Polymers Brand of Sherwin-Williams
- B. Primer: Moisture Vapor Primer
  - 1. Physical properties of moisture mitigating primer shall have a maximum of 0.3 perms with 100% RH.
  - 2. Flexible Reinforcing Membrane: Iso-Crack Epoxy Membrane, for substrate crack preparation and reflective crack reduction.

- a. Reinforcement: Fiberglass scrim.
- 3. Epoxy Matrix: Epoxy matrix and in color required for mix indicated.
  - a. Physical properties without aggregates. All specimens cured for 7 days at 75°F plus or minus 2°F and 50% plus or minus 2% RH. This product shall meet the following requirements:

Property	Test Method	NTMA Requirements
Hardness	ASTM D-2240 using Shore-D Durometer	60-85
Tensile Strength	ASTM D-638	3,000 psi min.
Compressive Strength	ASTM D-695 Specimen B cylinder	10,000 psi min.
Flexural Strength	ASTM D-790	Not specified
Chemical Resistance	ASTM D-1308 seven days at room temperature by immersion method	No deleterious effects: <ul style="list-style-type: none"> <li>▪ Distilled Water</li> <li>▪ Mineral Oil</li> <li>▪ Isopropanol</li> <li>▪ Ethanol</li> <li>▪ 0.025 Detergent Solution</li> <li>▪ 1% Soap Solution</li> <li>▪ 10% Sodium Hydroxide</li> <li>▪ 10% Hydrochloric Acid</li> <li>▪ 30% Sulfuric Acid</li> <li>▪ 5% Acetic Acid</li> </ul>

- b. Physical properties with aggregates. For epoxy matrix blended with 3 volumes of Georgia White marble blended 60% #1 chip and 40% #0 chip, ground and grouted with epoxy resin according to installation specifications, finishing to a nominal 1/4" thickness. All specimens cured for 7 days at 75°F plus or minus 2°F and 50% RH plus or minus 2% RH. This finished epoxy matrix shall meet the following requirements:

Property	Test Method	NTMA Requirements
Flammability	ASTM D-635	Self-extinguishing, extent of burning 0.25 inches max.
Thermal Coefficient of Linear Expansion	ASTM D-696	25x10 <sup>-6</sup> inches per inch per degrees to 140°F
Bond Strength	ACI COMM 403, Bulletin 59-43 (pages 1139-1141)	300 psi (100% concrete failure)

- 4. Aggregates Complying with NTMA gradation standards for mix indicated and containing no deleterious or foreign matter.
  - a. Abrasion and impact resistance: Less than 40% loss per ASTM C 131.
  - b. 24-Hour absorption rate: Less than 0.74%.
  - c. Dust content: Less than 1.0% by weight.
- 5. Finishing Grout: NTMA approved resin systems.
- C. Mix: Comply with NTMA's "Terrazzo Specifications and Design Guide" and manufacturer's written instructions for matrix and aggregate proportions and mixing.
  - 1. Color and Pattern Schedule: Where the following designations are indicated, provide specified terrazzo matrices matching architect's samples:
    - a. TZ1: field and base color, marble, glass & mirror, color: MTT 80681
    - b. TZ2: Light blue/green-border, containing marble, glass & mirror, color: MTT 80846
    - c. TZ3: Light blue background, containing marble, glass & mirror, color: MTT 80845
    - d. TZ4: Medium green leaves, containing all glass, color MTT 808443
    - e. TZ5: Light yellow flower center & beak, containing all glass, color: MTT 80842
    - f. TZ6: Light beige flowers, containing mother of pearl and glass, color: MTT 80843
    - g. TZ7: Brown dog and branches, containing all glass, color MTT 80684
    - h. TZ8: Red bird and strawberry, containing all glass, color MTT 80687
    - i. TZ9: Black bird face & lighthouse, containing all glass, color MTT 80688
    - j. Other colors to be determined
- D. Additive: Stone Hardener as required for 3000 grit (high polish) finish

**2.02 STRIP MATERIALS**

- A. Thin-set Divider Strips: L-type.
  - 1. Material **Aluminum**
  - 2. Guide for commonly used L-type divider strips for thin-set epoxy terrazzo systems:

System Height	Strip Height	Strip Width
		16 gauge
3/8" System	3/8"	1/8" 1/4"

- B. Control-Joint Strips: Separate double L-type angles, positioned back to back with minimum 1/8" – 1/4" width between. (Single L-type angle, positioned adjacent to the joint is also acceptable.) Fill joint with 100% solids epoxy joint filler. Fill area between strips with elastomeric joint filler. Match material, thickness, and color of divider strips and depth required for topping thickness indicated. (For buried control joint): Fill saw cut concrete control joint with 100% solids epoxy filler, apply Iso-Crack Membrane 30-40 mils, embed 12" fiberglass fabric reinforcement. Saw cut control joints

should be prefilled with hard epoxy and a single "L" divider with the vertical part placed precisely over the cut. If the saw cut control joint opening is  $\frac{1}{4}$ " or wider, the strip treatment should be as a cold-pour construction below.

- C. Construction-Joint (Cold-Joint) Strips: Separate double L-type angles back to back with minimum  $\frac{1}{8}$ " –  $\frac{1}{4}$ " width between. Fill joint and area between strips with elastomeric joint filler. Match material, thickness, and color of divider strips and depth required for topping thickness indicated.
- D. Isolation-Joint Strips: Separate double L-type angles, positioned back to back with minimum  $\frac{1}{8}$ " –  $\frac{1}{4}$ " width between. Fill area between strips with elastomeric joint filler. Match material, thickness, and color of divider strips and depth required for topping thickness indicated.
- E. Accessory Strips: Match divider strip width, material, and color unless otherwise indicated. Use the following types of accessory strips if specified and detailed:
  - 1. Base-bead strips for exposed top of terrazzo base
  - 2. Edge-bead for exposed edges of terrazzo
  - 3. Nosings for terrazzo stair treads and landings

## 2.03 MISCELLANEOUS ACCESSORIES

- A. Strip Adhesive: 100% solids epoxy resin adhesive
  - 1. Use adhesive that has a VOC content of 50g / L or less when calculated according to 40 CFR 59, subpart D (EPA Method 24)
- B. Patching and Fill Material: Fill and selected aggregates as recommended and approved by NTMA Resin Systems
- C. Joint Compound: Joint filler, color to be selected by architect to match / compliment terrazzo
- D. Cleaner: Clean with a neutral cleaner with pH factor between 7 – 10 specifically designed for terrazzo

## 2.04 PRECAST TERRAZZO

- A. Terrazzo Cove Base:
  - 1. Precast Epoxy Terrazzo Cove Base: Type  $\frac{3}{4}$ " radius , 6" high.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates and areas, with terrazzo contractor present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions, including level tolerances, have been corrected.

### 3.02 PREPARATION

- A. Clean substrates of substances, including oil, grease, and curing compounds, that might impair terrazzo bond. Provide clean, dry, and neutral substrate for terrazzo application.
- B. Concrete Slabs:
  - 1. Provide sound concrete surface free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with terrazzo.
    - a. Prepare concrete mechanically by shot-blasting. Grinding of slab is not sufficient surface preparation. Surface preparation results should achieve a CSP3-CSP5 profile according to International Concrete Repair Institute Guideline No. 03732.
    - b. Repair or flatten damaged and deteriorated concrete according to Terrazzo Resin Systems Technical Bulletin 008 Substrate Leveling Requirements for Thin-Set Epoxy Terrazzo

- c. Repair cracks and non-expansion joints greater than  $\frac{1}{16}$ " (1.6 mm) wide according to Resin Systems Technical Bulletin 009 Crack Detailing and Joint Treatments Resin Thin-set Epoxy Terrazzo.
2. Verify that concrete substrates are visibly dry and free of moisture.
3. Moisture Testing:
  - a. Test for moisture according to ASTM F2170 (determining relative humidity in concrete slabs using in situ probes). Proceed with installation only after substrates have a maximum relative humidity measurement reading less than 80%. If relative humidity measurement reading is greater than or equal to 80%, moisture vapor primer (MVP) is recommended. Apply to terrazzo substrates according to resin systems MVP product data sheet.

### 3.03 EPOXY TERRAZZO INSTALLATION

- A. General:
  1. Comply with NTMA's written recommendations for terrazzo and accessory installation.
  2. Place, rough grind, grout, cure grout, fine grind, and finish terrazzo according to resin systems epoxy matrix product data sheet and NTMA's "Terrazzo Specifications and Design Guide".
  3. Ensure that matrix components and fluids from grinding operations do not stain terrazzo by reacting with divider and control-joint strips.
  4. Delay fine grinding until heavy trade work is complete and construction traffic through area is restricted unless general contractor or owner is prepared to protect the final finish.
- B. Thickness:  $\frac{3}{8}$ " (9.5 mm)
- C. Moisture Vapor Primer (MVP): Apply to terrazzo substrates according to resin systems moisture vapor primer product data sheet. Contractor to include since throughout since mil of existing membrane is unknown.
- D. Primer: Apply to terrazzo substrates according to resin systems primer product data sheet.
- E. **Flexible Reinforcing Membrane for cracks only.**
  1. Membrane application for isolated cracking. Route out all cracks and fill with 100% solids epoxy. Apply Iso-Crack Epoxy Membrane (spread at 40 mils thickness) across the crack allowing a minimum of 9 inches on either side. Embed fiberglass scrim into wet membrane and saturate with additional membrane..
- F. Strip Materials:
  1. Divider and Accessory Strips:
    - a. Install strips in adhesive setting bed without voids below strips or mechanically anchor strips as required to attach strips to substrate.
    - b. Control-Joint Strips: Separate double L-type angles, positioned back to back with minimum  $\frac{1}{8}$ " –  $\frac{1}{4}$ " width between. (single L-type angle, positioned adjacent to the joint is also acceptable.) Fill joint with 100% solids epoxy joint filler. Fill area between strips with elastomeric joint filler. Match material, thickness, and color of divider strips and depth required for topping thickness indicated.
      - i. Buried Control Joint: Fill saw cut concrete control joint with 100% solids epoxy filler. Apply Terroxy Iso-Crack Membrane 30-40 mils, embed 12" fiberglass fabric reinforcement.
      - ii. Eliminate double L and filler at control joints unless opening at saw cut is  $\frac{1}{4}$ ' or greater.
    - c. Construction-Joint (Cold-Joint) Strips: Separate double L-type angles, positioned back to back with minimum  $\frac{1}{8}$ " –  $\frac{1}{4}$ " width between. Fill joint and area between strips with elastomeric joint filler. Match material, thickness, and color of divider strips and depth required for topping thickness indicated.
    - d. Isolation-Joint Strips: Separate double L-type angles, positioned back to back with minimum  $\frac{1}{8}$ " –  $\frac{1}{4}$ " width between. Fill area between strips with elastomeric joint filler. Match material, thickness, and color of divider strips and depth required for topping thickness indicated.
- G. Placing Terrazzo:
  1. Mix epoxy matrix with chips and fillers in ratios directed by resin systems.

2. Trowel-apply terrazzo mixture over epoxy primer to provide a dense flat surface to top of divider strips. Allow to cure per Resin Systems recommendations before rough grinding.
- H. Rough Grinding: **Grind with 60 grit & 150 Diamond matrix stones until all terrazzo strips and marble chips are uniformly exposed.**
- I. Grouting:
  1. Cleanse floor with clean water and rinse.
  2. Remove excess rinse water by wet vacuum, dry, and fill voids with resin systems epoxy matrix or clear resin.
  3. Allow grout to cure. Grout may be left on terrazzo until other trades work is completed. **Remove excess grout with 150 grit diamonds and then follow with 200 grit diamonds.**
- J. Polishing: **Grinding with 400-grit diamonds and incremental increases up to 3000 grit diamonds until all grout is removed from surface.** Repeat rough grinding, grout coat, and polishing if large terrazzo chip voids exist after initial polishing. Produce surface with a minimum of 70% aggregate exposure.  
**Resulting surface to be such that no sealing is required.**

### 3.04 PRECAST TERRAZZO INSTALLATION

- A. Install precast units using method recommended by NTMA and manufacturer unless otherwise indicated.
- B. Seal joints between units with joint sealants.

### 3.05 CLEANING AND PROTECTION

- A. Cleaning: Remove grinding dust from installation and wash all surfaces with cleaner.
- B. The General Contractor shall protect terrazzo flooring from damage until project completion; any damage that does occur shall be the responsibility of the General Contractor to repair or replace to the satisfaction of the Architect.

END OF SECTION 09662

## **SECTION 09900 - PAINTING**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Painting and finishing of exposed exterior items and surfaces.
  - 2. Painting and finishing of exposed interior items and surfaces.

#### **1.02 DEFINITIONS**

- A. DFM (dry film mils): Thickness, measured in mils, of a coat of paint in the cured state.

#### **1.03 SUBMITTALS**

- A. Product Data: Manufacturer's technical data sheets for each coating.
- B. Color and Texture Samples:
  - 1. Provide for each coating system, color, and texture and applied to representative substrate samples.
    - a. Prepare samples to show bare, prepared surface and each successive coat.
    - b. Label each sample with coating name and color.
  - 2. Miscellaneous substrates: 12-by-12-inch hardboard.
  - 3. Concrete: 8-inch square samples.
  - 4. Wood: 8-inch square samples for surfaces; 8-inch long samples for trim.
  - 5. Metal: 5-by-7-inch samples.

#### **1.04 QUALITY ASSURANCE**

- A. Materials: All coating materials required by this section shall be provided by a single manufacturer, unless otherwise required or approved.
- B. Applicator: Firm with successful experience in painting work similar in scope to work of this project.
  - 1. Maintain throughout duration of the work a crew of painters who are fully qualified to satisfy requirements of the specifications.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials in manufacturer's original containers bearing coating name and color, material composition data, date of manufacture, legal notices if applicable, and mixing, thinning, and application instructions.

#### **1.06 PROJECT CONDITIONS**

- A. Apply coatings only under the following environmental conditions:
  - 1. Provide continuous ventilation and heating to prevent accumulation of hazardous fumes and to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and for 48 hours after application of finishes, or longer if required to obtain fuel cure as indicated by manufacturer's instructions.

## 1.07 COORDINATION

- A. Coordination: Where special coatings will be applied over shop coatings specified in other sections, coordinate work of such other sections to ensure that only approved, compatible primers are applied.

## 1.08 MAINTENANCE STOCK

- A. At time of completing application, deliver stock of maintenance material to the owner. Furnish not less than one properly labeled and sealed 1-gallon can of each type of finish coat of each color, taken from lots furnished for the work.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. The brand-name products listed in the schedule at the end of this section and made by the following manufacturer of Low or No V.O.C. paints are the basis of the contract documents:
  - 1. **Sherwin Williams Company - Health Spec.**
- B. Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered in accordance with standard substitution procedures:
  - 1. Benjamin Moore & Company - Pristine EcoSpec.
  - 2. The Glidden Company\* - Lifemaster.

### 2.02 PRODUCTS

- A. Colors:
  - 1. For multicoat systems, apply each coat using a successively darker tint or shade, unless approved otherwise.
  - 2. Top coat colors: To be determined by owner/architect.
- B. **Lead Content:**
  - 1. **Not more than 0.06 percent lead** by weight (calculated as lead metal) in the total nonvolatile content of the paint or the equivalent measure of lead in the dried film.
  - 2. Exception: Where permitted by applicable regulations.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Verify that surfaces and conditions are ready for work in accordance with coating manufacturer's recommendations.

### 3.02 SURFACE PREPARATION

- A. Apply coatings to surfaces that are clean and properly prepared in accordance with manufacturer's instructions. Remove dirt, dust, grease, oils, and foreign matter. Prepare surface for proper texture necessary to optimum coating adhesion and intended finished



appearance. Plan cleaning, preparation, and coating operations to avoid contamination of freshly coated surfaces.

1. Do not apply coatings to labels that identify equipment, fire-resistance ratings, etc.
2. Remove hardware, cover plates, and similar items before applying coatings.
3. Provide protection for non-removable items not scheduled for coating. After application of coatings, install removed items. Use only skilled workmen for removal and replacement of such items.
4. Protect surfaces not scheduled for coating. Clean, repair, or replace to the satisfaction of the Engineer any surfaces inadvertently spattered or coated.
5. Allow substrate to dry thoroughly. Test for moisture in accordance with coating manufacturer's recommendations before applying coatings.
6. Intricate fabricated shapes may be pickled in lieu of hand or power tool cleaning.
7. Before hand or power tool cleaning, remove visible oil, grease, soluble welding residue, and salts by solvent cleaning. After hand or power tool cleaning, re-clean surfaces if necessary.
8. Before touching up coatings damaged by handling or welding, re-prepare damaged surfaces.

### **3.03 MIXING AND THINNING**

- A. Remove and discard any skin formed on surface of coatings in containers. Discard any containers where skin comprises 2 percent or more of the remaining material. Do not add thinner except as specifically recommended (not merely permitted) by the coating manufacturer for proper coating application under the circumstances prevailing at the project site when application equipment recommended by the coating manufacturer is employed. Use only the quantities and the types of thinner recommended.

### **3.04 APPLICATION**

- A. General:
  1. Apply coatings in accordance with coating manufacturer's instructions and using application method best suited for obtaining full, uniform coverage of surfaces to be coated.
  2. Apply each coat to achieve the dry film thickness per coat recommended by the coating manufacturer. Application rates in excess of those recommended and fewer numbers of coats than specified will not be accepted.
  3. Completed coatings shall be free of defects such as runs, sags, variations in color, lap or brush marks, holidays, and skips.
  4. Apply coatings according to the schedule at the end of this section and as otherwise indicated. Coat all similar surfaces not specifically mentioned unless specifically exempted.
  5. Coat front and back of miscellaneous items such as covers, access panels, and grilles. Apply fully finish coats behind movable items of furniture and equipment before installation. Apply prime coat only behind non-movable items of furniture and equipment before installation.
  6. Sand gloss coats before applying subsequent coatings.
- B. Remove coatings not in compliance with this specification, re-clean and re-prepare surfaces as specified, and apply coatings to comply with the contract documents.
- C. Scheduling:
  1. Apply first coat of material to properly prepared surfaces without delay.
    - a. Apply successive coats within the time limits recommended by the manufacturer.

### 3.05 PRIME COATS

- A. General:
  - 1. Field apply bottom coats scheduled except where the contract documents require shop coating of ferrous metals.
  - 2. Ferrous metals that have not been shop primed shall be field primed promptly after arrival at the site or shall be stored away from the effects of weather.
  - 3. Re-prepare and retouch damaged prime coats using approved, compatible primer.
- B. Primers for Wood and Wood Products:
  - 1. Apply first coat to wood upon receipt at the site and before wood is exposed to sun or rain.
  - 2. Back-prime concealed surfaces and cut edges of exterior wood trim prior to installation.

### 3.06 FINISH COATS

- A. Number of Coats and Minimum Coating Thickness:
  - 1. Apply not less than the number of coats indicated.
  - 2. Apply each coat to achieve not less than the dry film thicknesses indicated per coat.
  - 3. Apply additional coats at no additional cost to the owner when necessary to achieve complete hiding, uniform texture, or uniform sheen and appearance.

### 3.07 CLEANING AND PROTECTION

- A. Cleaning:
  - 1. Clean work area on a daily basis; dispose of spent materials and empty containers. If requested, turn over the Engineer all empty coatings containers used during the course of each day.
  - 2. Remove all trace of coatings from adjacent surfaces not scheduled to be coated. Remove by appropriate methods that do not damage surfaces.
- B. Protection:
  - 1. Protect work against damage until fully cured. Provide signs identifying wet surfaces until surfaces are adequately cured.
  - 2. Shortly before final completion of the project, examine surfaces for damage to coatings and restore coatings to new, undamaged condition.
  - 3. Touch-up of minor damage will be acceptable where result is not visibly different from surrounding surfaces. Where result is different either in color, sheen, or texture, recoat entire surface.

### 3.08 SCHEDULE OF COATINGS FOR INTERIOR NONTRAFFIC SURFACES

- A. **Gypsum Wallboard: Walls.**
  - 1. Latex acrylic, Eggshell finish.
    - a. Bottom coat: Airless High-Build Flat Interior Primer / Finish; 1.1DFM.
    - b. Intermediate coat: Same as top coat.
    - c. Top coat: High Performance Waterborne Acrylic Eggshell Enamel (see paint schedule)
- B. **Wood: Doors & frames, windows, ceiling, trim, display cabinet, shelving.**
  - 1. Varnish, satin
    - a. Stain: Interior Oil Wood Finishing Stain, (color to be selected).
    - b. Bottom and intermediate coats: WoodPride 1908 Interior Polyurethane Gloss Varnish.
    - c. Top coat: Interior Polyurethane Satin Varnish.

**3.09 SCHEDULE OF COATINGS FOR EXTERIOR NONTRAFFIC SURFACES**

- A. **Fiber-Cement: Lap siding & trim;**
  - 1. Acrylic / Latex, flat.
    - a. Bottom coat: Same as top coat.
    - b. Top coat: Exterior Acrylic Flat Finish; 1.5 DFM.  
(Siding & trim color shall paint over the fiber-cement see schedule)
- B. **Fiber-Cement: Vertical siding & trim;**
  - 1. Acrylic / Latex, flat.
    - a. Bottom coat: Same as top coat.
    - b. Top coat: Exterior Acrylic Flat Finish; 1.5 DFM.  
(Siding & trim color shall paint over the fiber-cement see schedule)
- C. Plywood Bead board and Batten Strips
  - a. Bottom coat: Same as top coat.
  - b. Top coat: Exterior Acrylic Flat Finish; 1.5 DFM.

**3.10 SCHEDULE OF PAINT COLORS**

SEE SHEET A1.9.

**END OF SECTION 09900**

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## **SECTION 10100 - VISUAL DISPLAY BOARDS**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
1. Tack boards, see Detail on sheet A3.5 and Section 06200-Finish Carpentry.

#### **1.02 SUBMITTALS**

- A. Product Data:
1. Manufacturer's technical data and Manufacturer's installation and breaking-in instructions.
  2. Submit shop drawings of Display Case with Oak frame, tack board, hardware, and glazing.

#### **1.03 PROJECT CONDITIONS**

- A. Environmental Requirements:
1. Install boards only when interior air and substrates have reached equilibrium moisture and temperature approximating that of normal occupied conditions.

### **PART 2 – PRODUCTS**

#### **2.01 MATERIALS**

- A. Natural Cork Tack Boards: 4-30"x72" Display Units;
1. Seamless, ¼-inch-thick cork sheet, laminated to ¼-inch-thick hardboard.
  2. Paint cork sheets, color to be determined with submittal.
- B. Wood Trim: See Section 06200-Finish Carpentry and Section 09900-Painting for stain and varnish.
- C. Adhesives: As recommended by manufacturer for the materials and substrates to be joined.
- D. Felt Seal: ¼" wide continuous felt strip adhered to the sides and bottom face of the Display Case Cedar inner frame to seal out dust when in contact with the Display Case door in the closed position.
- E. Non-glare Polycarbonate Plastic sheeting

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that substrate surfaces to receive units are true and plumb. Correct inadequate surfaces before installation of boards.
- B. Verify that moisture and temperature levels of substrate and environment have stabilized.

#### **3.02 INSTALLATION**

- A. General:
1. Install off-site fabricated units as instructed by manufacturer.

2. Provide any necessary installation accessories, including blocking, backing, anchors, etc.
3. Join parts forming neatly fitted hairline joints.

**3.03 PROTECTION**

- A. Cover completed work with building paper or other covering recommended by manufacturer.
- B. Protect boards from damage until substantial completion.

**END OF SECTION 10100**

# SECTION 102113 - STAINLESS STEEL TOILET COMPARTMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Stainless steel toilet compartment partitions floor mounted, overhead braced for following applications:
    - a. Toilet enclosures.
    - b. Urinal screens.
- B. Related Requirements:
  - 1. Division 03 Section "Cast in Place Concrete" for compartment anchorage to concrete substrates.
  - 2. Division 04 Section "Unit Masonry" for compartment anchorage to masonry substrates.
  - 3. Division 06 Section "Rough Carpentry" for compartment anchorage to frame walls.

### 1.2 REFERENCES

- A. ASTM International (ASTM):
  - 1. ASTM A 240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - 2. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 3. ASTM A 743/A 743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
  - 4. ASTM B 86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
  - 5. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 6. ASTM B 221/B 221M - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
- B. International Code Council (ICC)/American National Standards Institute (ANSI):
  - 1. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities, as applicable to toilet compartments designated as accessible.
- C. United States Department of Justice:
  - 1. ADA - Americans with Disabilities Act, Excerpt from 28 CFR Part 36 - ADA Standards for Accessible Design.

### 1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for each type of product indicated. Include fabrication details, description of materials and finishes.
  - 1. Product Test Reports: When requested by Architect, submit documentation by qualified independent testing agency indicating compliance of products with requirements.
- B. Shop Drawings: Include overall product dimensions, floor plan, elevations, sections, details, and attachments to other work. Include choice of options with details.
- C. Samples for Selection: Furnish samples of manufacturer's full range of finishes for initial selection.
- D. Samples for Verification: Furnish physical sample of material in selected finish.
  - 1. Size: 2 by 2 inch (52 by 52 mm) minimum, in type of finish specified.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

**1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance and cleaning instructions.

**1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of toilet compartments.
- B. Installers Qualifications: Experienced Installer regularly engaged in installation of toilet compartments for minimum 3 years.
- C. Source Limitations: Obtain toilet compartment components and accessories from single manufacturer.
- D. Accessibility Requirements: Comply with requirements of ICC/ANSI 117.1, and with requirements of authorities having jurisdiction.
- E. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 0.
  - 2. Smoke-Developed Index: 0.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Do not deliver toilet compartments to site until building is enclosed and HVAC systems are in operation.
  - 1. Deliver toilet compartments in manufacturer's original packaging.
  - 2. Store in an upright condition.

**1.8 WARRANTY**

- A. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship during the following period after substantial completion:
  - 1. Stainless Toilet Partitions: Against rust-out: 15 years.
  - 2. Stainless Steel Hardware: Lifetime.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. **The Mills Company, Marion.** Website [www.bradleycorp.com](http://www.bradleycorp.com).
- B. **Hadrian Manufacturing Inc.** Website [www.hadrian-inc.com](http://www.hadrian-inc.com)
- C. **Metpar Corporation** Website [www.metpar.com](http://www.metpar.com)

**2.2 MATERIALS**

- A. Stainless Steel Sheet: A 666, 300 series commercial stainless steel sheet suitable for exposed applications. Provide smooth material, without creases or ripples.
  - 1. Provide with leather grain or embossed finish.
- B. Stainless Steel Castings: ASTM A 743/A 743M.
- C. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.
- D. Aluminum: ASTM B 221/B 221M.

**2.3 STAINLESS STEEL TOILET COMPARTMENTS**

- A. Toilet Compartment Type:
  - 1. Overhead braced, floor anchored.
- B. Urinal Screen Style:
  - 1. Government-flanged with Wing Bracket:
    - a. Overhead braced, floor anchored
- C. Door, Panel, and Pilaster Construction, General: Form edges with interlock to provide watertight fit without crown molding. Welded corners and finish smooth.



1. Provide exposed surfaces free of pitting, visible seams and fabrication marks, stains, telegraphing of core material, or other imperfections.
  2. Core Material: Manufacturer's standard sound-deadening, water resistant honeycomb in thickness required to provide finished thickness for doors, panels and pilasters.
- D. Door Construction: 1 inch thick, constructed from 0.0313 inch/22 ga stainless steel.
1. Provide each door with internal 0.0625 inch/16 ga and 0.0781 inch/14 ga welded reinforcements at top and bottom hinge locations, with factory installed concealed true gravity cam hinges.
  2. Provide pre-punched hole to permit field installation of ADA-compliant concealed slide latch.
- E. Panel Construction: 1 inch thick, constructed from 0.0313 inch/22 ga stainless steel.
1. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
- F. Pilaster Construction: 1 1/4 inch (32 mm) thick, constructed 0.048 inch/18 stainless steel.
1. Provide pilaster with internally welded bracket suitable to accept minimum 3 inch (76 mm) long, 5/16 inch stainless steel hex bolt for leveling.
- G. Headrail: Extruded anodized aluminum headrail with anti-grip profile. Provide fasteners for attachment to pilaster and stainless steel brackets to secure to wall.
- H. Shoes: 4 inches (102 mm) high minimum, Type 304 stainless steel with No. 4 satin brushed finish. Secured to the floor with tamper-resistant screws.
- I. Urinal-Screen Construction: Matching toilet compartment panel construction
- J. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters.
- K. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

## 2.4 HARDWARE

- A. Hardware, Heavy Duty: Manufacturer's heavy-duty stainless steel castings, including stainless steel tamper-resistant fasteners:
1. Hinges: Heavy duty, Self-closing continuous spring-loaded type, adjustable to hold doors open at any angle up to 90 degrees, with emergency access by lifting door. Mount with stainless steel through-bolts.
  2. Latch and Keeper: Surface mounted slide latch with flat rubber-faced combination door strike and keeper, with provision for emergency access, meeting requirements for accessibility at accessible compartments.
  3. Coat Hook: Combination hook and rubber-tipped stop, sized to prevent door from hitting compartment-mounted accessories. Provide wall bumper where door abuts wall. Provide formed L-shaped hook without stop at outswing doors. Mount with stainless steel through-bolts.
  4. Door Pull: Provide **door pulls** on all doors, including handicapped compartments (for outer side of non-handicapped compartment doors and both sides of handicap compartments): Suitable for use by handicapped persons..

## 2.5 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at bottoms of posts. Provide caps, shoes, and covers at posts to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 26-inch- (660-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging

doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine work area to verify that measurements, substrates, supports, and environmental conditions are in accordance with manufacturer's requirements to allow installation.
  - 1. Proceed with installation once conditions meet manufacturer's requirements.

### **3.2 INSTALLATION**

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
- B. Install toilet partitions and screens in spaces with operating, temperature controlled HVAC systems. Shield partitions and screens from direct sunlight.
- C. Clearances: Install with clearances indicated on Drawings. Where clearances are not indicated, allow maximum 1/2 inch (13 mm) between pilasters and panels, and 1 inch (25 mm) between panels and walls.
- D. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

### **3.3 ADJUSTING**

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 15 degrees from closed position when unlatched. Set hinges on out-swinging doors to hold doors open approximately 10 degrees from closed position when unlatched.

### **3.4 FINAL CLEANING**

- A. Remove packaging and construction debris and legally dispose of off-site.
- B. Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

## **END OF SECTION**

# SECTION 102113 - STAINLESS STEEL TOILET COMPARTMENTS

## PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Stainless steel toilet compartment partitions floor mounted, overhead braced for following applications:
    - a. Toilet enclosures.
    - b. Urinal screens.
- B. Related Requirements:
  - 1. Division 03 Section "Cast in Place Concrete" for compartment anchorage to concrete substrates.
  - 2. Division 04 Section "Unit Masonry" for compartment anchorage to masonry substrates.
  - 3. Division 06 Section "Rough Carpentry" for compartment anchorage to frame walls.

### 1.2 REFERENCES

- A. ASTM International (ASTM):
  - 1. ASTM A 240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - 2. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 3. ASTM A 743/A 743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
  - 4. ASTM B 86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
  - 5. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 6. ASTM B 221/B 221M - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
- B. International Code Council (ICC)/American National Standards Institute (ANSI):
  - 1. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities, as applicable to toilet compartments designated as accessible.
- C. United States Department of Justice:
  - 1. ADA - Americans with Disabilities Act, Excerpt from 28 CFR Part 36 - ADA Standards for Accessible Design.

### 1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for each type of product indicated. Include fabrication details, description of materials and finishes.
  - 1. Product Test Reports: When requested by Architect, submit documentation by qualified independent testing agency indicating compliance of products with requirements.
- B. Shop Drawings: Include overall product dimensions, floor plan, elevations, sections, details, and attachments to other work. Include choice of options with details.
- C. Samples for Selection: Furnish samples of manufacturer's full range of finishes for initial selection.
- D. Samples for Verification: Furnish physical sample of material in selected finish.
  - 1. Size: 2 by 2 inch (52 by 52 mm) minimum, in type of finish specified.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

**1.5 CLOSEOUT SUBMITTALS**

- A. Maintenance and cleaning instructions.

**1.6 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of toilet compartments.
- B. Installers Qualifications: Experienced Installer regularly engaged in installation of toilet compartments for minimum 3 years.
- C. Source Limitations: Obtain toilet compartment components and accessories from single manufacturer.
- D. Accessibility Requirements: Comply with requirements of ICC/ANSI 117.1, and with requirements of authorities having jurisdiction.
- E. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 0.
  2. Smoke-Developed Index: 0.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Do not deliver toilet compartments to site until building is enclosed and HVAC systems are in operation.
1. Deliver toilet compartments in manufacturer's original packaging.
  2. Store in an upright condition.

**1.8 WARRANTY**

- A. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship during the following period after substantial completion:
1. Stainless Toilet Partitions: Against rust-out: 15 years.
  2. Stainless Steel Hardware: Lifetime.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. **The Mills Company, Marion.** Website [www.bradleycorp.com](http://www.bradleycorp.com).
- B. **Accurate Partitions Corp.** Website [www.accuratepartitions.com](http://www.accuratepartitions.com)
- C. **Metpar Corporation** Website [www.metpar.com](http://www.metpar.com)

**2.2 MATERIALS**

- A. Stainless Steel Sheet: A 666, 300 series commercial stainless steel sheet suitable for exposed applications. Provide smooth material, without creases or ripples.
1. Provide with leather grain or embossed finish.
- B. Stainless Steel Castings: ASTM A 743/A 743M.
- C. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.
- D. Aluminum: ASTM B 221/B 221M.

**2.3 STAINLESS STEEL TOILET COMPARTMENTS**

- A. Toilet Compartment Type:
1. Overhead braced, floor anchored.
- B. Urinal Screen Style:
1. Government-flanged with Wing Bracket:
    - a. Overhead braced, floor anchored
- C. Door, Panel, and Pilaster Construction, General: Form edges with interlock to provide watertight fit without crown molding. Welded corners and finish smooth.

1. Provide exposed surfaces free of pitting, visible seams and fabrication marks, stains, telegraphing of core material, or other imperfections.
  2. Core Material: Manufacturer's standard sound-deadening, plywood or solid particle board in thickness required to provide finished thickness for doors, panels and pilasters.
- D. Door Construction: 1 inch thick, constructed from 0.0313 inch/22 ga stainless steel.
1. Provide each door with internal 0.0625 inch/16 ga and 0.0781 inch/14 ga welded reinforcements at top and bottom hinge locations, with factory installed concealed true gravity cam hinges.
  2. Provide pre-punched hole to permit field installation of ADA-compliant concealed slide latch.
- E. Panel Construction: 1 inch thick, constructed from 0.0313 inch/22 ga stainless steel.
1. Grab-Bar Reinforcement: provided by solid core.
- F. Pilaster Construction: 1 1/4 inch (32 mm) thick, constructed 0.048 inch/18 stainless steel.
1. Provide pilaster with internally welded bracket suitable to accept minimum 3 inch (76 mm) long, 5/16 inch stainless steel hex bolt for leveling.
- G. Headrail: Extruded anodized aluminum headrail with anti-grip profile. Provide fasteners for attachment to pilaster and stainless steel brackets to secure to wall.
- H. Shoes: 4 inches (102 mm) high minimum, Type 304 stainless steel with No. 4 satin brushed finish. Secured to the floor with tamper-resistant screws.
- I. Urinal-Screen Construction: Matching toilet compartment panel construction
- J. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters.
- K. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

## 2.4 HARDWARE

- A. Hardware, Heavy Duty: Manufacturer's heavy-duty stainless steel castings, including stainless steel tamper-resistant fasteners:
1. Hinges: Heavy duty, Self-closing continuous spring-loaded type, adjustable to hold doors open at any angle up to 90 degrees, with emergency access by lifting door. Mount with stainless steel through-bolts.
  2. Latch and Keeper: Surface mounted slide latch with flat rubber-faced combination door strike and keeper, with provision for emergency access, meeting requirements for accessibility at accessible compartments.
  3. Coat Hook: Combination hook and rubber-tipped stop, sized to prevent door from hitting compartment-mounted accessories. Provide wall bumper where door abuts wall. Provide formed L-shaped hook without stop at outswing doors. Mount with stainless steel through-bolts.
  4. Door Pull: Provide **door pulls** on all doors, including handicapped compartments (for outer side of non-handicapped compartment doors and both sides of handicap compartments): Suitable for use by handicapped persons..

## 2.5 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at bottoms of posts. Provide caps, shoes, and covers at posts to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 26-inch- (660-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging

doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine work area to verify that measurements, substrates, supports, and environmental conditions are in accordance with manufacturer's requirements to allow installation.
  - 1. Proceed with installation once conditions meet manufacturer's requirements.

### **3.2 INSTALLATION**

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
- B. Install toilet partitions and screens in spaces with operating, temperature controlled HVAC systems. Shield partitions and screens from direct sunlight.
- C. Clearances: Install with clearances indicated on Drawings. Where clearances are not indicated, allow maximum 1/2 inch (13 mm) between pilasters and panels, and 1 inch (25 mm) between panels and walls.
- D. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

### **3.3 ADJUSTING**

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 15 degrees from closed position when unlatched. Set hinges on out-swinging doors to hold doors open approximately 10 degrees from closed position when unlatched.

### **3.4 FINAL CLEANING**

- A. Remove packaging and construction debris and legally dispose of off-site.
- B. Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

## **END OF SECTION**

## SECTION 10425 - SIGNS

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Interior aluminum plaques and aluminum letters.
- B. Provide signage as indicated on the signage schedules.

#### 1.02 SUBMITTALS

- A. Product Data: Submit for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Shop drawings:
  - 1. Show fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Metal Custom Room Signs: Products of the following manufacturers or approved equal, provided they comply with requirements of the contract documents, will be among those considered acceptable (colors shall match those specified):
  - 1. AOA Signs, Inc. (336) 679-3344
  - 2. Sign-A-Rama\*; (919) 773-8014
  - 3. Best Manufacturing Co.
  - 4. Accusign, Inc.; (919) 872-2008 or approved equal.

#### 2.02 RAISED LETTER SIGNS

- A. Base Material: **Aluminum plate** with brushed and polished mill finish (Sign Plaques):
  - 1. Total Thickness: ½ and 1/4 inch.
  - 2. Height: 1.5 to 7.5" inches.
  - 3. Edges: Square room title with male/female caricatures on top.
- B. Raised Character Size and Style: Routed and painted aluminum:
  - 1. Comply with applicable provisions of 2012 NC Building Code, Chapter 11, Accessibility, including International Symbol of Accessibility (restrooms, Family), and ANSI/ICC A117.1, including Tactile Characters and Braille.
  - 2. Character Color: Black
  - 3. Character Thickness: 1/32 inch minimum raised letters.
  - 4. Height: 5/8 inch minimum.
  - 5. Edges: Square.
  - 6. Character Font: Helvetica.
  - 7. Character Case: Upper case only.

#### 2.03 INDIVIDUAL METAL LETTERS

- A. Material: **Aluminum plate** with brushed mill finish:
  - 1. Thickness: 1/4 inch.
  - 2. Height: see drawings.
  - 3. Edges: Square.
- B. Character Style:
  - 1. Character Font: Helvetica.
  - 2. Character Case: Upper case only and solid arrows.
  - 3. Mount individual letters on post.

**2.04 CEILING MOUNTED SIGN-cable suspended**

- A. Material: **Aluminum plate** with brushed mill finish:
1. Thickness: 1/4 inch.
  2. Height: 10 inches.
  3. Edges: Square.
- B. Character Style:
1. Character Font: Helvetica.
  2. Character Case: Upper case only and solid arrows.

**2.05 ACCESSORIES**

- A. Mounting Hardware: Stainless steel or aluminum screws and double sided tape, permanent adhesive.
- B. Provide surface mounting for individual interior letters; 2-sets on the Beadboard panels.

**2.06 SIGN SCHEDULE:**

- A. Sign custom aluminum plaques shall read as follows:

<u>Location/Room No.</u>	<u>Copy</u>	<u>Quantity</u>
See plan	FAMILY ROOM**	2
See plan	KNOCK BEFORE ENTRY	2
See plan	WOMEN *	4
See plan	MEN *	2
See plan	Fire extinguisher is located inside	1
See plan	STORAGE	1
See plan	ELECTRICAL	1
See plan	JANITOR	1

\* Provide the male or female caricature at signs noted above with aluminum figure, mount to wall 2" from the doorway or corners.

\*\* Provide both caricatures (male & female) at signs noted above with aluminum figure, mount to wall 4" from the door opening.

**PART 3 - EXECUTION****3.01 INSTALLATION**

- A. General:
1. Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
  2. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
  3. Install project sign in locations indicated and using mounting methods indicated.
- B. Aluminum Plaques and Individual Letters:
1. Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated (stainless steel or aluminum screws and double sided tape).
  2. Concealed mounting: Use double-sided foam tape and mount plaques at 60" above the floor adjacent to doors 2" from the latch side of the jamb for plaques and center individual letters as indicated.

**3.02 CLEANING AND PROTECTION**

- A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

**END OF SECTION 10425**



## **SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES**

### **PART 1 - GENERAL**

#### **1.01 SUMMARY**

- A. Fire extinguishers and cabinet located in rooms as shown on drawings.

#### **1.02 SUBMITTALS**

- A. Product Data.
- B. Operating and Maintenance Data.

#### **1.03 QUALITY ASSURANCE**

- A. Labels: Provide only fire extinguishers which are listed and labeled by Underwriters Laboratories Inc., or Factory Mutual System.

### **PART 2 - PRODUCTS**

#### **2.01 FIRE EXTINGUISHERS**

- A. Manufacturers: Products of the following manufacturers or approved equal, provided they comply with requirements of contract documents, will be among those considered acceptable:
  - 1. Fire extinguishers:
    - a. Amerex Corporation.
    - b. Buckeye Fire Equipment Co.
    - c. Fire-End & Croker Corporation.
    - d. General Fire Extinguisher Corporation.
    - e. Walter Kidde, The Fire Extinguisher Co.
- B. Fire Extinguishers:
  - 1. Rating: 4A:60B:C.
  - 2. Type: Multipurpose dry chemical (ammonium phosphate).
    - a. Stored pressure type.
  - 3. Cabinet mounted.

#### **2.02 CABINETS AND CABINET ACCESSORIES**

- A. Manufacturers: Products of the following manufacturers or approved equal, provided they comply with requirements of contract documents, will be among those considered acceptable:
  - 1. Cabinets and accessories:
    - a. J.L. Industries.
    - b. Larsen's Manufacturing Company.
    - c. Potter-Roemer Division/Smith Industries, Inc.
    - d. Samson Metal Products, Inc.
- B. Cabinets:
  - 1. To house one extinguisher.
  - 2. Size: Inside minimum box dimensions: 24"h. x 9"w. x 6"d.; 4" deep into wall.]
  - 3. Style: Semi-recessed mounted, protruding not more than 1-1/2 inches from face of wall.
    - a. Rolled edge trim.
  - 4. Single flat door.
    - a. Frameless acrylic.
      - 1. Clear.
    - b. Door material: Aluminum, satin anodized.

- c. Surface mounted door handle, finished to match door.
  - d. Friction or roller catch.
- 5. Trim (box flange or frame): Aluminum, satin anodized.
  
- 6. Manufacturer's standard vertical lettering identifying contents of cabinet.
  - a. Letters silk screen painted.
  - b. Letter color: Red.
- 7. Box: Aluminum sheet.
- C. Hinges: Provide hinges for each door; concealed or continuous type; allow full 180 degree opening of door.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Prepare openings for recessed cabinets.

### **3.02 INSTALLATION**

- A. Perform installation in accordance with the manufacturer's instructions except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
- B. Install cabinets at locations indicated.
- C. Install with door handle not more than 48" above finish floor per the 2012 NC Building Code, Chapter 11, Accessibility, and ICC A117.1.

## **END OF SECTION 10522**

## SECTION 10810 - TOILET ACCESSORIES

### PART 1 - GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Paper Towel Dispenser and waste receptacles.
  - 2. Soap Dispenser
  - 3. Mirrors (2-year warranty).
  - 4. Grab bars.
  - 5. Toilet Paper Dispenser.
  - 6. Sanitary Napkin Disposal Units.
  - 7. Combination utility shelf / mop and broom holders.
  - 8. Hand Dryers.

#### 1.02 SUBMITTALS

- A. Product Data.
- B. Shop Drawings.
- C. Manufacturer's Instructions.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. For each distinct type of toilet accessory, provide accessories fabricated by a single manufacturer.
- B. All model numbers specified are products of **Bobrick\* Washroom Equipment, Inc.**
- C. Only equivalent products of the following other manufacturers complying with the following **Bobrick Washroom Equipment, Inc.** provided they comply with requirements of the contract documents or approved equal, will be considered acceptable:
  - 1. A & J Washroom Accessories
  - 2. American Specialties, Inc. (ASI)

#### 2.02 TOILET ACCESSORIES

- A. Toilet Paper Dispensers:
  - 1. Basis of design: Model B-2892 Bobrick.
    - a. Classic series surface-mounted twin jumbo roll toilet tissue dispenser, holds 2-rolls 10" diameter, sliding access panel.
- B. Automatic Soap Dispenser
  - 1. Basis of design: Model U135EA, AJW.
- C. Grab Bar 36:
  - 1. Basis of design: B-6806.99 - 36".
    - a. Stainless steel, nonslip gripping surface and concealed mounting, Model B-5806.99, by Bobrick.
- D. Grab Bar 42:
  - 1. Basis of design: B-6806.99 - 42".
    - a. Stainless steel, nonslip gripping surface and concealed mounting, Model B-5806.99, by Bobrick.
- E. Grab Bar 18:
  - 1. Basis of design: B-5806.99 - 18".
    - a. Stainless steel, nonslip gripping surface and concealed mounting, Model B-5806.99, by Bobrick.
- F. Recessed Sanitary Napkin Disposal:

1. Basis of design: ASI 0473-1.
  - a. Stainless steel.
  - b. Single end compartments.
- G. Partition Mounted Sanitary Napkin Disposal:
  1. Basis of design: ASI 0472-1.
    - a. Stainless steel.
    - b. Serves 2-compartments.
- H. Recessed Towel Dispenser and Waste Receptacle: 600 C-fold paper towels, 18 gallon waste capacity bottom cabinet, locking doors/cabinets, recessed flush with wall, stainless steel; no sharp edges, seamless wall flanges, concealed piano hinges.
  1. Product: B-43944 manufactured by Bobrick.
  2. LinerMate accessory to be included part-number 43944-134
- J&K. Mirrors: Stainless steel framed, ¼" thick float glass mirror (provide a 2-year warranty from mirrored glass from staining or delaminating and frame rusting);
  1. Sizes: 18' x 30" and 18" x 60".
  2. Frame: Radius edges, with mitered and welded and ground corners, and tamperproof hanging system; burr free satin finish.
  3. Product: Model B-2908 1830 and B-2908 1860 manufactured by Bobrick.
- L. Hand Dryers:
  1. Basis of design: Surface mounted sensor hand dryer "Xlerator" Model XL-SB, by Excel
    - a. Automatic hand dryer, stainless steel finish.
    - b. Mount 48" above finish floor.
- M. Combination Utility Shelf/Mop and Broom Holder:
  1. Basis of design: B-223 x 24" long.
    - a. Stainless steel with 3 mop holders.
    - b. With 3-spring loaded rubber cam mop/broom holders, Model B-223x24, by Bobrick.

## 2.03 MATERIALS

- A. Stainless steel: Type-304 stainless steel with satin finish, typical for all accessories.
- B. Mounting Devices and Fasteners: Provide toilet accessory manufacturer's recommended items for substrates and conditions indicated.

## 2.04 FABRICATION

- A. Manufacturer's Trademarks and Model Numbers: Permanently affix manufacturer's name and model number to unexposed surface of accessory.

# PART 3 - EXECUTION

## 3.01 INSTALLATION

- A. Perform installation in accordance with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
- B. Accessories Installed for Use by Handicapped Persons: Install as indicated on drawings and in accordance with the 2012 NC Building Code, Chapter 11, Accessibility, and ANSI A117.1.

# END OF SECTION 10810

**DIVISION 15A - PLUMBING**

15010	Basic Plumbing Requirements
15140	Hangers and Supports
15190	Plumbing Identification
15250	Plumbing Piping Insulation
15410	Plumbing Piping
15430	Plumbing Specialties
15440	Plumbing Fixtures
15450	Water Heaters



**SECTION 15010 - BASIC PLUMBING REQUIREMENTS****PART I - GENERAL**

## 1.1 GENERAL CONDITIONS

- A. The stipulations and conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", hereinbefore set forth, shall apply to this and the other Sections of Division 15A.

## 1.2 GENERAL REQUIREMENTS

- A. The General Requirements hereinafter listed apply to the Plumbing Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

## 1.3 ALTERNATES

- A. Carefully examine all alternates at the back of this specification to determine if any work described under the Plumbing Section will be affected thereby.

## 1.4 INTENT

- A. The intent of these drawings and specifications are to describe the installation of a complete, fully adjusted and operational system. Therefore, any items shown on drawings and not specifically called for in the specifications, or any items specified and not specifically indicated or detailed on the drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Plumbing Contractor at his own expense.

## 1.5 DEFINITIONS

- A. The Plumbing Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the plumbing systems. All items of equipment are specified in the singular; however, the Plumbing Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

## 1.6 VISIT TO THE SITE

The Plumbing Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

## 1.7 REGULATORY REQUIREMENTS

- A. All work under this Section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern. The Plumbing Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

## 1.8 PERMITS AND FEES

### A. NA

## 1.9 DRAWINGS AND SPECIFICATIONS

- A. The Plumbing Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between General Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Plumbing Contractor shall figure on the most expensive of the items in conflict.
- B. The Plumbing Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. The Plumbing Contractor shall not under any circumstances scale drawings for the location of equipment. The Plumbing Contractor shall verify the locations of all utility services.
- C. The Plumbing Contractor shall keep at least one set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

## 1.10 SUPERVISION

- A. The Plumbing Contractor performing the work specified shall be required to employ a qualified Superintendent or Foreman to continuously supervise the installation of their work, with authorization to act as agent. Contractors: He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels, and locating chases, openings, hangers, inserts, sleeves, etc.

## **PART II - PRODUCTS**

### 2.1 STANDARD PRODUCTS

- A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

### 2.2 SUBMITTAL

- A. The Plumbing Contractor shall submit, for approval, detailed shop drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Plumbing Contractor has in his possession the approved shop drawing for the particular material or equipment. The Plumbing Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.
- B. Submitted material shall be properly labeled indicating specific service for which material or equipment to be used, section and article number of specifications governing, Contractor's name and name of job.



**SECTION 15140 - HANGERS AND SUPPORTS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Hangers and Supports for Plumbing Systems Piping and Equipment.

**PART II - PRODUCTS**

## 2.1 PIPE HANGERS AND SUPPORTS

- A. Hangers: Galvanized carbon steel, adjustable, clevis
- B. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- C. Vertical Support: Steel riser clamp
- D. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- E. Shield for Insulated Piping 2 Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- F. Sheet metal saddles must be  $\frac{1}{2}$  the circumference of the insulation, turned up or rounded at the corners to avoid damage to the vapor barrier.

## 2.2 HANGER RODS

- A. Galvanized Steel Hanger Rods: Threaded both ends or continuous threaded.

## 2.3 FLASHING

- A. Metal Flashing: 26 gauge galvanized steel
- B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- G. Flashing shall be compatible with the roofing material and be coordinated with the General Contractor.

## 2.4 SLEEVES

- A. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe
- B. Fire Stopping Insulation: Glass fiber type, non-combustible
- C. Caulk: Fire Barrier type sealant

## 2.5 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized

- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts
- C. Washers: ASTM F 844, steel, plain, flat washers
- D. Grout: ASTM C 1107, Grade B, non-shrink, non-metallic
  - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic cement-type grout that is non-staining, non-corrosive, non-gaseous and is recommended for both interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5MPa), 28-day compressive strength
  - 3. Water: Potable
  - 4. Packaging: Pre-mixed and factory-packaged

2.6 ATTACHMENTS

- A. Mechanical Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over four (4) inches thick.
- B. Weld: Type 22
- C. Beam clamps: Types 20, 21, 28 or 29
- D. Wood: Wood screws or lag bolts

**PART III - EXECUTION**

3.1 HANGERS AND SUPPORTS INSTALLATION

- A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints ,and at changes in direction of piping.
- C. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers and other accessories.
- D. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- E. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Support horizontal piping as follows:

<u>PIPE SIZE</u>	<u>HANGER SPACING</u>	<u>MAXIMUM DIAMETER</u>
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
Waste Pipe	5'-0"	3/8"

- G. Install hangers to provide minimum ½ inch space between finished covering and adjacent work
- H. Place a hanger within 12 inches of each horizontal elbow.
- I. Use hangers with 1½ inch minimum vertical adjustment
- J. Support riser piping independently of connected horizontal piping.
- K. Hangers shall be galvanized steel or copper.

### 3.2 FLASHING

- A. Provide flashing and counter-flashing where piping penetrates weather-proofed walls, floors and roofs.
- B. Flash vent and soil pipes projecting six (6) inches minimum above finished roof surface with lead worked one (1) inch minimum into hub. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash and seal.

### 3.3 SLEEVES

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe
- C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and caulk seal air-tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. Install chrome plated steel or stainless steel escutcheons at finished surfaces.
- E. Pipe strapping will not be allowed.

END OF SECTION 15140



**SECTION 15190 - PLUMBING IDENTIFICATION****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes plumbing identification materials and devices.

## 1.3 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

## 1.4 SEQUENCING AND SCHEDULING

- A. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

**PART II - PRODUCTS**

## 2.1 MATERIALS

- A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
  - 1. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
  - 2. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½ inch diameter.
  - 3. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
  - 4. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

**PART III - EXECUTION**

## 3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

## 3.2 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners.
- B. Plastic Tags: Install with corrosive-resistant chain.

- C. Plastic Tape Pipe Markers: Install complete around pipe in accordance with the manufacturer's instructions
- D. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above the buried pipe.
- E. Equipment: Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic tags
- F. Controls: Identify control panels and major control components outside panels with plastic nameplates.
- G. Piping: Identify piping, concealed or exposed, with plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 15190

**SECTION 15250 - PLUMBING PIPING INSULATION****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Plumbing Pipe Insulation.

## 1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
  - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
  - 2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

## 1.4 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Flexible Elastomeric Cellular:
    - a. Armstrong World Industries, Inc.
    - b. Halstead Industrial Products
    - c. IMCOA
    - d. Rubatex Corporation

## 2.2 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
- B. Form: Tubular materials conforming to ASTM C 534, Type I.
- C. Thermal Conductivity: 0.30 average maximum at 75 degrees F.
- D. Coating: Water based latex enamel coating recommended by insulation manufacturer.

## 2.3 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

- B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades.
  - 1. Class 1, Grade A for bonding glass cloth and tape to un-faced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to un-faced glass fiber insulation.
  - 2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

### **PART III - EXECUTION**

#### **3.1 PREPARATION**

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

#### **3.2 INSTALLATION - GENERAL**

- A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- C. Keep insulation materials dry during application and finishing.
- D. Apply insulation continuously over fittings, valves and specialties.
- E. Apply insulation with a minimum number of joints.
- F. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire rated walls and partitions.
- G. Fire Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with fire stopping or fire resistant joint sealer.
- H. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified.
  - 1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

#### **3.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION INSTALLATION**

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
  - 1. Miter cut materials to cover soldered elbows and tees.
  - 2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.



3.4 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

3.5 PIPE INSULATION SCHEDULES

<u>PIPING</u>	<u>THICKNESS TYPE</u>	<u>INSULATION IN INCHES</u>
Domestic Hot Water Supply	ELASTOMERIC	1/2
Domestic Hot Water Re-Circulating	ELASTOMERIC	1
Domestic Cold Water	ELASTOMERIC	1/2
"P" Trap at Handicapped Fixtures	ELASTOMERIC	1/2 *

(\* provide pre-formed insulation kits for the drain and supply lines)

END OF SECTION 15250



**SECTION 15410 - PLUMBING PIPING****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes plumbing piping systems to a point shown on the civil drawings. Systems include the following:
  1. Potable water distribution, including cold and hot water supply and hot water circulation.
  2. Sanitary Drainage and Vent Systems.

## 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
  1. Water Distribution Systems, Below Ground: 150 psig.
  2. Water Distribution Systems, Above Ground: 125 psig.
  3. Soil, Waste and Vent Systems: 10-foot head of water

**PART II - PRODUCTS**

## 2.1 SANITARY SEWER PIPING - BURIED

- A. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

## 2.2 SANITARY SEWER PIPING - ABOVE GRADE

- A. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

## 2.3 WATER PIPING - BURIED

- A. Copper Tubing: ASTM B88, Type K, annealed. Fittings; ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

## 2.4 WATER PIPING - ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

## 2.5 MANUFACTURERS

- A. Acceptable Manufacturers-Valves:
  1. Crane
  2. Grinnell
  3. Nibco
  4. Apollo

## 2.6 GATE VALVES

- A. 150 psig rated, bronze body, lever ball type, Apollo or equal.

## **PART III - EXECUTION**

### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### 3.2 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipes, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Slope water piping and arrange to drain at low points.
- H. Establish elevations of buried piping outside the building to ensure not less than 1 ft of cover.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.
- K. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- L. Excavate in accordance with Sections 15010.
- M. Backfill in accordance with Sections 15010.
- N. Install bell and spigot pipe with bell end upstream.
- O. Copper piping 2" and larger shall be silver-soldered.
- P. Install valves with stems upright or horizontal, not inverted.

### 3.3 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.

- B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe or ball valves for throttling, bypass, or manual flow control services.

#### 3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Inject disinfectant solution containing 100 ppm of available chlorine and allow to stand for 2 hours before flushing.
- C. Flush disinfectant from system until residual is equal to that of incoming water or 1.0 mg/L.
- E. Take samples from outlets and analyze in accordance with AWWA C601. Contractor shall engage an independent laboratory to conduct bacteriological and post chlorination tests certifying that the water meets the quality of drinking water. After acceptance by the Engineer of Record, "The Water Test Report for Use" is required to be submitted to SCO prior to requesting the Occupancy Permit.

#### 3.5 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

END OF SECTION 15410



**SECTION 15430 - PLUMBING SPECIALTIES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Plumbing Specialties for water distribution systems; and soil, waste and vent systems.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Backflow Preventers:
    - a. Ames Co., Inc.
    - b. Hersey Products, Inc., Grinnell Corp.
    - c. Watts Regulator Co.
    - d. Wilkins Regulator Div., Zurn Industries, Inc.
  - 2. Water Pressure Regulators:
    - a. Spence Engineering Co., Inc.
    - b. Watts Regulator Co.
    - c. Wilkins Regulator Div., Zurn Industries, Inc.
  - 3. Specialties:
    - a. Josam Co.
    - b. Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
    - c. Watts Regulator Co.
    - d. Woodford Manufacturing Co. Div., WCM Industries, Inc.
    - e. Zurn by Hydromechanics Div., Zurn Industries, Inc.

## 2.2 CLEANOUTS

- A. Exterior Surfaced Areas: Round cast nickel-bronze access frame and non-skid cover.
- B. Exterior Un-Surfaced Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover.

- C. Interior Finished Floor Areas: Lacquered cast iron, two piece body, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.
- D. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

### 2.3 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

### 2.4 TRAP SEAL PRIMER VALVE:

- A. ASSE 1018; water supply fed type, fully automatic 125psig minimum working pressure, Bronze body with atmospheric vented drain chamber, ½ inch threaded or solder joint inlet and outlet connections, Chrome plated, or rough bronze finish. Unit shall be capable of being located on any active water line.

### 2.5 BACKFLOW PREVENTERS

- A. Reduced Pressure Back-flow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

## **PART III - EXECUTION**

### 3.1 PREPARATION

- A. Coordinate construction areas to receive drains to the required invert elevations.

### 3.2 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Extend clean-outs to finished floor. Lubricate threaded clean-out plugs Teflon pipe dope. Ensure clearance at clean-out for rodding of drainage system.
- C. Encase exterior clean-outs in concrete flush with grade.
- D. Install water hammer arrestors complete with accessible isolation valve.

END OF SECTION 15430



**SECTION 15440 – PLUMBING FIXTURES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers (or approved equal):
  - 1. Fixtures and Trim:
    - a. American Standard, Inc.
    - b. Eljer; A Household International Co.
    - c. Kohler Co.
  - 2. Stainless Steel Sinks:
    - a. Elkay Manufacturing Co.
    - b. Just Manufacturing Co.
    - c. Kohler Co.
  - 3. Mop Basins:
    - a. Crane Plumbing/Fiat Products.
    - b. Florestone Products Co., Inc.
    - c. Swan Corp.
  - 4. Water Coolers:
    - a. Elkay Manufacturing Co.
    - b. Halsey Taylor
    - c. Haws Drinking Faucet Co.
    - d. Sunroc Corporation
    - e. Oasis
  - 5. Toilet Seats:
    - a. Bemis Mfg. Co.
    - b. Beneke Division: Sanderson Plumbing Products, Inc.
    - c. Church Seat Co.

- d. Kohler Co.
  - e. Olsonite Corp.
6. Flushometers:
- a. Coyne & Delaney Co.
  - b. Sloan Valve Co.
  - c. Zurn Industries, Inc.; Flush Valve Operations.
7. Commercial/Industrial Cast-Brass Faucets:
- a. American Standard, Inc.
  - b. Chicago Faucet Co.
  - c. Delta Faucet Co.
  - d. Eljer; A Household International Co.
  - e. T & S Brass and Bronze Works, Inc.
  - f. Cambridge Brass
  - g. Elkay Manufacturing Co.
  - h. Sloan
  - i. Speakman Co.
8. Commercial/Institutional Shower and Bathtub Valves and Trim:
- a. Symmons Industries, Inc.
  - b. Bradley Corp.
  - c. Speakman Co.
  - d. Delta Faucet Co.

END OF SECTION 15440

**SECTION 15450 - WATER HEATERS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Electric Water Heaters and In-Line Circulators.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories, and indicating dimensions, required clearances, and methods of assembly of components, and piping and wiring connections.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Water Heaters:
    - (a) Bradford-White Corp.
    - (b) A.O. Smith Water Products Co. Div.
    - (c) State Industries, Inc.
    - (d) Ruud

## 2.5 COMMERCIAL ELECTRIC WATER HEATERS

- A. Factory assembled and wired, electric, [vertical] [horizontal] storage type, 150 psig maximum working pressure.
- B. Glass lined welded steel tank; four (4) inch diameter inspection port, thermally insulated with minimum two (2) inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
- C. Brass water connections and dip tube, drain valve, high-density magnesium anode, and ASME rated temperature and pressure relief valve.
- D. Flange-mounted immersion heating electrical elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.

## 2.6 IN-LINE CIRCULATOR PUMPS

- A. Casing: Bronze, rated for 125 psig working pressure
- B. Impeller: Bronze

- C. Shaft: Alloy steel with integral thrust collar and two (2) oil lubricated bronze sleeve bearings.
- D. Seal: Carbon rotating against a stationary ceramic seat.
- E. Drive: Flexible coupling

## 2.7 THERMAL EXPANSION TANKS

- A. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, maximum operating temperature 210 degrees F., with flexible EPDM diaphragm sealed into tank.
- B. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 55 psig.
- C. Size: 10.5" diameter, 16" overall length, 5 gallon capacity.

## PART III - EXECUTION

### 3.1 WATER HEATER INSTALLATION

- A. Install water heaters in accordance with manufacturer's instructions and to UL requirements.
- B. Coordinate with plumbing piping and related [fuel piping] [gas venting] [electrical] work to achieve operating system.

### 3.2 PUMP INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide air cock and drain connection on horizontal pump casings.
- C. Decrease from line size, with long radius reducing elbows or reducers. Support piping adjacent to pump such as that no weight is carried on pump casings.

Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 15450

**DIVISION 15B: MECHANICAL**

15500	Basic Mechanical Requirements
15501	Hangers and Supports
15504	Piping Insulation-Refrigerant and Condensate
15507	Ductwork Insulation
15513	Refrigerant Piping
15672	Split System Heat Pump
15674	Duct Free Split System Air Conditioner
15782	Energy Recovery Ventilator
15870A	Power Ventilators
15891A	Metal Ductwork
15910	Duct Accessories
15932	Air Outlets and Inlets
15990	Testing, Adjusting and Balancing



**SECTION 15500 BASIC MECHANICAL REQUIREMENTS****PART I - GENERAL**

## 1.1 GENERAL CONDITIONS

- A. The Stipulations and Conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", herein before set forth, shall apply to this and the other Sections of Division 15.

## 1.2 GENERAL REQUIREMENTS

- A. The General Requirements hereinafter listed apply to the Mechanical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

## 1.3 ALTERNATES

- A. Carefully examine all Alternates at the back of this Specification to determine if any work described under the Mechanical Section will be affected thereby.

## 1.4 INTENT

- A. The intent of these Drawings and Specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on Drawings and not specifically called for in the Specifications, or any items specified and not specifically indicated or detailed on the Drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Mechanical Contractor at his own expense.

## 1.5 DEFINITIONS

- A. The Mechanical Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the mechanical systems. All items of equipment are specified in the singular; however, the Mechanical Contractor shall provide the number of items of equipment as indicated on the Drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

## 1.6 VISIT TO THE SITE

- A. The Mechanical Contractor shall visit the site before submitting his bid, so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything that could have been anticipated from a visit to the site.

## 1.7 REGULATORY REQUIREMENTS

- A. All work under this Section shall be accomplished in strict accordance with State codes. Where these Plans and Specifications conflict with such codes, the codes shall govern. The Mechanical Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

## 1.8 PERMITS AND FEES

- A. The Mechanical Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Mechanical Work Division of the Specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the Mechanical Contractor under whose work such services appear. Before the job is certified as substantially complete, a Certificate of Approval from all authorities involved must be obtained and turned over to the Architect/Engineer.

## 1.9 DRAWINGS AND SPECIFICATIONS

- A. The Mechanical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between general Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Mechanical Contractor shall figure on the most expensive of the items in conflict.
- B. The Mechanical Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No Contractor shall under any circumstances scale Drawings for the location of equipment. The Mechanical Contractor shall verify the locations of all utility services.
- C. The Mechanical Contractor shall keep at least one (1) set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

## 1.10 SUPERVISION

- A. The Mechanical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent Contractors. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels and locating chases, openings, hangers, inserts, sleeves, etc.

## **PART II - PRODUCTS**

### 2.1 STANDARD PRODUCTS

- A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

### 2.2 SUBMITTAL

- A. The Mechanical Contractor shall submit, for approval, detailed Shop Drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Mechanical Contractor has in his possession the approved shop drawing for the particular material or equipment. The Mechanical Contractor shall furnish the number of copies required by the General or Special



- Conditions of the contract, but in no case less than six (6) copies.
- B. Submitted material shall be properly labeled indicating specific Service for which material or equipment to be used, Section and Article Number of Specifications governing, Contractor's name and name of job.
  - C. Approval of equipment will not relieve the Mechanical Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Mechanical Contractor and with no additional expense to the Owner.

### 2.3 SUBSTITUTIONS

- A. Manufacturer's lists are to establish a Standard of Quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality. Free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Mechanical Contractor shall purchase and install all materials required.
- B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

### 2.4 PRODUCT HANDLING

- A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.
- B. The Mechanical Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

### 2.5 MATERIALS AND WORKMANSHIP

- A. The Mechanical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Mechanical Contractor at the Mechanical Contractor's expense.
- B. The material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.
- C. Any equipment furnished by the Mechanical Contractor that is larger than those indicated on the Drawings and described in these Specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

**PART III - EXECUTION****3.1 EXCAVATION AND BACKFILL**

- A. The Mechanical Contractor shall preform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding four (4) inches in depth, wetting each layer as it is placed, and thoroughly compacting each layer with mechanical tamper or other approved means. Any damage done during excavation and back-filling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its condition prior to construction at no expense to the Owner.

**3.2 SCAFFOLDING, RIGGING AND HOISTING**

- A. The Mechanical Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

**3.3 CUTTING AND PATCHING**

- A. The Mechanical Contractor shall provide all cutting and patching necessary to install the work specified in this Section. The patching shall match adjacent surfaces.
- B. No Structural member shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.

**3.4 EQUIPMENT SPACE AND ARRANGEMENT**

- A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing and maintenance. The Mechanical Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.
- B. These drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Mechanical Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after Award of Contract. No departure shall be made without written Approval of the Architect/Engineer.

**3.5 DAMAGE TO WORK ALREADY IN PLACE**

- A. The Mechanical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

**3.6 JURISDICTION OF WORK**

- A. It may become necessary for the Mechanical Contractor to furnish labor or material which is not generally accepted as part of this trade. In cases of this type, he shall contract the work, or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

### 3.7 COORDINATION WITH OTHER TRADES

- A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Mechanical Contractor shall make required changes or relocations at no additional cost to the Owner.
- B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination.
- C. The Mechanical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed will be borne by the subcontractor or contractors directed to do this work.

### 3.8 DIVISION OF WORK

- A. This paragraph is intended to show exactly the point of division of work between the Electrical Division and the Mechanical Division.
- B. All equipment covered in the Mechanical Division of the Specifications shall be furnished, mounted and aligned under the Mechanical Division. All individual motor starters, unless indicated as part of a motor control center, for this equipment shall be furnished and installed by the Mechanical Contractor.
- C. All final electrical connections to equipment covered in the Mechanical Division of the Specifications shall be completed under the Mechanical Division.
- D. The Electrical Contractor shall provide a disconnect switch or junction box for each item of equipment under Division 16.
- E. Electrical equipment and wiring that is provided by the Mechanical Contractor shall be in accordance with the Electrical specification.

### 3.9 EQUIPMENT INSTALLATION

- A. Final connections to equipment, including pipe, duct, and controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.
- B. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these Drawings and Specifications.

### 3.10 OPERATION AND MAINTENANCE MANUALS

- A. One complete Manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.

- B. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words "OPERATION AND MAINTENANCE MANUAL", the name and location of the building, the name of the Section, such as "Heating" and the name of the Mechanical Contractor. Two (2) copies of each approved manual shall be submitted to the Owner and one (1) copy shall be submitted to the Architect/Engineer.
- C. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the Contract Documents.
- D. Manuals shall include the following:
  - 1. Complete Operating Installations, covering start-up and shutdown for all components installed.
  - 2. Legible copies of all Shop Drawings. Any comments incorporated in "as noted" approvals of Shop Drawings shall be recorded on the Drawings included in the Manuals.
  - 3. All equipment Maintenance and Service Manuals.
  - 4. A complete parts list for each piece of equipment.
  - 5. All descriptive literature for the equipment.
  - 6. Operating characteristics, performance data, ratings, and curves for each piece of equipment such as condensers, fans and air handling units.
  - 7. Internal wiring and control diagrams.
  - 8. Automatic temperature control diagrams, part descriptions and numbers, and sequences of operation. Drawings shall be neatly folded and inserted in a separate clear plastic binder. The plastic binders shall be bound in the back of each Manual.
  - 9. Final Testing and Balancing Reports.
  - 10. All other information pertinent to the maintenance and servicing of equipment and systems provided in the Project.
  - 11. Name, address, and telephone number for service on each manufacturer's equipment.

### 3.11 OPERATING INSTRUCTIONS

- A. After all equipment and services are in operation, and the Operation and Maintenance Manuals are available, an instruction and training session shall be conducted for the Owner's operating personnel.
- B. Instruction sessions shall be conducted during the Owner's normal working periods, and at times and locations satisfactory to the Owner.

### 3.12 EQUIPMENT START-UP

- A. No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments are required to meet design conditions. Such services

shall be at no additional cost to the Owner.

3.13 GUARANTEE

- A. The Mechanical Contractor shall present to the Owner a written Guarantee covering his work, including all equipment, material and workmanship. This Guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.
- B. Any defective work, equipment, material and/or workmanship that develops within the Guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Mechanical Contractor without cost to the Owner.

3.14 FINAL INSPECTION

- A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Mechanical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.

3.15 FINAL PAYMENTS

- A. All Final Payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

END OF SECTION 15500



**SECTION 15501 - HANGERS AND SUPPORTS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- B. This Section includes Hangers and Supports for Mechanical Systems Piping and Equipment.

**PART II - PRODUCTS**

## 2.1 PIPE HANGERS AND SUPPORTS

- A. Hangers: Galvanized carbon steel, adjustable, clevis.
- B. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

## 2.2 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends or continuous threaded.

## 2.3 FLASHING

- A. Metal Flashing: 26 gage galvanized steel.
- B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

## 2.4 SLEEVES

- A. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe
- B. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.
- C. Sleeves for Round Ductwork: Form with galvanized steel.
- D. Sleeves for Rectangular Ductwork: Form with galvanized steel or wood.
- E. Fire Stopping Insulation: Glass fiber type, non-combustible.
- F. Caulk: Fire Barrier type sealant.

## 2.5 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

- C. Washers: ASTM F 844, steel, plain, flat washers.

2.6 ATTACHMENTS

- A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over 4 inches thick.
- B. Beam Clamps: Types 20, 21, 28 or 29
- C. Wood: Wood screws or lag bolts

**PART III - EXECUTION**

3.1 HANGERS AND SUPPORTS INSTALLATION

- A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.
- C. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- D. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- E. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Support horizontal piping as follows:

<b>PIPE SIZE</b>	<b>HANGER SPACING</b>	<b>MAXIMUM HANGER DIAMETER</b>
1/2 to 1-1/4 inch	6' - 6"	3/8"
1-1/2 to 2 inch	10' - 0"	3/8"

- G. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- H. Place a hanger within 12 inches of each horizontal elbow.
- I. Use hangers with 1 1/2 inch minimum vertical adjustment.
- J. Support vertical piping at every floor.
- L. Support riser piping independently of connected horizontal piping.
- M. All pipe hangers shall be galvanized steel or copper.
- N. Pipe strapping, duct tape or zip ties will not be allowed.



### 3.2 EQUIPMENT BASES AND SUPPORTS

- A. Provide equipment bases of concrete.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

### 3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

### 3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal arc welding, appearance and quality of welds.

### 3.5 FLASHING

- A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flexible sheet flash and counter-flash with sheet metal; seal watertight.

### 3.6 SLEEVES

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

END OF SECTION 15501



**SECTION 15504 - PIPING INSULATION-REFRIGERANT/CONDENSATE****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Mechanical Pipe Insulation.

## 1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
  - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
  - 2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

## 1.4 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers
  - 1. Flexible Elastomeric Cellular:
    - a. Armstrong World Industries, Inc.
    - b. Halstead Industrial Products
    - c. IMCOA
    - d. Rubatex Corporation

## 2.3 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
- B. Form: Tubular materials conforming to ASTM C 534, Type I.
- C. Thermal Conductivity: 0.30 average maximum at 75 degrees F.
- D. Coating: Water based latex enamel coating recommended by insulation manufacturer.

## 2.5 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

**2.8 SEALING COMPOUNDS**

- B. Weatherproof Sealant: Flexible elastomer based, vapor barrier sealant designed to seal metal joints.
  - 1. Water Vapor Permeance: 0.02 perm maximum
  - 2. Temperature Range: Minus 50 to 250 degrees F

**PART III - EXECUTION****3.1 PREPARATION**

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

**3.2 INSTALLATION - GENERAL**

- A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- C. Keep insulation materials dry during application and finishing.
- D. Apply insulation continuously over fittings, valves, and specialties.
- E. Apply insulation with a minimum number of joints.
- F. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- G. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with fire stopping or fire resistant joint sealer.
- H. Flanges, Fittings, and Valves: Apply pre-molded, pre-cut, or field fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
  - 1. Use same material and thickness as adjacent pipe insulation.
  - 2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
  - 3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
  - 4. Insulate elbows and tees smaller than 3-inches pipe size with pre-molded insulation.
  - 5. Insulate elbows and tees Three (3) inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.
- J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified.

1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION INSTALLATION

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
  1. Miter cut materials to cover soldered elbows and tees.
  2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.6 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation. Paint all exterior insulation with UV resistant paint as recommended by Insulation manufacturer.

**INTERIOR COLD CONDENSATE DRAINS**

<b><u>PIPE SIZES (NPS)</u></b>	<b><u>MATERIALS</u></b>	<b><u>THICKNESS IN INCHES</u></b>
1/2 TO 4	FLEXIBLE ELASTOMERIC	3/4

**REFRIGERANT SUCTION**

<b><u>PIPE SIZES (NPS)</u></b>	<b><u>MATERIALS</u></b>	<b><u>THICKNESS IN INCHES</u></b>
1/2 TO 1-1/4	FLEXIBLE ELASTOMERIC	3/4
1-1/2 TO 4	FLEXIBLE ELASTOMERIC	1

END OF SECTION 15505



**SECTION 15507 - DUCTWORK INSULATION****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Duct and Plenum Insulation.

## 1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including linings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
  - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
  - 2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

**PART II – PRODUCTS**

## 2.1 MANUFACTURERS

- I. Glass Fiber:
  - a. Certain Teed Corporation
  - b. Knauf Fiberglass GmbH
  - c. Manville
  - d. Owens-Corning Fiberglass Corporation
  - e. USG Interiors, Inc. - Thermafiber Division

## 2.2 INSTALLATION

## A. GLASS FIBER

- 1. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All purpose, factory-applied, laminated glass fiber reinforced, flame retardant Kraft paper and aluminum foil having self-sealing lap.
- C. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets-2” thick.
  - 1. Thermal Conductivity: 0.32 average maximum, at 75 degrees F mean temperature.
- D. Adhesive: Produced under the UL Classification and follow-up service.
  - 1. Type: Non-Flammable, solvent-based.
  - 2. Service Temperature Range: Minus 20 to 180 degrees F.

### 2.3 ACCESSORIES AND ATTACHMENTS

- A. Corner Angles: 28-gauge, 1-inch by 1-inch aluminum, adhered to 2-inch by 2-inch Kraft paper.
- B. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

### 2.4 SEALING COMPOUNDS

- A. Vapor Barrier Compound: Water-based, fire-resistive composition
  - 1. Water Vapor Permeance: 0.08 perm maximum
  - 2. Temperature Range: Minus 20 to 180 degrees F

## PART III - EXECUTION

### 3.1 PREPARATION

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale and dirt.

### 3.2 INSTALLATION

- A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- C. Install insulation with smooth, straight, and even surfaces.
- D. Seal joints and seams to maintain vapor barrier.
- E. Seal penetrations for hangers, supports, anchors and other projections.
- F. Keep insulation materials dry during application and finishing.
- H. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
  - 1. Smaller Than 24 Inches: Bonding adhesive applied in 6-inch wide transverse strips on 12-inch centers.
  - 2. Twenty-four (24) Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
  - 3. Overlap joints three (3) inches.
  - 4. Seal joints, breaks, and punctures with vapor barrier compound.

END OF SECTION 15507



**SECTION 15513 – REFRIGERANT PIPING****PART I - GENERAL**

- 1.1 A. This section includes all pipe, pipe fittings, hangers, supports, etc. as may be required to provide a complete refrigerant piping system.
- B. Testing of all piping shall be made in the presence of a designated representative of the owner. No piping shall be covered or put into operation before such testing has been approved.
- C. The actual arrangement of the piping shall follow the general locations shown on the drawings such that clearances, line drainage, etc. shall be maintained.

**PART II - PRODUCTS**

## 2.1 PIPING

- A. Refrigerant piping shall be type “ACR” hard drawn copper conforming to ANSI B-31.5 or ASTM B280.

## 2.2 PIPE FITTINGS

- A. Copper pipe fittings shall be wrought metal solder joint type conforming to ANSI B16.22.

**PART III - EXECUTION**

## 3.1 PIPING

- A. The installation of piping and related items shall be made neatly and in such a manner as not to interfere with access to valves or equipment.
- B. All piping shall be reamed to remove all burrs, fins and foreign material. Pipe shall be thoroughly cleaned before soldering.
- C. “Sil-Fos” or silver solder shall be used with non-corrosive flux. During the soldering operation, the pipe shall be purged with nitrogen.
- D. Piping shall be arranged (and traps installed where necessary) to allow the proper return of oil to the compressor.

## 3.2 HANGERS AND SUPPORTS

- A. The spacing of hangers and supports shall not exceed five feet.
- B. Pipe covering protection saddles shall be used at all supports for insulated piping. Sheet metal shields shall be 10 gauge, one half the circumference of the insulation and minimum of twelve inches long.

## 3.3 TESTING

- A. All refrigerant equipment not tested at the factory shall be shut off from the rest of the system and tested. Piping systems shall be tested after installation is complete and before any insulation is applied. All controls and other apparatus that may be damaged by the test pressure shall be removed before tests are made.

- B. Refrigerant lines shall be tested at 150 psig with dry nitrogen. Pressure shall be maintained for 60 minutes without loss of pressure. Each joint shall be checked for leaks with a soap solution. Testing and repair shall continue until there is no loss of pressure. After a satisfactory pressure test, high vacuum pumps shall be connected to the system and the system evacuated to a pressure of 0.20 inches of mercury with the ambient temperature at not less than 36 degrees F. After this has been attained, the vacuum shall be broken by charging the system with refrigerant as soon as possible.

END OF SECTION 15055

**SECTION 15672 - SPLIT SYSTEM HEAT PUMP****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and a Division 1 Specification Sections, apply to work of this Section.

## 1.2 SUMMARY

- A. Section includes Split System Heat Pumps.

## 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), dimensions, required clearances, and methods of assembly of components, furnished specialties and accessories and installation and start-up instructions.
- B. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring required for final installation of heat pump units and controls. Clearly differentiate between portions of wiring which are factory-installed and portions to be field-installed.
- C. Operation and Maintenance Data: Submit maintenance data and parts list for each heat pump unit, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual in accordance with requirements of Division 1.

## 1.4 WARRANTY

- A. Provide Five (5) Year Warranty.
- B. Warranty: Include coverage for Refrigerant Compressors.

**PART II - PRODUCTS**

## 2.1 SPLIT SYSTEM HEAT PUMPS

- A. Acceptable Manufacturers:
  1. Carrier Air Conditioning: Division of Carrier Corp.
  2. Trane (The) Co.: Division of American Standard Inc.
  3. York: Division of York International

## 2.2 GENERAL

- A. Split System: The split-system unit shall be an outdoor heat pump unit and indoor factory-fabricated single-zone draw-through air-handling unit. Both indoor and outdoor unit shall be by the same manufacturer. The net capacities shall be as indicated and shall not exceeded by more than 5%. The minimum efficiency for systems less than 65,000 BTUH shall be 15.0 SEER. The minimum efficiency for systems of 65,000 BTUH or greater shall be in accordance with the 2012 N. C. State Building Code: Energy Conservation Code.

### 2.3 AIR HANDLER

- A. Direct Expansion Coil: Coil shall be provided with pressure-type brass distributors and solder connections. The coil shall be dehydrated after testing and charged with dry air. Maximum working conditions shall be 300 psig at 200 degrees F for cooling. Tests shall be conducted, subjecting the coil to a minimum air pressure of 350 psig with the coil submerged in water. The cooling coil shall be subject to ASHRAE 15-1978 Safety code for Mechanical Refrigeration. Coils shall be of the cartridge type, removable from other side of casing and supported the entire length in tracks. Staggered tube pattern shall be provided for all coils of more than one row deep. Tubing shall have a minimum outside diameter of 1/2 inch. Tubing shall be individually finned with smooth aluminum or copper fins, wound under tension. Tube joints for all coils shall be made with high temperature brazing alloys.
- B. Cabinet: Unit shall be provided with baked enamel finish and internally insulated. Fan shall be forward curved, and dynamically and statically balanced at the factory. Fan shall be belt driven. Provide adjustable sheaves for each air handler. Fan and motor bearings shall be permanently lubricated type.

### 2.4 OUTDOOR HEAT PUMP UNIT

- A. Unit shall be factory-assembled and tested. Unit shall provide liquid lift as required to suit installation. Unit shall deliver the specified capacity to the cooling coil with an ambient air temperature of 95 degrees F. Units shall be certified per ARI 240 and 270.
- B. Coil shall have aluminum plate fins, mechanically bonded to 1/2 inch aluminum tubes. Coil shall be circuited for sub-cooling.
- C. Outdoor Fans and Motors: Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation and built in current and thermal overload protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard.
- D. Compressor: Unit shall have compressors of serviceable hermetic design with external spring isolators and an automatically reversible oil pump. Compressor motors shall have across-the-line start.
- E. Controls shall be factory-wired and located in a separate enclosure. Safety devices shall consist of high and low pressure stats and compressor overload devices. Unit wiring shall incorporate a time delay relay to prevent short-cycling of the compressor. Relay shall prevent compressor from restarting for a 5-minute period. The unit shall include a transformer for 24-volt control circuit, pressure relief valves and circuit breakers.
- F. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be provided for power and refrigerant connections. Panel shall be removable to provide access for servicing. The unit shall be mounted on manufacturer's standard legs anchored to concrete pedestals with steel bearing plates and neoprene pads.
- G. Connections: Only one liquid line, one suction line, required for units under 15 tons in capacity shall be provided. A 15-ton unit shall be dual circuited. Double suction risers for the refrigerant lines shall be provided.
- H. Piping shall be sized by the manufacturer.

**2.5 TEMPERATURE CONTROL SYSTEM**

- A. See Section 15973, Direct Digital Controls

**2.6 FILTRATION**

- A. Provide a filter rack and a 1" replaceable pleated throwaway filter. Filter rack size shall be as required by AHU manufacture.
- B. Provide additional sets of filters (minimum of 3) as required during construction. Install a clean set of filters for the Final Inspection.

**PART III - EXECUTION****3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service.
- C. Install units with vibration isolation.
- D. Install units on concrete base as indicated.

**3.2 MANUFACTURER'S FIELD SERVICES**

- A. Prepare start systems under provisions of Section 15500.
- B. Provide initial start-up.
- C. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION 15672



**SECTION 15674 DUCT FREE SPLIT SYSTEM AIR CONDITIONER****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and a Division 1 Specification Sections, apply to work of this Section.

## 1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), dimensions, required clearances, and methods of assembly of components, furnished specialties and accessories and installation and start-up instructions.
- B. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring required for final installation of heat pump units and controls. Clearly differentiate between portions of wiring which are factory-installed and portions to be field-installed.
- C. Operation and Maintenance Data: Submit maintenance data and parts list for each heat pump unit, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual in accordance with requirements of Division 1.

## 1.3 WARRANTY

- A. Provide Five (5) Year Warranty.
- B. Warranty: Include coverage for Refrigerant Compressors.

**PART II - PRODUCTS**

## 2.1 SPLIT SYSTEM AIR CONDITIONER

- A. Acceptable Manufacturers:
  - 1. Mitsubishi
  - 2. Sanyo.
  - 3. Freidrich
  - 4. Amana

## 2.2 GENERAL

- A. Split System: The split-system unit shall be an outdoor condensing unit and indoor factory-fabricated single-zone draw-through air-handling unit. Both indoor and outdoor unit shall be by the same manufacturer. The net capacities shall be as indicated and shall not be exceeded by more than 5%. The minimum efficiency for systems less than 65,000 BTUH shall be 13.0 SEER and shall be in accordance with the 2012 N. C. State Building Code: Energy Conservation Code.

## 2.3 AIR HANDLER

- A. Direct Expansion Coil: Coil shall be provided with pressure-type brass distributors and solder connections. The coil shall be dehydrated after testing and charged with dry air. Maximum working conditions shall be 300 psig at 200 degrees F for cooling. Tests shall

be conducted, subjecting the coil to a minimum air pressure of 350 psig with the coil submerged in water. The cooling coil shall be subject to ASHRAE 15-1978 Safety code for Mechanical Refrigeration. Staggered tube pattern shall be provided for all coils of more than one row deep. Tubing shall have a minimum outside diameter of 1/2 inch. Tubing shall be individually finned with smooth aluminum or copper fins, wound under tension. Tube joints for all coils shall be made with high temperature brazing alloys.

- B. Cabinet: Unit shall be provided with baked enamel finish and internally insulated. Fan shall be forward curved, and dynamically and statically balanced at the factory. Fan and motor bearings shall be permanently lubricated type.

#### 2.4 OUTDOOR CONDENSING UNIT

- A. Unit shall be factory-assembled and tested. Unit shall provide liquid lift as required to suit installation. Unit shall deliver the specified capacity to the cooling coil with an ambient air temperature of 95 degrees F. Units shall be certified per ARI 240 and 270.
- B. Coil shall have aluminum plate fins, mechanically bonded to ½ inch aluminum tubes. Coil shall be circuited for sub-cooling.
- C. Outdoor Fans and Motors: Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation and built in current and thermal overload protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard.
- D. Compressor: Unit shall have compressors of serviceable hermetic design with external spring isolators and an automatically reversible oil pump. Compressor motors shall have across-the-line start.
- E. Controls shall be factory-wired and located in a separate enclosure. Safety devices shall consist of high and low pressure stats and compressor overload devices. Unit wiring shall incorporate a time delay relay to prevent short-cycling of the compressor. Relay shall prevent compressor from restarting for a 5-minute period. The unit shall include a transformer for 24-volt control circuit, AND pressure relief valve.
- F. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be provided for power and refrigerant connections. Panel shall be removable to provide access for servicing. The unit shall be mounted on manufacturer's standard legs anchored to concrete pedestals with steel bearing plates and neoprene pads.
- G. Piping shall be sized by the manufacturer.

#### 2.5 FILTRATION

- A. Provide a throw away filter.
- B. Provide additional sets of filters (minimum of 3) as required during construction. Install a clean set of filters for the Final Inspection.

### PART III - EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service.



- C. Install units with vibration isolation.
- D. Install units on concrete base as indicated.

### 3.2 MANUFACTURER'S FIELD SERVICES

- A. Prepare start systems under provisions of Section 15500.
- B. Provide initial start-up.
- C. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION



**SECTION 15782 –Energy Recovery Ventilator****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 DESCRIPTION OF WORK

- A. Extent of Air Conditioning Unit work required by this Section is indicated on Drawings and Schedules and by Requirements of this Section.

## 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities for each unit indicated, weights (shipping, installed, and operating), furnished specialties and accessories; and rigging, installation, and start-up instructions.
- B. Maintenance Data: Submit Maintenance Data and Parts List for each unit, control, and accessory; including "trouble- shooting" maintenance guide. Include this data and product data in Maintenance Manual in accordance with requirements of Division 1.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Handle unit and components properly to prevent damage, breaking, denting and scoring. Do not install damaged roof top unit or components; replace with new. Comply with manufacturer's rigging and installation instructions for unloading the unit, and transporting the unit to final location.

## 1.5 WARRANTY

- A. General Warranty: The special warranty specified in this Section shall not deprive the owner of other rights the owner may have under other provisions of the contract documents and shall be in addition to, and run concurrent with, other warranties made by the contractor under requirements of the contract documents.
- B. Special Warranty: A written warranty, executed by the manufacturer and signed by the contractor, agreeing to replace the components that fail in material or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.
  1. Unit warranty period: Not less than one year after date of start-up, but not to exceed 14 months from date of shipment.
  2. Heat Wheel: Non-prorated full parts replacement not less than 5 years from date of shipment.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  1. Micrometal
  2. Semco
  3. RenewAire

## 2.2 MANUFACTURED UNITS

- A. Provide complete unit with heat wheel energy recovery.
- B. Unit shall be self-contained, packaged, factory assembled and pre-wired, consisting of cabinet and frame, supply fan, exhaust fan, heat recovery wheel, controls, air filters.

## 2.3 FABRICATION

- A. Cabinet: Galvanized steel with baked enamel finish, access doors or removable access panels with quick fasteners [locking door handle type with piano hinges. Structural members shall be minimum 18 gauge (1.20 mm), with access doors or removable panels of minimum 20 gauge (0.90 mm).
- B. Insulation: One inch thick neoprene coated glass fiber on surfaces where conditioned air is handled. Protect edges from erosion.
- C. Heat Exchangers: Aluminized steel of welded construction.
- D. Supply and Exhaust Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted motor.
- E. Air Filters: 2 inch thick pleated glass fiber disposable media in metal frames. Provide at total of 4 complete sets.

## 2.4 ENERGY RECOVERY SECTION

- A. The unit shall have a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings.
- B. The energy recovery cassette shall be rated in accordance with ARI Standard 1060 and shall bear the ARI certification symbol.
- C. The energy recovery cassette shall contain a total energy recovery heat wheel constructed of a light-weight polymer material with permanently bonded desiccant coating. The energy recovery wheel media shall be capable of removal from the cassette and replacement without the use of tools. Wheel media shall be cleanable using hot water or light detergent without degrading the efficiency.
- D. The exhaust fan shall be backward inclined type. Fan and motor shall be dynamically balanced. A back draft damper shall be included with the exhaust fan. Outside air filters shall be 4" thick pleated disposable media. Provide a total of 4 sets.
- E. Motors shall be standard efficiency with ball bearings and external lubrication connections.

**PART III - EXECUTION**

## 3.1 EXAMINATION

- A. Verify that proper power supply is available.

## 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on field built mounting frame. Install mounting frame level. Mounting frame shall be provided by the HVAC Contractor. Field Coordinate frame and installation required.
- C. See structural drawings for design of mounting frame.

## 3.3 MANUFACTURER'S FIELD SERVICES

- A. Provide initial start-up and standard maintenance during first year of operation, including routine service and check-out.

END OF SECTION 15782



**SECTION 15870 - POWER VENTILATORS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Power Ventilators.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
  - 1. Product data for selected models, including specialties, accessories, and the following:
    - a. Motor ratings and electrical characteristics plus motor and fan accessories.
    - b. Materials gauges and finishes.
  - 2. Shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Carnes Company, Inc.
  - 2. Cook (Loren) Co.
  - 3. Greenheck Fan Corp.
  - 4. Penn Ventilator Co., Inc.

## 2.2 ROOF EXHAUSTERS

- A. Centrifugal Fan Unit: V-belt driven with spun aluminum housing; resilient mounted motor, ½ inch mesh, 16 gauge aluminum bird screen; square base to suit roof curb with continuous curb gaskets; secured with cadmium plated bolts and screws.
- B. Roof Curb: 16 inch high with continuously welded seams and factory installed door nailer strip.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- D. Back Draft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.

- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### 2.3 WALL EXHAUSTERS

- A. Centrifugal Fan Unit: V-belt driven with spun aluminum housing; resilient mounted motor, ½ inch mesh, 16 gauge aluminum bird screen; secured with cadmium plated bolts and screws.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Back Draft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### 2.4 CEILING EXHAUST FANS

- A. Centrifugal Fan Unit: V-belt or direct drive with galvanized steel housing lined with ½ inch acoustic insulation, resilient mounted motor, gravity back draft damper in discharge.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Grille: Molded white plastic or aluminum with baked white enamel finish.
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required RPM is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### 2.5 IN-LINE CABINET EXHAUST FANS

- A. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with ½ inch acoustic insulation, resilient mounted motor, gravity back draft damper in discharge.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required RPM is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### 2.6 ROOF SUPPLY FAN

- A. Fan Unit: Direct driven axial type, aluminum hood, bird screen, die formed aluminum propeller blades riveted to steel hub, resilient mounted motor square base to suit roof curb.
- B. Roof Curbs: 16 inch high, continuously welded seams, and factory door nailed strip. Roof curb shall have same manufacturer as fan and be supplied by Mechanical Contractor and installed by the General Contractor.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected



motor.

**PART III - EXECUTION**

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with lag screws to roof curb.

END OF SECTION 15870



**SECTION 15891 - METAL DUCTWORK****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes low pressure ducts and plenums for heating, ventilating, and air conditioning systems

**PART II - PRODUCTS**

## 2.1 MATERIALS

- A. Steel Ducts: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of G-90 for each side in conformance with ASTM A90.
- B. Insulated Flexible Ducts: Flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 degrees F.
- C. Fasteners: Rivets, bolts, or sheet metal screws
- D. Sealant: Liquid non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.
- E. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

## 2.2 LOW PRESSURE DUCTWORK

- A. Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, re-inforcing and sealing for operating pressures indicated.
- B. No variation of duct configuration or sizes permitted except by written permission.
- C. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on center line. Where not possible and where rectangular elbows are used, provide turning vanes.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- E. Connect flexible ducts to metal ducts with liquid adhesive.
- F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.

2.3 FACTORY FABRICATED DUCTWORK

- A. Duct shall be of standard spiral lock seam or single-rib construction and shall be provided according to the gages given in the following table:

<b>Diameter (inches)</b>	<b>Thickness (inches)</b>
3 - 8	.032
9 - 14	.040
15 - 36	.050

- B. Duct shall be provided in continuous, unjoined lengths wherever possible. Except when interrupted by fittings, round duct sections.
- C. Fittings shall be round and shall have a wall thickness in accordance with the following table:

<b>Fitting Body Diameters (inches)</b>	<b>Minimum Round Fitting Thickness (inches)</b>
3-14	.040
15-26	.050
27-36	.063

- D. Elbows shall be of die-stamped, gored or pleated construction. The bend radius of stamped, gored and pleated elbows shall be 1.5 time the elbow diameter.
- E. All round elbows in diameter of 8 inches or less shall be of die-stamped or pleated construction.
- F. All round elbows in diameter of 9 inches through 14 inches shall be of gored or pleated construction.
- G. All round elbows in diameter greater than 14 inches shall be of gored construction.
- H. Diverging-flow fittings shall be constructed with a radiused entrance to all branch taps and with no excess material projecting from the body into the branch tap entrance.
- I. All take-off or branch entrances shall be by means of factory fabricated fittings.
- J. All fitting ends shall be sized to slip inside mating duct sections. They shall provide a tight fit and have a minimum 2-inch insertion length with a stop bead. No additional coupling shall be required for duct to fitting joints.

**PART III - EXECUTION**

3.1 INSTALLATION

- A. Factory Fabricated ductwork can be substituted for low-pressure field constructed ductwork.
- B. All factory fabricated spiral duct and fittings shall be installed in accordance with manufacturer's recommendations.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

- D. Connect diffusers or troffer boots to low pressure ducts with 5 feet maximum length of flexible duct. Hold in place with strap or clamp.
- E. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

### 3.3 ADJUSTING AND CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that may be harmed by excessive dirt with temporary filters or bypass during cleaning.
- B. Clean duct systems with high power vacuum machines. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION 15891



**SECTION 15910 - DUCT ACCESSORIES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Not used
  - 2. Turning Vanes
  - 3. Duct Mounted Access Doors and Panels
  - 4. Flexible Connectors
  - 5. Flexible Ducts

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data including details for materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings from manufacturer detailing assemblies: Include dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

**PART II - PRODUCTS**

## 2.3 AIR TURNING DEVICES

- A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

## 2.4 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- B. Provide factory made spin-in starting collars for connections to trunk ducts.

## 2.5 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.
- B. Review locations prior to fabrication.
- C. Fabricate rigid and close fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one-inch thick insulation with sheet metal cover.
- D. Access doors smaller than 12 inches square may be secured with sash locks.

- E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.
- F. Access doors with sheet metal screw fasteners are not acceptable.

### **PART III - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions.
- B. Provide balancing dampers at points on low pressure supply systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.
- C. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- D. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.
- E. Provide duct test holes where indicated and required for testing and balancing purposes.

END OF SECTION 15910



**SECTION 15932 - AIR OUTLETS AND INLETS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 DESCRIPTION OF WORK

- A. Extent of air outlets and inlets work is indicated by Drawings and Schedules and by Requirements of this Section.
- B. Types of outlets and inlets required for this Project include the following:
  - 1. Ceiling Air Diffusers
  - 2. Wall Registers and Grilles
  - 3. Louvers

## 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:
  - 1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size and accessories furnished.
  - 2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish and mounting details.
  - 3. Performance data for each type of air outlet and inlet furnished, throw and drop; and noise criteria ratings. Indicate selections on data.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

**PART II - PRODUCTS**

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Diffusers & Grilles
  - 1. Titus, Inc.
  - 2. Metalaire, Inc.
  - 3. Carnes, Inc.
  - 4. E. H. Price
- B. Louvers
  - 1. Arrow United Industries, Inc.
  - 2. Louvers & Dampers, Inc.
  - 3. Penn Ventilator Co., Inc.
  - 4. Ruskin Mfg. Co.
  - 5. Safe-Air Inc.
  - 6. Vent Products Co., Inc.
  - 7. NCA

## 8. Cesco Products

## 2.2 RECTANGULAR CEILING DIFFUSERS

- A. Rectangular, extruded aluminum, multi-core type diffuser to discharge air in 360 degree pattern.
- B. Provide inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabricate of aluminum with baked enamel off-white finish.
- D. Provide opposed blade damper with damper adjustable from diffuser face.

## 2.3 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

- A. Fixed grilles of 1/2 x 1/2 x 1 inch egg crate.
- B. Provide inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabricate of aluminum with baked enamel off-white finish.
- D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

## 2.4 WALL SUPPLY REGISTERS/GRILLES

- A. Streamlined and individually adjustable blades, depth of which exceeds 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
- B. Fabricate 1 1/4 inch margin frame with countersunk screw mounting and gasket.
- C. Fabricate of aluminum extrusions with 20 gauge minimum frames and 22 gauge minimum blades, with baked enamel off-white finish.
- D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

## 2.6 LOUVERS

- A. Provide 4-inch deep louvers with blades on 45 degree slope with center baffle and return bend, heavy channel frame, bird screen with 1/2 inch square mesh.
- B. Fabricate of 12-gauge extruded aluminum, welded assembly, with factory baked enamel finish. Color selection from manufacturer standard.
- C. Furnish with interior screw holes in jambs for installation.

## 2.7 ROOF HOODS

- A. Fabricate air inlet or exhaust hoods in accordance with SMACNA Low Pressure Duct Construction Standards.
- B. Fabricate of aluminum, minimum 16 gauge base and 18 gauge hood; suitably reinforced; with removable hood; bird screen with 1/2 inch square mesh and factory prime coat baked enamel finish.
- C. Mount unit on minimum 12-inch high curb base with insulation between duct and curb.

- D. Make hood outlet area minimum of twice throat area.

**PART III - EXECUTION**

3.1 INSTALLATION

- A. Install items in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.
- C. Install diffusers to ductwork with air-tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION 15932



**SECTION 15990 - TESTING, ADJUSTING AND BALANCING****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section specifies the Requirements and Procedures of Total Mechanical Systems Testing, Adjusting and Balancing. Requirements include measurement and establishment of the fluid quantities of the Mechanical Systems as required to meet Design Specifications and Recording and reporting the results.
- B. Testing and Balancing must be conducted by an independent, Certified Testing and Balancing firm, registered with either the AABC or the NEBB.
- C. The Test and Balance Contractor shall be a subcontractor to the Mechanical Contractor.

## 1.3 SECTION INCLUDES

- A. Testing, adjustment and balancing of air systems.
- B. Measurement of final operating condition of HVAC Systems.
- C. Sound measurement of equipment operating conditions.
- D. Vibration measurement of equipment operating conditions.

## 1.4 SUBMITTALS

- A. Submit under provisions of Section 15500.
- B. Submit name of adjusting and balancing agency for approval within 30 days after Award of Contract.
- C. Field Reports: Submit under provisions of Section 15500.
- D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- E. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
- F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and for inclusion in operating and maintenance manuals.
- G. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Report shall reference the Contract Drawings for location of equipment and devices. Where reference to the contract drawings is not satisfactory, include a set of reduced drawings or sketches with equipment and devices identified to correspond with data sheets.
- H. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

- I. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or NEBB forms.

#### 1.5 QUALITY ASSURANCE

- A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111, and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- B. Maintain one copy of each document on site.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Sequence work under the provisions of Section 15500.
- B. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.
- C. Schedule work under the provisions of Section 15500.
- D. Schedule and provide assistance in final adjustment and test of Smoke Control System with Fire Authority.

### **PART II - PRODUCTS (Not Used)**

### **PART III - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  1. Systems are started and operating in a safe and normal condition.
  2. Control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Ductwork Systems:
    - a. Final filters are clean and in place. If required, install temporary media in addition to final filters.
    - b. Duct systems are clean of debris.
    - c. Fans are rotating correctly.
    - d. Dampers are in place and open.
    - e. Air coil fins are cleaned and combed.
    - f. Access doors are closed and duct end caps are in place.
    - g. Air inlets and outlets are installed and connected.
    - h. Duct system leakage is minimized.
- B. Submit Field Reports: Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

### 3.2 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

### 3.3 INSTALLATION TOLERANCES

- A. HVAC Systems: Adjust to within plus or minus 5 percent of design for supply and return systems and plus or minus 10 percent of design for exhaust systems.
- B. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### 3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of balancing devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### 3.5 AIR SYSTEM PROCEDURE

- A. Adjust equipment and distribution systems to provide required or design air quantities.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure and record air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Adjust air volume by adjusting duct internal devices such as dampers and splitters. Do not utilize opposed blade dampers at air inlets and outlets.
- F. Vary total system air quantities by adjusting sheave position at each fan. Vary branch air quantities by damper regulation.
- G. Measure and record static air pressure conditions at air supply and exhaust units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- H. Adjust settings and minimum set points for motorized and back draft dampers to design conditions.
- I. Measure and record inlet and outlet temperatures at each air supply unit at full cooling and heating capacity.

## 3.6 REPORT FORMS

## A. Forms shall include the following:

1. Title Page:
  - a. Name of Testing, Adjusting and Balancing Agency
  - b. Address of Testing, Adjusting and Balancing Agency
  - c. Telephone number of Testing, Adjusting and Balancing Agency
  - d. Project Name
  - e. Project Location
  - f. Project Architect
  - g. Project Engineer
  - h. Project Contractor
  - i. Project Altitude
  - j. Report Date
2. Summary Comments:
  - a. Design versus final performance
  - b. Notable characteristics of system
  - c. Description of systems operation sequence
  - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
  - e. Nomenclature used throughout report
  - f. Test Conditions
3. Instrument List:
  - a. Instrument
  - b. Manufacturer
  - c. Model Number
  - d. Serial Number
  - e. Range
  - f. Calibration Date
4. Electric Motors:
  - a. Manufacturer
  - b. Model/Frame
  - c. HP/BHP/Efficiency
  - d. Phase, Voltage, Amperage; Nameplate, Actual, No Load
  - e. RPM
  - f. Service Factor
  - g. Starter Size, Rating, Heater Elements
  - h. Sheave Make/Size/Bore
5. V-Belt Drive:
  - a. Identification/Location
  - b. Required Driven RPM
  - c. Driven Sheave, Diameter and RPM
  - d. Belt, Size and Quantity
  - e. Motor Sheave Diameter and RPM
  - f. Center to center distance, maximum, minimum, and actual
6. Equipment Data:
  - a. Identification/number
  - b. Manufacturer
  - c. Model number and Serial number



- d. Capacity
- e. Service
- f. Design flow rate, pressure drop, BHP
  
- g. Actual flow rate, pressure drop, BHP
- h. Temperature readings
  
- 7. Duct Traverse:
  - a. System zone/branch
  - b. Duct size
  - c. Area
  - d. Design velocity
  - e. Design air flow
  - f. Test velocity
  - g. Test air flow
  - h. Duct static pressure
  - i. Air temperature
  - j. Correction factor
  
- 8. Air Distribution Test Sheet:
  - a. Air terminal number
  - b. Room number/location
  - c. Terminal type
  - d. Terminal size
  - e. Area factor
  - f. Design velocity
  - g. Design air flow
  - h. Test (final) velocity
  - i. Test (final) air flow
  - j. Percent of design air flow

### 3.7 SOUND AND VIBRATION TESTING

- A. Test and adjust Mechanical Systems for sound and vibration in accordance with the detailed instructions of the referenced Standards.
  
- B. Sound Level Test and Report:
  - 1. Location
  - 2. Octave Bands - equipment off
  - 3. Octave Bands - equipment on
  
- C. Vibration Test and Report:
  - 1. Location of Points:
    - a. Fan bearing: drive end
    - b. Fan bearing: opposite end
    - c. Motor bearing: center (if applicable)
    - d. Motor bearing: drive end
    - e. Motor bearing: opposite end
    - f. Casing: (bottom or top)
    - g. Casing: (side)
    - h. Duct after flexible connection: (discharge)
    - i. Duct after flexible connection: (suction)
  
  - 2. Test Readings:
    - a. Horizontal, velocity and displacement
    - b. Vertical, velocity and displacement
    - c. Axial, velocity and displacement

3. Normally acceptable readings, velocity and acceleration
4. Unusual conditions at time of test
5. Vibration source (if non-complying)

END OF SECTION 15990

**DIVISION 16: ELECTRICAL**

16010	Basic Electrical Requirements
16050	Basic Electrical Materials and Methods
16100	Raceways, Boxes and Cabinets
16120	Wires and Cables
16140	Wiring Devices
16190	Supporting Devices
16195	Electrical Identification
16452	Grounding
16470	Panel Boards
16476	Disconnects
16515	Interior Lighting



**SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS****PART I - GENERAL**

## 1.1 GENERAL CONDITIONS

- A. The Stipulations and Conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions" and "Special Conditions", hereinbefore set forth, shall apply to this and the other Sections of Division 16.

## 1.2 GENERAL REQUIREMENTS

- A. The General Requirements hereinafter listed apply to the Electrical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

## 1.3 ALTERNATES

- A. Carefully examine all alternates at the back of this Specification and on the Drawings to determine if any work described under the Electrical Section will be affected thereby.

## 1.4 INTENT

- A. The intent of these Drawings and Specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on Drawings and not specifically called for in the Specifications, or any items specified and not specifically indicated or detailed on the Drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Electrical Contractor at his own expense.

## 1.5 DEFINITIONS

- A. The Electrical Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the Electrical systems. All items of equipment are specified in the singular; however, the Electrical Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

## 1.6 VISIT TO THE SITE

- A. The Electrical Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

## 1.7 REGULATORY REQUIREMENTS

- A. All work under this section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern.
- B. The Electrical Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.
- C. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL),

- and National Fire Protection Association (NFPA) are a minimum installation requirement.
- D. The following regulatory shall be used as minimum standards:

AEIC	American Association of Edison Illuminating Companies
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers
NCCM	N.C. Construction Manual w/G.S. as listed
NCSBC	N.C. State Building Code
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
U/L	Underwriters' Laboratories, Inc.
OSHA	Occupational Safety and Health Standards
ASHRAE/IES	90.1 energy code

#### 1.8 TEST STANDARDS

- A. All material and equipment shall be listed, labeled or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., or third party agencies accredited by the North Carolina Building Code Councils latest edition or amendment.

#### 1.9 PERMITS AND FEES

- A. NA

#### 1.10 DRAWINGS AND SPECIFICATIONS

- A. The Electrical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The Drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between General Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Electrical Contractor shall include in his bid the most expensive of the items in conflict.
- B. The Electrical Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No Contractor shall under any circumstances scale drawings for the location of equipment. The Electrical Contractor shall verify the locations of all utility services and electrical equipment.
- C. The Electrical Contractor shall keep at least one set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit Drawings to Architect/Engineer before final payment is made.

#### 1.11 SUPERVISION

- A. The Electrical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels and locating chases, openings, hangers, inserts, sleeves, etc.

**PART II - PRODUCTS****2.1 STANDARD PRODUCTS**

- A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

**2.2 SUBMITTAL**

- A. The Electrical Contractor shall submit, for approval, detailed Shop Drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Electrical Contractor has in his possession the approved Shop Drawing for the particular material or equipment. The Electrical Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.
- B. Submitted material shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specifications governing, Contractor's name and name of job.
- C. Approval of equipment will not relieve the Electrical Contractor of compliance with the Specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other Contractors and suppliers shall be solely the responsibility of the Electrical Contractor and with no additional expense to the Owner.

**2.3 SUBSTITUTIONS**

- A. Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Electrical Contractor shall purchase and install all materials required, unless otherwise noted.
- B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.
- C. All products shall be furnished in compliance with NC General Statute 133-3.

**2.4 PRODUCT HANDLING**

- A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.

- B. The Electrical Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

## 2.5 MATERIALS AND WORKMANSHIP

- A. The Electrical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Electrical Contractor at the Electrical Contractor's expense.
- B. The material used throughout the work, except when otherwise noted, shall be new and of Specification grade and the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.
- C. Any equipment furnished by the Mechanical Contractor or any other Contractor that is larger than those indicated on the Drawings and described in these Specifications or have different Electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

## PART III - EXECUTION

### 3.1 EXCAVATION AND BACKFILL

- A. The Electrical Contractor shall perform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding 4 inches in depth, wetting each layer as it is placed and thoroughly compacting each layer with Mechanical tamper or other approved means. Any damage done during excavation and backfilling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its original condition prior to construction at no expense to the owner. All work will be approved by the Engineer.

### 3.2 SCAFFOLDING, RIGGING AND HOISTING

- A. The Electrical Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

### 3.3 CUTTING AND PATCHING

- A. The Electrical Contractor shall provide all cutting and patching necessary to install the work specified in the 16000 Sections. The patching shall match adjacent surface material and finishes.
- B. No Structural member shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.
- C. Cutting or Holes:
  - 1. Locate holes in advance where they are proposed in the Structural Sections such as ribs or beams. Obtain the approval of the Engineer prior to drilling through Structural Sections.
  - 2. Cut holes through concrete and masonry in new and existing structures with a



diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed.

### 3.4 WATERPROOFING

- A. At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight. All work subject to approval of the Engineer.

### 3.5 EQUIPMENT SPACE AND ARRANGEMENT

- A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Electrical Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements. Working clearances shall be not less than N.E.C or other regulatory requirements.
- B. These drawings indicate the extent and general arrangement of equipment. If any departures are deemed necessary by the Electrical Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after Award of the Contract. No departure shall be made without written approval of the Architect/Engineer. Any delay on the Contractor's part to provide such submittal will not constitute an extension of the Contract time.

### 3.6 DAMAGE TO WORK ALREADY IN PLACE

- A. The Electrical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by Mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

### 3.7 JURISDICTION OF WORK

- A. It may become necessary for the Electrical Contractor to furnish labor or materials which are not generally accepted as part of this trade. In cases of this type, he shall contract the work or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of Trade Agreements as to jurisdiction, alleged or actual.

### 3.8 COORDINATION WITH OTHER TRADES

- A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Electrical Contractor shall make required changes or relocations at no additional cost to the Owner.
- B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, a Ceiling Suspension System may be installed as required for coordination.
- C. The Electrical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of

any work directed shall be borne by the Subcontractor or Contractors directed to do this work.

### 3.9 DIVISION OF WORK

- A. These paragraphs are intended to show exactly the point of division of work between the Electrical Division and the Mechanical Division or any other division.
- C. All equipment covered in the Mechanical Division or any other Division of the Specifications shall be furnished, mounted, and aligned under the respective Division. All starters, controls and wiring for this equipment, including final connection to the same, shall be furnished and installed under that Division.
- D. Divisions of the Specifications shall be completed under the respective Division.
- E. Under Division 16, the Contractor shall be responsible for providing all line side power wiring, conduit, disconnect switches, and junction boxes as shown on the electrical drawings.

### 3.10 EQUIPMENT INSTALLATION

- A. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these Drawings and Specifications.

### 3.11 OPERATION AND MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT". In addition to the requirements specified in Division 1, include the following information for equipment items:
  - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
  - 2. Manufacturer's printed Operating Procedures to include start-up, break-in, and routine and normal Operating Instructions; regulation, control, stopping, shutdown, and emergency instructions and summer and winter operating instructions.
  - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.
  - 4. Servicing Instructions and Lubrication Charts and Schedules.

### 3.12 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT". In addition to the requirements specified in Division 1, indicate installed conditions for:
  - 1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.

2. Equipment locations (exposed and concealed) dimensioned from prominent building lines.
3. Approved substitutions, Contract modifications and actual equipment and materials installed.

### 3.13 GUARANTEE

- A. The Electrical Contractor shall present to the Owner a written guarantee covering his work, including all equipment, material and workmanship. This guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.
- B. Any defective work, equipment, material and/or workmanship that develops within the Guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Electrical Contractor without cost to the Owner.

### 3.14 FINAL INSPECTION

- A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Electrical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.
- B. An authorized Inspector from the North Carolina Department of Insurance shall inspect the project during construction and upon completion of the construction phase. It shall be the responsibility of the Electrical Contractor to notify the Inspector as the work progresses. The NCDOI Inspector can be reached at (919) 661-5880.**

### 3.15 FINAL PAYMENTS

- A. All Final Payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

### 3.16 DOCUMENTATION

- A. All tests shall be completely documented indicated time of day, temperature, and all pertinent test information.
- B. All required documentation of readings shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

END OF SECTION 16010



**SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes limited Scope, General Construction Materials and Methods for Application with Electrical Installations as follows:
  - 1. Miscellaneous metals for support of electrical materials and equipment.
  - 2. Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.

## 1.3 DEFINITIONS

- A. The following definitions apply to excavation operations:
  - 1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.
  - 2. Sub-Base: As used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.
  - 3. Sub-Grade: As used in this Section refers to the compacted soil immediately below the slab or pavement system.
  - 4. Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific direction from the Architect.

## 1.4 SEQUENCE AND SCHEDULING

- A. Coordinate the shut-off and disconnection of electrical service with the Owner and the utility company.

**PART II - PRODUCTS**

## 2.1 SOIL MATERIALS

- A. Sub-Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.
- B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1½ inch sieve, and not more than 5 percent passing a No. 4 sieve.
- C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP; free of clay, rock, or gravel larger than 2 inches

in any dimension; debris; waste; frozen materials; and vegetable and other deleterious matter.

## 2.2 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Fasteners: Zinc-coated, type, grade and class as required.

## PART III - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 EXCAVATION

- A. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.
- B. Install sediment and erosion control measures in accordance with local codes and ordinances.
- C. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
  - 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials.
  - 2. Provide and establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- D. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
  - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
  - 2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.
- E. Trenching: Excavate trenches for electrical installations as follows:
  - 1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of raceways and equipment.

2. Excavate trenches to depth indicated or required.
  3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.
  4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.
- F. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree 2 C).
- G. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.
1. Under walks and pavements, use a combination of sub-base materials and excavated or borrowed materials.
  2. Under building slabs, use drainage fill materials.
  3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
  4. For raceways less than 30 inches below surface of roadways, provide 4-inch thick concrete base slab support. After installation of raceways, provide a 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway sub-base.
  5. Other areas, use excavated or borrowed materials.
- H. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Inspection, testing, approval, and locations of underground utilities have been recorded.
  2. Removal of concrete formwork.
  3. Removal of shoring and bracing and backfilling of voids.
  4. Removal of trash and debris.
- I. Placement and Compaction: Place backfill and fill materials in layers of not more than eight (8) inches in loose depth for material compacted by heavy equipment, and not more than four (4) inches in loose depth for material compacted by hand operated tampers.
- J. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- K. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
- L. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils), 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 (cohesion-less soils).
2. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of material, or 95 percent relative density for cohesionless material.
  - a. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material or 95 percent relative density for cohesionless material.
  - b. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.
3. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.
4. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

### 3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code".

END OF SECTION 16050



**SECTION 16100 - RACEWAYS, BOXES AND CABINETS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Raceways, Fittings, Boxes, Enclosures and Cabinets for Electrical Wiring.

**PART II - PRODUCTS**

## 2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1
- B. Intermediate Metal Conduit: ANSI C80.6
- C. Electrical Metallic Tubing and Fittings: ANSI C80.3 with compression-type fittings.
- D. Flexible Metal Conduit: Zinc coated steel
- E. Liquid tight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.
- F. Fittings: NEMA FB 1, compatible with conduit/tubing materials.
- G. Non-Metallic Rigid Conduit: Schedule 40 pvc as where shown on the drawings.
- H. "MC" type cable.

## 2.2 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1
- B. Cast Metal Boxes: NEMA FB 1, type FD, cast alloy box with gasketed cover

## 2.3 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- C. Pull Boxes: Code gauge steel with screw type removable cover. NEMA rated for the condition.

**PART III - EXECUTION**

## 3.1 EXAMINATION

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been

corrected.

3.2 MINIMUM CONDUIT SIZE: (unless indicated otherwise) on the drawings conduit shall be sized as follows:

- A. Indoors: The minimum conduit size shall be 1/2".
  - 1. Flexible metal conduit may be used for tap connection to recessed lighting fixtures.
- B. Outdoors: Branch circuit conduit installed below grade to exterior equipment shall be one (1) inch minimum unless noted otherwise.

3.3 WIRING METHODS: Unless noted otherwise on the drawings the following materials shall be used:

- A. Outdoors: Use the following wiring methods:
  - 1. Exposed: Rigid or intermediate metal conduit.
  - 2. Underground: Galvanized Rigid Conduit.
  - 3. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquid tight flexible metal conduit.
  - 4. Boxes and Enclosures: NEMA Type 3R or Type 4.
- B. Indoors: Use the following wiring methods:
  - 1. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquid tight flexible metal conduit.
  - 2. Damp or Wet Locations: Rigid steel conduit.
  - 3. Exposed: Electrical metallic tubing above 8 feet and rigid metallic conduit below eight (8) feet.
  - 4. Concealed: Electrical metallic tubing or MC cable.
  - 5. Boxes and Enclosures: NEMA Type 1, except in damp or wet locations use NEMA Type 3R, unless otherwise noted.

3.4 INSTALLATION

- A. Telephone/Data/Cable TV outlet boxes shall be 2 gang with appropriate trim and cover. Coordinate cover plates with Owner.
- B. Provide insulated bushings for all conduit ends.
- C. Conceal rigid conduit and EMT, unless otherwise indicated, within finished walls, ceilings, above attic space and below floors.
- D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.
- E. Install raceways level and square and at proper elevations. Provide adequate headroom.
- F. Complete raceway installation before starting conductor installation.

- G. Use temporary closures to prevent foreign matter from entering raceway.
- H. Protect stubs from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- I. **Where non-metallic conduit is shown to be used below the slab provide rigid conduit to turn up into the building space or at all exterior walls, poles or equipment.**
- J. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.
- K. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated. Where the number of bends exceed the total number required by the N.E.C., provide pull boxes as required by code.
- L. Install raceways parallel to or at right angles to surfaces or structural members, and follow the surface contours as much as practical.
  - 1. Run parallel or banked raceways together, on common supports where practical.
  - 2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.
- M. Join raceways with fittings designed and approved for the purpose and make joints tight.
  - 1. Use bonding jumpers where joints cannot be made tight.
  - 2. Use insulating bushings to protect conductors.
  - 3. Provide expansion joint fittings where required for the raceway used.
- N. IMC and GRC shall terminate with either a double locknut/bushing set or in a threaded hub.
- O. Where conduit type "LB" fittings are used all conduits on conduits over 2" in size shall be "MOGAL" type.
- P. **"EMT" connectors shall be steel plated hexagonal compression type only. Do not use pot metal, set-screw, or indenter type connectors.**
- Q. Where concentric, eccentric, or oversized knockouts are encountered, a grounding-type insulated bushing shall be provided.
- R. Where conduits of any type pass over a building expansion joint, a standard "expansion joint" fitting, compatible with the type raceway, shall be provided.
- S. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.
- T. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the

raceway so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

- U. Install pull cords in all empty raceways. Use monofilament plastic line having not less than 200-lb (90 kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull cord.
- V. Telephone and Signal System Raceways 2 Inch Trade Size and Smaller: In addition to the above requirements, install in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements. Pull boxes shall be a minimum of 10" square x 6" deep with removable cover.
- W. Install raceway sealing fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
  - 1. Where conduits enter or leave hazardous classified locations.
  - 2. Where conduits pass from warm locations to cold locations, such as exterior spaces and air-conditioned spaces.
  - 3. Where otherwise required by the NEC.
- X. Stub-Up Connections: Extend conduits through concrete floor a minimum of 6" for connection to freestanding equipment. Extend conductors to equipment with flexible metal conduit. Where equipment connections are not made under this Contract verify the length of the flexible connectors.
- Y. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor.
- AA. Provide grounding connections for raceway, boxes and components. Tighten connectors and terminals according to tightening torques specified in UL Standard 486A.
- BB. All underground raceways shall be identified by "UNDERGROUND LINE MARKING TAPE" located directly above the raceway at 6" below finished grade. Tape shall be permanent, bright-colored, continuous, magnetic strip, printed, plastic tape compounded for direct burial not less than 6" wide and 4 mils thick. Printed legend shall be indicative of the service it is marking. Provide sufficient tape not less than 2/3 of the width of the item marked for the full length of the Raceway.
- CC. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the sub-up out of the slab or earth shall be rigid steel.
- DD. Where shown to be used on the drawings PVC non-metallic conduit used exterior to the building for grouped circuits it shall be encased in a minimum of 3" of 3000 psi rated concrete. Concrete encased non-metallic ducts shall be supported on plastic separators coordinated with duct size and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Secure separators to the earth and to ducts to prevent floating during placement of concrete. Do not use steel or tie wires in such a way to form conductive or magnetic loops around ducts or duct groups.
- EE. The Raceway System shall not be relied on for grounding continuity. A green grounding conductor, properly sized per NEC Table 250-122, shall be run in all power raceways.

- FF. Where non-metallic conduit is allowed on the drawings all bends and off-sets shall be made by approved mechanical benders per the manufacturers instruction. Any conduit not in compliance will be removed.

### 3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to paint finishes with matching touch-up coating recommended by the manufacturer.

### 3.6 CLEANING

- A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt and construction debris and repair damaged finish, including chips.

END OF SECTION 16100



**SECTION 16120 - WIRES AND CABLES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Building Wires and Cables and Associated Splices, Connectors and Terminations for Wiring Systems rated 600 Volts and Less.

**PART II - PRODUCTS**

## 2.1 BUILDING WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Applications" Article.
- B. Rubber Insulation: Conform to NEMA WC 3.
- C. Thermoplastic Insulation: Conform to NEMA WC 5.
- D. Cross-Linked Polyethylene Insulation: Conform to NEMA WC 7.
- E. Ethylene Propylene Rubber Insulation: Conform to NEMA WC 8.
- F. Solid conductor for 10 AWG and smaller: Stranded conductor for larger than 10 AWG.

## 2.2 CONNECTORS AND SPLICES

- A. UL-listed factory fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.

**PART III - EXECUTION**

## 3.1 EXAMINATION

- A. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

## 3.2 APPLICATIONS

- A. Feeders and Branch Circuits: Type THHN\THWN or XHHW, copper conductor, in raceway.

## 3.3 INSTALLATION

- A. All conductors shall be copper.
- B. Minimum conductor size for power and lighting circuits shall be #12 AWG. Maximum conductor size shall be 500 KCMIL AWG.

- C. All power and lighting circuits #10 awg and smaller shall be solid copper conductors. Conductor sizes #8 awg and larger shall be Class "B" stranded copper conductors.
- D. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.
  - 1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
  - 2. Use pulling means, including fish tape, cable, rope, and basket weave wire/cable grips that will not damage cables or raceway.
- E. Conductor Splices: Keep to minimum.
- F. Wiring at Outlets: Install with at least 8 inches of slack conductor at each outlet.
- G. Connect outlets and components to wiring and to ground as indicated. Tighten to UL Standard 486A.
- H. Power and Lighting circuits shall have individual neutral conductors.**
- I. All power circuits noted for computer equipment with isolated grounding shall be individually installed in a separate conduit with separate phase, neutral conductor, grounding conductor, and isolated grounding conductor, unless noted otherwise.
- J. In no case shall any wire installed to a device exceed the U.L. rating of the device.

#### 3.4 SPLICING

- A. Joints in solid conductors shall be using Idea "wire nuts", 3M Company "scotch lock", or "T&B" "PIGGY" connectors in junction boxes, outlet boxes and lighting fixtures.
- B. "Sta-kon" or other permanent type crimp connectors shall not be used for branch circuit connections.
- C. Joints in stranded conductors shall be spliced by approved mechanical connectors. Solderless mechanical connectors similar to "NSI" multi-cable connector blocks for splices and taps, provided with UL approved insulating covers, may be used instead of mechanical connectors plus tape.
- D. Conductors in all cases, shall be continuous from outlet to outlet unless "taps" are required and shall be made only within outlet, junction boxes, troughs and gutters.

#### 3.5 VOLTAGE DROP

- A. Where conductor length from the panel to the first outlet on a 120 volt circuit exceeds 100 feet, the branch circuit conductors from the panel to the first outlet shall be not smaller than #10 awg.

#### 3.6 FIELD QUALITY CONTROL

- A. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1.Procedures: Perform each Visual and Mechanical Inspection and Electrical Test stated in NETA Standard ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Correct malfunctioning products at site, where possible, and re-test to demonstrate



compliance; otherwise, remove and replace with new units and re-test.

3.7 ELECTRICAL TESTING

A. Feeder Insulation Resistance Testing:

1. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt megger. The procedures listed below shall be followed:
2. Minimum readings shall be one million (1,000,000) or more ohms for # 6 AWG wire and smaller, 250,000 ohms or more for #4 wire or larger, between conductor and the grounding conductor.
3. After all devices and equipment are installed and all connections completed to each panel, the Contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the Contractor shall disconnect the branch circuit neutral wires from the neutral bar. Test each neutral conductor separately until the low readings are found. The Contractor shall correct troubles, reconnect and re-test until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
4. The Contractor shall send a letter to the Engineer certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.
5. At the final inspection, the Contractor shall furnish a megger and show the Engineers that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and a voltmeter and take current and voltage readings as directed by the representatives.

END OF SECTION 16120



**SECTION 16140 - WIRING DEVICES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes various types of receptacles, connectors, switches and finish plates.

## 1.3 SUBMITTALS

- A. Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each product specified.

**PART II - PRODUCTS**

## 2.1 WIRING DEVICES

- A. Comply with NEMA Standard WD 1-101968, "General Purpose Wiring Devices".
- B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.
- C. Color: Selected by Architect.
- D. Duplex receptacles shall be of the grounding type arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall be straight blade, rated 20 amp, 125 volt and the face configuration shall conform to the NEMA Standard No. WDI.101968, and shall be approved third party listed. Self-grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct green insulated conductor connection to the equipment grounding system. Receptacles shall be specification grade mounted vertically.
- E. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicated, and with the following additional requirements:
  - 1. Ground Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, "Ground Fault Circuit Interrupters" with integral NEMA 5-20R duplex receptacle. Design units for installation in a 2¾ inch (70-mm) deep outlet box without an adapter.
  - 2. Isolated Ground Receptacles: Equipment grounding contacts are connected only to the green grounding screw terminal of the device and have inherent electrical isolation from the mounting strap.
    - a. Devices: Listed and labeled as isolated ground receptacles.
    - b. Isolation Method: Integral to the receptacle construction and not dependent on removable parts.
    - c. Color: Orange with "green" triangle.

- F. Receptacles, Industrial Heavy-Duty: Conform to NEMA Standard PK 4 "Plugs, Receptacles and Cable Connectors of the Pin and Sleeve type for Industrial Use".
- G. Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.
- H. Single pole and three/four-way toggle type Snap Switches: Shall be 20 amp 120/277v. a.c. rated, quiet-type a.c. switches, NRTL listed and labeled as complying with UL Standard 20 "General Use Snap Switches" and with Federal Specification W-S-896. Color selected by Architect.
- I. Dimmer Switches: Modular full-wave solid-state units with integral, quiet On/Off switches, and audible and electromagnetic noise filters. See plans for model numbers.
  - 1. Wattage rating shall be 2000 watts minimum, except as otherwise indicated.
  - 2. Control: Continuously adjustable slide or toggle. Single pole or 3-way switch to suit conditions.
- J. Motion Sensor Switches
  - 1. Single Pole-single switching- Hubbell Model LHMTS1
  - 2. Single Pole-double switching-Hubbell Model LMHTD2
  - 3. Switches shall be combination ultrasonic and passive infrared.
  - 4. 100 square foot coverage, 180 degree.
  - 5. 120 volt: 800 watt incandescent, 1000 watt fluorescent.
  - 6. 277 volt, 1800 watt fluorescent.
  - 7. 5 year warranty.
  - 8. Equals by Wattstopper and Lutron.
- K. Wall Plates: Single and combination types that mate and match with corresponding wiring devices. Features include the following:
  - 1. Color: Matches wiring device except as otherwise indicate.
  - 2. Plate-Securing Screws: Metal with heads colored to match plate finish

## 2.2 FLOOR SERVICE OUTLET ASSEMBLIES

- A. Types: Modular, above-floor, or recessed in floor, dual service units suitable for the wiring method indicated.
- B. Compartmentation: Barrier separates power and signal compartments.
- C. Housing Material: Die-cast aluminum, satin finished.
- D. Power Receptacle: NEMA configuration 5-20R, ivory finish, except as otherwise indicated.
- E. Signal Outlet: Blank cover with bushed cable opening, except as otherwise indicated.

### 2.3 MULTI-OUTLET ASSEMBLIES

- A. Comply with Standard UL 5, "Surface Metal Raceways and Fittings".
- B. Components of Assemblies: Products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.
- C. Raceway Material: Metal with manufacturer's standard corrosion-resistant finish.

## PART III - EXECUTION

### 3.1 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.
  - 1. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- C. Protect devices and assemblies during painting.
- D. Adjust locations at which floor service outlets are installed to suit the indicated arrangement of partitions and furnishings.
- E. Field verify the actual location of all outlet devices above equipment or counter tops before rough-in and installation. Any outlet installed in conflict with equipment or conditions that could have been avoided, will be corrected at the Contractor's expense.
- F. Provide weatherproof cast aluminum cover plates for all device's exterior to the building or in "wet" locations, Hubbell WP26M or equal. Ensure covers for outdoor receptacles are Extra Duty rated per 2017 NEC 406.9(B)(1).
- G. GFCI protection shall be provided for all receptacles exterior to the building, in restrooms or where required by Code.
- H. Locate all receptacles in rated walls with 24" minimum horizontal separation. This includes devices located opposite each other in the walls.

### 3.2 IDENTIFICATION

- A. Comply with Division 16 Section "Electrical Identification".
  - 1. Switches: Where 3 or more switches are ganged and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.
  - 2. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

### 3.3 GROUNDING

- A. Isolated Ground Receptacles: Connect to isolated grounding conductor routed to designated isolated equipment ground terminal of Electrical System.

### 3.3 FIELD QUALITY CONTROL

- A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least six (6) times.
- B. Test ground-fault circuit interrupter operation with both local and remote fault simulations according to manufacturer recommendations.
- C. Replace damaged or defective components.

### 3.4 CLEANING

- A. General: Internally clean devices, device outlet boxes and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 16140

**SECTION 16190 - SUPPORTING DEVICES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes secure support from the building structure for Electrical items by means of Hangers, Supports, Anchors, Sleeves, Inserts, Seals and Associated Fastenings.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.

**PART II - PRODUCTS**

## 2.1 COATINGS

- A. Coating: Supports, support hardware and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish and inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

## 2.2 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C clamps with retainers, ceiling trapeze hangers, wall brackets and spring steel clamps.
  - 1. Expansion Anchors: Carbon steel wedge or sleeve type.
  - 2. Toggle Bolts: All steel spring-head type.
- B. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps and cap screws.
- C. U-Channel Systems: 16-gage steel channels, with 9/16-inch diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

## 2.3 FABRICATED SUPPORTING DEVICES

- A. General: Shop or field fabricated supports or manufactured supports assembled from U-Channel components.
- B. Steel Brackets: Fabricated of angles, channels and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snap-lock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
    - a. 3-inch and smaller: 20-gage
    - b. 4-inch to 6-inch: 16-gage
  2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
  3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

### PART III - EXECUTION

#### 3.1 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
  1. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
  2. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
  3. Support parallel runs of horizontal raceways together on trapeze-type hangers.
  4. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use ¼ inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
  5. Space supports for raceway's types not covered by the above in accordance with NEC.
  6. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
  7. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
  8. In interior spaces provide a minimum of ¼ inch space for all conduits installed on the exterior building walls. Approved "clamp-back" or strut devices shall be used.



- D. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers and other devices.
- E. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- F. Conduit Seals: Install bushing seals for conduit penetrations of slabs on grade and exterior walls below grade. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- G. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, bus ways, cabinets, panelboards, transformers, boxes, disconnect switches and control components in accordance with the following:
  - 1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry and machine screws, welded threaded studs, or spring-tension clamps on steel. Do not weld conduit, pipe straps or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

END OF SECTION 16190



**SECTION 16195 - ELECTRICAL IDENTIFICATION****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Identification of Electrical Materials, Equipment and Installations.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Ideal Industries, Inc.
  - 2. National Band and Tag Co.
  - 3. Panduit Corp.
  - 4. Seton Name Plate Co.
  - 5. Standard Signs, Inc.
  - 6. W.H. Brady, Co.

## 2.2 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width. Colors to match color schemes noted herein.
- B. Underground Line Marking Tape: Permanent, bright colored, continuous printed, metallic strip, plastic tape compounded for direct burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- C. Wire/Cable Designation Tape Markers: Vinyl or vinyl cloth, self adhesive, wrap-around, cable/conductor markers with pre-printed numbers and letter.
- D. Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, switchboard branch breakers, motor control centers and other electrical equipment. Nameplates shall be securely attached with self-tapping stainless steel screws, if the screw end is protected; otherwise rivets shall be used. Letters shall be approximately 1/2" high minimum. Embossed self-adhesive tape is not acceptable for marking equipment.
- E. Cable Ties: Fungus inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50 degrees F to 350 degrees F. Provide ties in specified colors when used for color coding.

**PART III - EXECUTION**

**3.1 INSTALLATION**

- A. Lettering and Graphics: Coordinate names, abbreviations, colors and other designations used in Electrical Identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.
- B. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- C. Identify Junction, Pull, and Connection Boxes: Install on outside of box cover. Label box covers with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels concealed boxes. Color code boxes as indicated below. Method shall be by colored adhesive not less than 4 square inches for 4" boxes and larger boxes. Permanent type "magic" markers are not accepted as a means of identification.

120/208 volt blue

- D. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal and communications lines, install continuous underground plastic line marker, located directly above line at 6 inches below finished grade where multiple lines are installed in a common trench or concrete envelope. Provide marker tape to cover 2/3 of the overall width.
- E. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

<u>230/120 Volts</u>	<u>Phase</u>
Black	A
Red	B
White	Neutral
Green	Ground

- G. Use conductors with color factory-applied the entire length of the conductors except as follows:
  - 1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
    - a. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration minimum width 2".
- H. Tag or label conductors as follows:
  - 1. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at

terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.

2. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- I. Install equipment/system circuit/device identification as follows:
    1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2 inch high lettering on 1½ inch high label (2 inch high where two lines are required), white lettering in blue field for normal power equipment other face colors shall match the equipment served. Text shall match terminology and numbering of the Contract Documents and shop drawings.
    2. All Phenolic labels shall be securely attached to the equipment by self-tapping stainless steel screws.
    3. Name plate colors shall be as follows:

....Blue surface with white core for 120/230 Volt Equipment.
  - J. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker. Pencil in all spare and leave spaces blank.
  - K. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme specified. This includes covers on boxes above lay-in and other type accessible ceilings.
  - L. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by pressure sensitive label applied to the conduit or outlet; designate "use" and "location served".

END OF SECTION 16195



**SECTION 16452 - GROUNDING****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Solid Grounding of Electrical Systems and Equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

## 1.3 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

**PART II - PRODUCTS**

## 2.1 GROUNDING AND BONDING PRODUCTS

- A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.
- B. Conductor Materials: Copper

## 2.2 WIRE AND CABLE CONDUCTORS

- A. General: Comply with Division 16 Section "Wires and Cables". Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
- B. Equipment Grounding Conductor: Green insulated
- C. Grounding Electrode Conductor: Stranded cable
- D. Bare Copper Conductors: Conform to the following:
  - 1. Solid Conductors: ASTM B-3
  - 2. Assembly of Stranded Conductors: ASTM B-8
  - 3. Tinned Conductors: ASTM B-33

## 2.3 MISCELLANEOUS CONDUCTORS

- A. Ground Bus: Bare annealed copper bars of rectangular cross section, full-size rated.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.
- C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

## 2.4 CONNECTOR PRODUCTS

- A. General: Listed and labeled as Grounding Connectors for the materials used.
- B. Pressure Connectors: High conductivity-plated units
- C. Bolted Clamps: Heavy-duty units listed for the application

## 2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel with high strength steel core and electrolytic grade copper outer sheath, molten welded to core.
  - 1. Size: 3/4 inch by 10 feet

## PART III - EXECUTION

### 3.1 APPLICATION

- A. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.
  - 1. The raceway system shall not be relied on for ground continuity .Install an equipment ground conductor in all power related conduits. Size conductor as required by NEC Table 250-122. Data and Signal conduits do not require a separate grounding conductor unless required by the manufacturer of the equipment to be installed.
- C. Signal and Communications: For telephone, alarm, and communication systems, provide a #6 AWG minimum green insulated copper conductor in raceway from the grounding electrode system to each terminal equipment location. Leave 3' pigtail wiring at termination point where equipment boards are shown. Make direct connection where equipment is provided.

### 3.2 INSTALLATION

- A. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.
- B. The electrical service shall be grounded by three (3) means:
  - 1. To the cold water main, if metallic and in direct contact with the earth for at least 10 feet as per the NEC Article 250-81.
  - 2. To the steel frame of the building, provided the building frame is effectively grounded.
  - 3. To ground rod(s)
- C. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use 3/4 inch by 10 ft. ground rods except as otherwise indicated. Drive rods until tops are 6



inches below finished floor or final grade except as otherwise indicated. All ground connections shall be accessible.

- D. Metallic Water Service Pipe: Provide insulated copper ground conductors, sized as indicated, in conduit from the building main service equipment, or the ground bus, to main metallic water service entrances to the building. Connect ground conductors to the main metallic water service pipes by means of ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fitting. Do not install a grounding jumper around dielectric fittings. Bond the ground conductor conduit to the conductor at each end.
- E. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

### 3.3 CONNECTIONS

- A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
  - 2. Make connections with clean bare metal at points of contact.
  - 3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
  - 4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.
- C. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- D. Compression-Type Connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

### 3.4 FIELD QUALITY CONTROL

- A. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being

moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2 point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System".

B. Service Grounding Test

1. After completion of the electrical grounding and bonding systems, test the ground resistance with a ground resistance tester. Where test shown resistance-to-ground is over 25 ohms, provide additional ground rods until the minimum of 25 ohms is achieved.

C. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are detected that exceed those indicated the provisions of the Contract, covering changes will apply.

D. Report: Prepare test reports of the ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.5 CLEANING AND ADJUSTING

A. Restore surface features at areas disturbed by excavation and re-establish original grades. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition. Include necessary topsoil, fertilizing, liming, seeding, sodding, sprigging, or mulching.

END OF SECTION 16452

**SECTION 16470 – PANEL BOARDS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Lighting and Power Panel Boards and Associated Auxiliary Equipment Rated 600 V or Less

## 1.3 DEFINITIONS

- A. Panel Boards: A panel board with thermal magnetic circuit-breaker branches, designed for residential and light commercial projects, operating at 600 V and below, available in both single and 3-phase versions, and equipped with combination flush/surface mounting trim.
- B. Over-current Protective Device (OCPD): A device operative on excessive current that causes and maintains the interruption of power in the circuit it protects.

## 1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type panel board, accessory item, and component specified.
- C. Shop Drawings from manufacturers of panel boards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features and voltage rating.
- D. Include the following:
  - 1. Enclosure type with details for types other than NEMA Type 1.
  - 2. Bus configuration and current ratings.
  - 3. Short-circuit current rating of panelboard.
  - 4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

## 1.5 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  - 1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code".
- C. NEMA Standard: Comply with NEMA PB1, "Panel Boards".
- D. UL Standards: Comply with UL 61, "Panel Boards", and UL 50, "Cabinets and Boxes".

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

## A. Acceptable Manufacturers:

1. Cutler Hammer
2. Square D
3. Siemens

## 2.2 PANELBOARDS - GENERAL REQUIREMENTS

- A. Over-current Protective Devices (OCPDs): Provide type, rating, and features as indicated on the schedules. Tandem circuit breakers shall not be used. Multiple breakers shall have common trip.
- B. Circuit Breakers shall be bolt-on type.
- C. 100% rated copper Ground and Neutral Bus (unless noted otherwise).
- D. Enclosures: Cabinets, flush or surface mounted as indicated. NEMA Type 1 enclosure.
- E. Front: Secured to box with concealed trim clamps except as indicated. Front for surface-mounted panels shall be same dimensions as box. Fronts for flush panels shall overlap box except as otherwise specified.
- F. Directory Frame: Metal, mounted inside each panel door.
- G. Bus: Hard drawn copper of 98 percent conductivity
- H. Main and Neutral Lugs: Bolt-on type
- I. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors.
- K. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the OCPD ampere ratings indicated for future installation of devices.
- L. Feed-through panels are not permitted.
- M. The use of series breakers is not permitted.
- N. Flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 and NFPA 70E requirements.

## 2.3 IDENTIFICATION

- A. Panel Board Nameplates: Engraved laminated plastic or metal nameplate for each panel board mounted with self-tapping stainless steel screws.

**PART III - EXECUTION**

## 3.1 INSTALLATION

- A. General: Install panel boards and accessory items in accordance with NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panel Boards

- B. Rated 600 Volts or Less" and manufacturers' written installation instructions.  
Mounting Heights: Top of trim 6'-2" above finished floor, except as indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.
- D. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval before installing. Pencil all spares. Spaces shall be left blank.
- E. Install filler plates in unused spaces.
- F. Provision for Future Circuits at Flush Panel Boards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future.
- G. Wiring in Panel Gutters: Train conductors neatly in groups, bundle and wrap with wire ties after completion of load balancing.

### 3.2 GROUNDING

- A. Connections: Make equipment grounding connections for panelboards as indicated.
- B. Provide ground continuity to main electrical ground bus indicated.

### 3.3 CONNECTIONS

- A. All connections shall be provided per UL 486A and UL 486B.

### 3.4 FIELD QUALITY CONTROL

- A. Quality Control Program: Conform to the following:
  - 1. Procedures: Field tests and Inspections will be made by the Engineer at time of completion of the work and in accordance these Specifications.
  - 2. Schedule tests with at least one (1) week in advance notification.
- B. Visual and Mechanical Inspection: Include the following inspections and related work:
  - 1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date Drawings and Panel Board Schedules.
  - 2. Exercise and perform of operational tests of all Mechanical components and other operable devices in accordance with manufacturer's Instruction Manual.
  - 3. Check panel board mounting, area clearances and alignment and fit of components.
  - 4. Check tightness of bolted electrical connections with calibrated torque wrench.

### 3.5 CLEANING

- A. Upon completion of installation, inspect interior and exterior of panel boards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.



**SECTION 16476 – DISCONNECTS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Equipment and Service disconnects.

## 1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for Switches and Accessories specified in this Section.

## 1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code", Article 100.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Cutler-Hammer Products; Eaton Corp.
  - 2. Siemens
  - 3. Square D Company

## 2.2 ENCLOSED SWITCHES

- A. Enclosed Non-Fusible Switch: NEMA KS 1, Type HD, handle lockable with 2 padlocks.
- B. Enclosed Fusible Switch, 800 Amperes and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.
- C. Enclosure: NEMA KS 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.
- D. Outdoor Locations: Type 3R
- E. Other Wet or Damp Indoor Locations: Type 4
- F. All switches shall be "Heavy Duty" rated for the voltage required.
- G. Coordinate all fuse rated switches with the equipment to be furnished. Furnish fuses.

- H. Safety switches shall be third-party listed.
- I. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the open position.
- J. Switches shall have handles whose positions are easily recognizable in the "on" or "off" position. For safety reasons, padlocks shall be provided for switches located in the public areas.
- K. Switches shall have nontearable, positive, quick make-quick-break mechanisms.
- L. Switches shall be properly labeled. See section 16195, Electrical Identification.

### **PART III - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install enclosed switches level and plumb.
- B. Where fuses are required, the fuses shall be matched with the equipment supplier's requirements.
- C. Provide one additional set of fuses for each disconnect switch.

#### **3.2 FIELD QUALITY CONTROL**

- A. Testing: After installing enclosed switches and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
- B. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance. Otherwise, remove and replace with new units and re-test.

#### **3.3 CLEANING**

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, construction debris and repair damaged finish including chips, scratches and abrasions.

END OF SECTION 16476



**SECTION 16515 - INTERIOR LIGHTING****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:
  - 1. Outline drawings of fixtures indicating dimensions and principal features.
  - 2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.
  - 3. Data on batteries and chargers of emergency lighting units.
  - 4. Shop Drawings from manufacturers detailing non-standard fixtures and indicating dimensions, weights, methods of field assembly, components, features and accessories.
  - 5. Non-returnable samples, when requested by Engineer, for verification purposes of specific individual fixtures.

## 1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Listing and Labeling: Provide fixtures that are listed and labeled for their indicated use on the Project.
- C. Coordination of Fixtures With Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system. Provide plaster or sheet-rock trims when required on the project whether indicated or not at no additional cost to the Owner. Coordinate with Architectural Plans before ordering fixtures.

## 1.5 WARRANTY

- A. Minimum warranty period on emergency lights shall be three (3) years from date acceptance. Warranty shall include all parts (less lamps).
- B. All other lighting products shall be warranted for a period of not less than 1 year from date of acceptance. This warranty does not include miscellaneous parts which are external to the product (i.e. lamps) which are considered maintenance item.

**PART II - PRODUCTS**

## 2.1 FIXTURES - GENERAL

- A. Comply with the requirements specified in the Articles below and the Lighting Fixture Schedule on the Drawings.

## 2.2 FIXTURE COMPONENTS - GENERAL

- A. Metal Parts: Free from burrs and sharp corners and edges.
- B. Sheet Metal Components: Steel, except as indicated. Components are formed and supported to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in the operating position. Light seal strips inside the fixture will not be allowed.
- D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
- |                                     |            |
|-------------------------------------|------------|
| 1. White Surfaces:                  | 85 percent |
| 2. Specular Surfaces:               | 83 percent |
| 3. Diffusing Specular Surfaces:     | 75 percent |
| 4. Laminated Silver Metalized Film: | 90 percent |
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic
- |   |  |
|---|--|
| 1. Plastic: Highly resistance to yellowing and other changes due to aging, exposure to heat and UV radiation. |  |
| 2. Lens Thickness: 0.125 inches minimum   |  |

## 2.3 SUSPENDED FIXTURE SUPPORT COMPONENTS

- A. Single-Stem Hangers: ½ inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
- B. Twin-Stem Hangers: Two, ½ inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
- C. Rod Hangers: 3/16 inch diameter cadmium plated, threaded steel rod.

## 2.4 FLUORESCENT FIXTURES

- A. Electronic Ballast:
- |   |  |
|---|--|
| 1. Ballast to be "UL listed, Class P".  |  |
| 2. Ballast to be "Sound Rated A".   |  |
| 3. Ballast enclosure size shall be same as or smaller than, magnetic ballast. |  |

4. Light regulation shall be +/- 10% input voltage variation.
  5. Ballast shall have high power factor (minimum of 90%).
  6. Lamp current crest factor shall be equal to, or less than, 1.7.
  7. Input current third harmonics shall not exceed ANSI recommendations (32% total harmonic distortion, 27.5% of the third triplets).
  8. Flicker shall be 15% or less with any lamp suitable for the ballast.
  9. Ballast design shall withstand line transients per IEEE 587, Category A.
  10. Ballast case temperature shall not exceed 25 degrees C rise over 40 degrees C ambient.
  11. Ballast shall meet FCC Rules and Regulations, Part 18.
  12. Parallel wiring between the ballast and fixture is recommended.
  13. Minimum of five (5) years warranty is required with each electronic ballast.
  14. The manufacturer shall have not less than 5 years of experience in manufacturing electronic ballast.
- B. Provide disconnecting means per NEC 410.130 G.
- C. Low Temperature Ballast Minimum Starting Temperature: Minus 20 degrees C
- D. Where compact fluorescent light fixtures are specified, "High Power Factor" electronic ballast shall be standard.

## 2.5 FLUORESCENT LAMPS

- A. All fluorescent lamps to be {41} K-rated unless noted otherwise.

## 2.6 EXIT SIGNS

- A. Conform to UL 924, "Emergency Lighting and Power Equipment".
1. Arrows: Include as indicated.
- B. Emergency Exit Signs shall be of the "LED" style.
- C. Units shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy code, NFPA-101, and NEMA Standards.
- D. BATTERY-It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and – negative terminal.
- E. CHARGER- It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD

battery is used to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

- F. ADDITIONAL FEATURES- Pilot light to indicate the unit is connected to AC power. The battery shall have rate discharge pilot light, unless self-diagnostic type. Test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.
- G. WARRANTY-The entire unit shall be warranted for 3 years. The battery must have an additional 2 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.
- H. LED-The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.

## 2.7 EMERGENCY LIGHTING UNITS

- A. Conform to UL 924, "Emergency Lighting and Power Equipment" requirements for "Unit Equipment". Provide self-contained units with the following features and additional characteristics as indicated.
- B. Units shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy code, NFPA-101, and NEMA Standards.
- C. BATTERY-It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and – negative terminal.
- D. CHARGER- It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD battery is used to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.
- E. ADDITIONAL FEATURES- Pilot light to indicate the unit is connected to AC power. The battery shall have rate discharge pilot light, unless self-diagnostic type. Test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.
- F. WARRANTY-The entire unit shall be warranted for 3 years. The battery must have an additional 2 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

## 2.8 FINISH

- A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.
- B. Paint parts after fabrication.

## PART III – EXECUTION

### 3.1 INSTALLATION

- A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved Shop Drawings.
- B. Support For Recessed and Semi-Recessed Fixtures: Units shall be supported independent from suspended ceiling. Install fixture with support wires at 2 diagonal corners to the structure or building steel.
  - 1. Fixtures of Sizes Less Than Ceiling Grid: Center in the acoustical panel. Support fixtures independently with at least two  $\frac{3}{4}$  inch metal channels spanning and secured to the ceiling tees.
  - 2. Install support clips or screws for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corners.
  - 3. Support wires shall be not less than the support wires for the ceiling system.
- C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit swinging. Support stem mounted single unit suspended fluorescent fixtures with twin stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.
- D. Lamping: See Schedule on Drawings, or provide standard lamp for the rating of the fixture.
- E. Where mounting height for fixtures are not scheduled, coordinate with the Engineer before any installation.

### 3.2 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Emergency Battery Units Test: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy for a period of not less than 90 minutes to demonstrate proper operation of Emergency Lighting installation. Include the following in tests of emergency lighting equipment.
  - 1. Duration of supply
  - 2. Low battery voltage shut-down
  - 3. Normal transfer to battery source and retransfer to normal
  - 4. Low supply voltage transfer
- C. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.
- D. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced and tested again. Copy of the test report shall be sent to the State Construction Office.

### 3.3 ADJUSTING AND CLEANING

- A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.

- B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16515

**DIVISION 15A - PLUMBING**

15010	Basic Plumbing Requirements
15140	Hangers and Supports
15190	Plumbing Identification
15250	Plumbing Piping Insulation
15410	Plumbing Piping
15430	Plumbing Specialties
15440	Plumbing Fixtures
15450	Water Heaters





**SECTION 15010 - BASIC PLUMBING REQUIREMENTS****PART I - GENERAL**

## 1.1 GENERAL CONDITIONS

- A. The stipulations and conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", hereinbefore set forth, shall apply to this and the other Sections of Division 15A.

## 1.2 GENERAL REQUIREMENTS

- A. The General Requirements hereinafter listed apply to the Plumbing Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

## 1.3 ALTERNATES

- A. Carefully examine all alternates at the back of this specification to determine if any work described under the Plumbing Section will be affected thereby.

## 1.4 INTENT

- A. The intent of these drawings and specifications are to describe the installation of a complete, fully adjusted and operational system. Therefore, any items shown on drawings and not specifically called for in the specifications, or any items specified and not specifically indicated or detailed on the drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Plumbing Contractor at his own expense.

## 1.5 DEFINITIONS

- A. The Plumbing Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the plumbing systems. All items of equipment are specified in the singular; however, the Plumbing Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

## 1.6 VISIT TO THE SITE

The Plumbing Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

## 1.7 REGULATORY REQUIREMENTS

- A. All work under this Section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern. The Plumbing Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

## 1.8 PERMITS AND FEES

### A. NA

## 1.9 DRAWINGS AND SPECIFICATIONS

- A. The Plumbing Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between General Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Plumbing Contractor shall figure on the most expensive of the items in conflict.
- B. The Plumbing Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. The Plumbing Contractor shall not under any circumstances scale drawings for the location of equipment. The Plumbing Contractor shall verify the locations of all utility services.
- C. The Plumbing Contractor shall keep at least one set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

## 1.10 SUPERVISION

- A. The Plumbing Contractor performing the work specified shall be required to employ a qualified Superintendent or Foreman to continuously supervise the installation of their work, with authorization to act as agent. Contractors: He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels, and locating chases, openings, hangers, inserts, sleeves, etc.

## **PART II - PRODUCTS**

### 2.1 STANDARD PRODUCTS

- A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

### 2.2 SUBMITTAL

- A. The Plumbing Contractor shall submit, for approval, detailed shop drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Plumbing Contractor has in his possession the approved shop drawing for the particular material or equipment. The Plumbing Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.
- B. Submitted material shall be properly labeled indicating specific service for which material or equipment to be used, section and article number of specifications governing, Contractor's name and name of job.

**SECTION 15140 - HANGERS AND SUPPORTS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Hangers and Supports for Plumbing Systems Piping and Equipment.

**PART II - PRODUCTS**

## 2.1 PIPE HANGERS AND SUPPORTS

- A. Hangers: Galvanized carbon steel, adjustable, clevis
- B. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- C. Vertical Support: Steel riser clamp
- D. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- E. Shield for Insulated Piping 2 Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- F. Sheet metal saddles must be  $\frac{1}{2}$  the circumference of the insulation, turned up or rounded at the corners to avoid damage to the vapor barrier.

## 2.2 HANGER RODS

- A. Galvanized Steel Hanger Rods: Threaded both ends or continuous threaded.

## 2.3 FLASHING

- A. Metal Flashing: 26 gauge galvanized steel
- B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- G. Flashing shall be compatible with the roofing material and be coordinated with the General Contractor.

## 2.4 SLEEVES

- A. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe
- B. Fire Stopping Insulation: Glass fiber type, non-combustible
- C. Caulk: Fire Barrier type sealant

## 2.5 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized

- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts
- C. Washers: ASTM F 844, steel, plain, flat washers
- D. Grout: ASTM C 1107, Grade B, non-shrink, non-metallic
  - 1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic cement-type grout that is non-staining, non-corrosive, non-gaseous and is recommended for both interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5MPa), 28-day compressive strength
  - 3. Water: Potable
  - 4. Packaging: Pre-mixed and factory-packaged

2.6 ATTACHMENTS

- A. Mechanical Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over four (4) inches thick.
- B. Weld: Type 22
- C. Beam clamps: Types 20, 21, 28 or 29
- D. Wood: Wood screws or lag bolts

**PART III - EXECUTION**

3.1 HANGERS AND SUPPORTS INSTALLATION

- A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints ,and at changes in direction of piping.
- C. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers and other accessories.
- D. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- E. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Support horizontal piping as follows:

<u>PIPE SIZE</u>	<u>HANGER SPACING</u>	<u>MAXIMUM DIAMETER</u>
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
Waste Pipe	5'-0"	3/8"

- G. Install hangers to provide minimum ½ inch space between finished covering and adjacent work
- H. Place a hanger within 12 inches of each horizontal elbow.
- I. Use hangers with 1½ inch minimum vertical adjustment
- J. Support riser piping independently of connected horizontal piping.
- K. Hangers shall be galvanized steel or copper.

### 3.2 FLASHING

- A. Provide flashing and counter-flashing where piping penetrates weather-proofed walls, floors and roofs.
- B. Flash vent and soil pipes projecting six (6) inches minimum above finished roof surface with lead worked one (1) inch minimum into hub. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash and seal.

### 3.3 SLEEVES

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe
- C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and caulk seal air-tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. Install chrome plated steel or stainless steel escutcheons at finished surfaces.
- E. Pipe strapping will not be allowed.

END OF SECTION 15140



**SECTION 15190 - PLUMBING IDENTIFICATION****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes plumbing identification materials and devices.

## 1.3 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

## 1.4 SEQUENCING AND SCHEDULING

- A. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

**PART II - PRODUCTS**

## 2.1 MATERIALS

- A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
  - 1. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
  - 2. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½ inch diameter.
  - 3. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
  - 4. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

**PART III - EXECUTION**

## 3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

## 3.2 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners.
- B. Plastic Tags: Install with corrosive-resistant chain.

- C. Plastic Tape Pipe Markers: Install complete around pipe in accordance with the manufacturer's instructions
- D. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above the buried pipe.
- E. Equipment: Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic tags
- F. Controls: Identify control panels and major control components outside panels with plastic nameplates.
- G. Piping: Identify piping, concealed or exposed, with plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 15190



**SECTION 15250 - PLUMBING PIPING INSULATION****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Plumbing Pipe Insulation.

## 1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
  - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
  - 2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

## 1.4 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Flexible Elastomeric Cellular:
    - a. Armstrong World Industries, Inc.
    - b. Halstead Industrial Products
    - c. IMCOA
    - d. Rubatex Corporation

## 2.2 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
- B. Form: Tubular materials conforming to ASTM C 534, Type I.
- C. Thermal Conductivity: 0.30 average maximum at 75 degrees F.
- D. Coating: Water based latex enamel coating recommended by insulation manufacturer.

## 2.3 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

- B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades.
  - 1. Class 1, Grade A for bonding glass cloth and tape to un-faced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to un-faced glass fiber insulation.
  - 2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

### **PART III - EXECUTION**

#### **3.1 PREPARATION**

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

#### **3.2 INSTALLATION - GENERAL**

- A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- C. Keep insulation materials dry during application and finishing.
- D. Apply insulation continuously over fittings, valves and specialties.
- E. Apply insulation with a minimum number of joints.
- F. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire rated walls and partitions.
- G. Fire Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with fire stopping or fire resistant joint sealer.
- H. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified.
  - 1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

#### **3.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION INSTALLATION**

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
  - 1. Miter cut materials to cover soldered elbows and tees.
  - 2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.4 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation.

3.5 PIPE INSULATION SCHEDULES

<u>PIPING</u>	<u>THICKNESS TYPE</u>	<u>INSULATION IN INCHES</u>
Domestic Hot Water Supply	ELASTOMERIC	1/2
Domestic Hot Water Re-Circulating	ELASTOMERIC	1
Domestic Cold Water	ELASTOMERIC	1/2
"P" Trap at Handicapped Fixtures	ELASTOMERIC	1/2 *

(\* provide pre-formed insulation kits for the drain and supply lines)

END OF SECTION 15250



**SECTION 15410 - PLUMBING PIPING****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes plumbing piping systems to a point shown on the civil drawings. Systems include the following:
1. Potable water distribution, including cold and hot water supply and hot water circulation.
  2. Sanitary Drainage and Vent Systems.

## 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
1. Water Distribution Systems, Below Ground: 150 psig.
  2. Water Distribution Systems, Above Ground: 125 psig.
  3. Soil, Waste and Vent Systems: 10-foot head of water

**PART II - PRODUCTS**

## 2.1 SANITARY SEWER PIPING - BURIED

- A. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

## 2.2 SANITARY SEWER PIPING - ABOVE GRADE

- A. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

## 2.3 WATER PIPING - BURIED

- A. Copper Tubing: ASTM B88, Type K, annealed. Fittings: ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

## 2.4 WATER PIPING - ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

## 2.5 MANUFACTURERS

- A. Acceptable Manufacturers-Valves:
1. Crane
  2. Grinnell
  3. Nibco
  4. Apollo

## 2.6 GATE VALVES

- A. 150 psig rated, bronze body, lever ball type, Apollo or equal.

## **PART III - EXECUTION**

### 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### 3.2 INSTALLATION

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipes, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Slope water piping and arrange to drain at low points.
- H. Establish elevations of buried piping outside the building to ensure not less than 1 ft of cover.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.
- K. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.
- L. Excavate in accordance with Sections 15010.
- M. Backfill in accordance with Sections 15010.
- N. Install bell and spigot pipe with bell end upstream.
- O. Copper piping 2" and larger shall be silver-soldered.
- P. Install valves with stems upright or horizontal, not inverted.

### 3.3 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.

- B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install globe or ball valves for throttling, bypass, or manual flow control services.

#### 3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Inject disinfectant solution containing 100 ppm of available chlorine and allow to stand for 2 hours before flushing.
- C. Flush disinfectant from system until residual is equal to that of incoming water or 1.0 mg/L.
- E. Take samples from outlets and analyze in accordance with AWWA C601. Contractor shall engage an independent laboratory to conduct bacteriological and post chlorination tests certifying that the water meets the quality of drinking water. After acceptance by the Engineer of Record, "The Water Test Report for Use" is required to be submitted to SCO prior to requesting the Occupancy Permit.

#### 3.5 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

END OF SECTION 15410





**SECTION 15430 - PLUMBING SPECIALTIES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Plumbing Specialties for water distribution systems; and soil, waste and vent systems.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Backflow Preventers:
    - a. Ames Co., Inc.
    - b. Hersey Products, Inc., Grinnell Corp.
    - c. Watts Regulator Co.
    - d. Wilkins Regulator Div., Zurn Industries, Inc.
  - 2. Water Pressure Regulators:
    - a. Spence Engineering Co., Inc.
    - b. Watts Regulator Co.
    - c. Wilkins Regulator Div., Zurn Industries, Inc.
  - 3. Specialties:
    - a. Josam Co.
    - b. Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
    - c. Watts Regulator Co.
    - d. Woodford Manufacturing Co. Div., WCM Industries, Inc.
    - e. Zurn by Hydromechanics Div., Zurn Industries, Inc.

## 2.2 CLEANOUTS

- A. Exterior Surfaced Areas: Round cast nickel-bronze access frame and non-skid cover.
- B. Exterior Un-Surfaced Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover.

- C. Interior Finished Floor Areas: Lacquered cast iron, two piece body, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.
- D. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

### 2.3 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

### 2.4 TRAP SEAL PRIMER VALVE:

- A. ASSE 1018; water supply fed type, fully automatic 125psig minimum working pressure, Bronze body with atmospheric vented drain chamber, ½ inch threaded or solder joint inlet and outlet connections, Chrome plated, or rough bronze finish. Unit shall be capable of being located on any active water line.

### 2.5 BACKFLOW PREVENTERS

- A. Reduced Pressure Back-flow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

## **PART III - EXECUTION**

### 3.1 PREPARATION

- A. Coordinate construction areas to receive drains to the required invert elevations.

### 3.2 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Extend clean-outs to finished floor. Lubricate threaded clean-out plugs Teflon pipe dope. Ensure clearance at clean-out for rodding of drainage system.
- C. Encase exterior clean-outs in concrete flush with grade.
- D. Install water hammer arrestors complete with accessible isolation valve.

END OF SECTION 15430

**SECTION 15440 – PLUMBING FIXTURES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers (or approved equal):
  - 1. Fixtures and Trim:
    - a. American Standard, Inc.
    - b. Eljer; A Household International Co.
    - c. Kohler Co.
  - 2. Stainless Steel Sinks:
    - a. Elkay Manufacturing Co.
    - b. Just Manufacturing Co.
    - c. Kohler Co.
  - 3. Mop Basins:
    - a. Crane Plumbing/Fiat Products.
    - b. Florestone Products Co., Inc.
    - c. Swan Corp.
  - 4. Water Coolers:
    - a. Elkay Manufacturing Co.
    - b. Halsey Taylor
    - c. Haws Drinking Faucet Co.
    - d. Sunroc Corporation
    - e. Oasis
  - 5. Toilet Seats:
    - a. Bemis Mfg. Co.
    - b. Beneke Division: Sanderson Plumbing Products, Inc.
    - c. Church Seat Co.

- d. Kohler Co.
  - e. Olsonite Corp.
6. Flushometers:
- a. Coyne & Delaney Co.
  - b. Sloan Valve Co.
  - c. Zurn Industries, Inc.; Flush Valve Operations.
7. Commercial/Industrial Cast-Brass Faucets:
- a. American Standard, Inc.
  - b. Chicago Faucet Co.
  - c. Delta Faucet Co.
  - d. Eljer; A Household International Co.
  - e. T & S Brass and Bronze Works, Inc.
  - f. Cambridge Brass
  - g. Elkay Manufacturing Co.
  - h. Sloan
  - i. Speakman Co.
8. Commercial/Institutional Shower and Bathtub Valves and Trim:
- a. Symmons Industries, Inc.
  - b. Bradley Corp.
  - c. Speakman Co.
  - d. Delta Faucet Co.

END OF SECTION 15440

**SECTION 15450 - WATER HEATERS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Electric Water Heaters and In-Line Circulators.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories, and indicating dimensions, required clearances, and methods of assembly of components, and piping and wiring connections.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Water Heaters:
    - (a) Bradford-White Corp.
    - (b) A.O. Smith Water Products Co. Div.
    - (c) State Industries, Inc.
    - (d) Ruud

## 2.5 COMMERCIAL ELECTRIC WATER HEATERS

- A. Factory assembled and wired, electric, [vertical] [horizontal] storage type, 150 psig maximum working pressure.
- B. Glass lined welded steel tank; four (4) inch diameter inspection port, thermally insulated with minimum two (2) inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
- C. Brass water connections and dip tube, drain valve, high-density magnesium anode, and ASME rated temperature and pressure relief valve.
- D. Flange-mounted immersion heating electrical elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.

## 2.6 IN-LINE CIRCULATOR PUMPS

- A. Casing: Bronze, rated for 125 psig working pressure
- B. Impeller: Bronze

- C. Shaft: Alloy steel with integral thrust collar and two (2) oil lubricated bronze sleeve bearings.
- D. Seal: Carbon rotating against a stationary ceramic seat.
- E. Drive: Flexible coupling

## 2.7 THERMAL EXPANSION TANKS

- A. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, maximum operating temperature 210 degrees F., with flexible EPDM diaphragm sealed into tank.
- B. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 55 psig.
- C. Size: 10.5" diameter, 16" overall length, 5 gallon capacity.

## PART III - EXECUTION

### 3.1 WATER HEATER INSTALLATION

- A. Install water heaters in accordance with manufacturer's instructions and to UL requirements.
- B. Coordinate with plumbing piping and related [fuel piping] [gas venting] [electrical] work to achieve operating system.

### 3.2 PUMP INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide air cock and drain connection on horizontal pump casings.
- C. Decrease from line size, with long radius reducing elbows or reducers. Support piping adjacent to pump such as that no weight is carried on pump casings.

Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 15450

**DIVISION 15B: MECHANICAL**

15500	Basic Mechanical Requirements
15501	Hangers and Supports
15504	Piping Insulation-Refrigerant and Condensate
15507	Ductwork Insulation
15513	Refrigerant Piping
15672	Split System Heat Pump
15674	Duct Free Split System Air Conditioner
15782	Energy Recovery Ventilator
15870A	Power Ventilators
15891A	Metal Ductwork
15910	Duct Accessories
15932	Air Outlets and Inlets
15990	Testing, Adjusting and Balancing





**SECTION 15500 BASIC MECHANICAL REQUIREMENTS****PART I - GENERAL**

## 1.1 GENERAL CONDITIONS

- A. The Stipulations and Conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", herein before set forth, shall apply to this and the other Sections of Division 15.

## 1.2 GENERAL REQUIREMENTS

- A. The General Requirements hereinafter listed apply to the Mechanical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

## 1.3 ALTERNATES

- A. Carefully examine all Alternates at the back of this Specification to determine if any work described under the Mechanical Section will be affected thereby.

## 1.4 INTENT

- A. The intent of these Drawings and Specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on Drawings and not specifically called for in the Specifications, or any items specified and not specifically indicated or detailed on the Drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Mechanical Contractor at his own expense.

## 1.5 DEFINITIONS

- A. The Mechanical Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the mechanical systems. All items of equipment are specified in the singular; however, the Mechanical Contractor shall provide the number of items of equipment as indicated on the Drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

## 1.6 VISIT TO THE SITE

- A. The Mechanical Contractor shall visit the site before submitting his bid, so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything that could have been anticipated from a visit to the site.

## 1.7 REGULATORY REQUIREMENTS

- A. All work under this Section shall be accomplished in strict accordance with State codes. Where these Plans and Specifications conflict with such codes, the codes shall govern. The Mechanical Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

## 1.8 PERMITS AND FEES

- A. The Mechanical Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Mechanical Work Division of the Specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the Mechanical Contractor under whose work such services appear. Before the job is certified as substantially complete, a Certificate of Approval from all authorities involved must be obtained and turned over to the Architect/Engineer.

## 1.9 DRAWINGS AND SPECIFICATIONS

- A. The Mechanical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between general Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Mechanical Contractor shall figure on the most expensive of the items in conflict.
- B. The Mechanical Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No Contractor shall under any circumstances scale Drawings for the location of equipment. The Mechanical Contractor shall verify the locations of all utility services.
- C. The Mechanical Contractor shall keep at least one (1) set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

## 1.10 SUPERVISION

- A. The Mechanical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent Contractors. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels and locating chases, openings, hangers, inserts, sleeves, etc.

## **PART II - PRODUCTS**

### 2.1 STANDARD PRODUCTS

- A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

### 2.2 SUBMITTAL

- A. The Mechanical Contractor shall submit, for approval, detailed Shop Drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Mechanical Contractor has in his possession the approved shop drawing for the particular material or equipment. The Mechanical Contractor shall furnish the number of copies required by the General or Special

- Conditions of the contract, but in no case less than six (6) copies.
- B. Submitted material shall be properly labeled indicating specific Service for which material or equipment to be used, Section and Article Number of Specifications governing, Contractor's name and name of job.
  - C. Approval of equipment will not relieve the Mechanical Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Mechanical Contractor and with no additional expense to the Owner.

### 2.3 SUBSTITUTIONS

- A. Manufacturer's lists are to establish a Standard of Quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality. Free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Mechanical Contractor shall purchase and install all materials required.
- B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

### 2.4 PRODUCT HANDLING

- A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.
- B. The Mechanical Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

### 2.5 MATERIALS AND WORKMANSHIP

- A. The Mechanical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Mechanical Contractor at the Mechanical Contractor's expense.
- B. The material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.
- C. Any equipment furnished by the Mechanical Contractor that is larger than those indicated on the Drawings and described in these Specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

**PART III - EXECUTION****3.1 EXCAVATION AND BACKFILL**

- A. The Mechanical Contractor shall preform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding four (4) inches in depth, wetting each layer as it is placed, and thoroughly compacting each layer with mechanical tamper or other approved means. Any damage done during excavation and back-filling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its condition prior to construction at no expense to the Owner.

**3.2 SCAFFOLDING, RIGGING AND HOISTING**

- A. The Mechanical Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

**3.3 CUTTING AND PATCHING**

- A. The Mechanical Contractor shall provide all cutting and patching necessary to install the work specified in this Section. The patching shall match adjacent surfaces.
- B. No Structural member shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.

**3.4 EQUIPMENT SPACE AND ARRANGEMENT**

- A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing and maintenance. The Mechanical Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.
- B. These drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Mechanical Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after Award of Contract. No departure shall be made without written Approval of the Architect/Engineer.

**3.5 DAMAGE TO WORK ALREADY IN PLACE**

- A. The Mechanical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

**3.6 JURISDICTION OF WORK**

- A. It may become necessary for the Mechanical Contractor to furnish labor or material which is not generally accepted as part of this trade. In cases of this type, he shall contract the work, or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

### 3.7 COORDINATION WITH OTHER TRADES

- A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Mechanical Contractor shall make required changes or relocations at no additional cost to the Owner.
- B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination.
- C. The Mechanical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed will be borne by the subcontractor or contractors directed to do this work.

### 3.8 DIVISION OF WORK

- A. This paragraph is intended to show exactly the point of division of work between the Electrical Division and the Mechanical Division.
- B. All equipment covered in the Mechanical Division of the Specifications shall be furnished, mounted and aligned under the Mechanical Division. All individual motor starters, unless indicated as part of a motor control center, for this equipment shall be furnished and installed by the Mechanical Contractor.
- C. All final electrical connections to equipment covered in the Mechanical Division of the Specifications shall be completed under the Mechanical Division.
- D. The Electrical Contractor shall provide a disconnect switch or junction box for each item of equipment under Division 16.
- E. Electrical equipment and wiring that is provided by the Mechanical Contractor shall be in accordance with the Electrical specification.

### 3.9 EQUIPMENT INSTALLATION

- A. Final connections to equipment, including pipe, duct, and controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.
- B. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these Drawings and Specifications.

### 3.10 OPERATION AND MAINTENANCE MANUALS

- A. One complete Manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.

- B. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words "OPERATION AND MAINTENANCE MANUAL", the name and location of the building, the name of the Section, such as "Heating" and the name of the Mechanical Contractor. Two (2) copies of each approved manual shall be submitted to the Owner and one (1) copy shall be submitted to the Architect/Engineer.
- C. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the Contract Documents.
- D. Manuals shall include the following:
  - 1. Complete Operating Installations, covering start-up and shutdown for all components installed.
  - 2. Legible copies of all Shop Drawings. Any comments incorporated in "as noted" approvals of Shop Drawings shall be recorded on the Drawings included in the Manuals.
  - 3. All equipment Maintenance and Service Manuals.
  - 4. A complete parts list for each piece of equipment.
  - 5. All descriptive literature for the equipment.
  - 6. Operating characteristics, performance data, ratings, and curves for each piece of equipment such as condensers, fans and air handling units.
  - 7. Internal wiring and control diagrams.
  - 8. Automatic temperature control diagrams, part descriptions and numbers, and sequences of operation. Drawings shall be neatly folded and inserted in a separate clear plastic binder. The plastic binders shall be bound in the back of each Manual.
  - 9. Final Testing and Balancing Reports.
  - 10. All other information pertinent to the maintenance and servicing of equipment and systems provided in the Project.
  - 11. Name, address, and telephone number for service on each manufacturer's equipment.

### 3.11 OPERATING INSTRUCTIONS

- A. After all equipment and services are in operation, and the Operation and Maintenance Manuals are available, an instruction and training session shall be conducted for the Owner's operating personnel.
- B. Instruction sessions shall be conducted during the Owner's normal working periods, and at times and locations satisfactory to the Owner.

### 3.12 EQUIPMENT START-UP

- A. No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments are required to meet design conditions. Such services

shall be at no additional cost to the Owner.

3.13 GUARANTEE

- A. The Mechanical Contractor shall present to the Owner a written Guarantee covering his work, including all equipment, material and workmanship. This Guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.
- B. Any defective work, equipment, material and/or workmanship that develops within the Guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Mechanical Contractor without cost to the Owner.

3.14 FINAL INSPECTION

- A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Mechanical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.

3.15 FINAL PAYMENTS

- A. All Final Payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

END OF SECTION 15500





**SECTION 15501 - HANGERS AND SUPPORTS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- B. This Section includes Hangers and Supports for Mechanical Systems Piping and Equipment.

**PART II - PRODUCTS**

## 2.1 PIPE HANGERS AND SUPPORTS

- A. Hangers: Galvanized carbon steel, adjustable, clevis.
- B. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

## 2.2 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends or continuous threaded.

## 2.3 FLASHING

- A. Metal Flashing: 26 gage galvanized steel.
- B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

## 2.4 SLEEVES

- A. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe
- B. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.
- C. Sleeves for Round Ductwork: Form with galvanized steel.
- D. Sleeves for Rectangular Ductwork: Form with galvanized steel or wood.
- E. Fire Stopping Insulation: Glass fiber type, non-combustible.
- F. Caulk: Fire Barrier type sealant.

## 2.5 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

- C. Washers: ASTM F 844, steel, plain, flat washers.

## 2.6 ATTACHMENTS

- A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over 4 inches thick.
- B. Beam Clamps: Types 20, 21, 28 or 29
- C. Wood: Wood screws or lag bolts

## PART III - EXECUTION

### 3.1 HANGERS AND SUPPORTS INSTALLATION

- A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.
- C. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- D. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- E. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- F. Support horizontal piping as follows:

<b>PIPE SIZE</b>	<b>HANGER SPACING</b>	<b>MAXIMUM HANGER DIAMETER</b>
1/2 to 1-1/4 inch	6' - 6"	3/8"
1-1/2 to 2 inch	10' - 0"	3/8"

- G. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- H. Place a hanger within 12 inches of each horizontal elbow.
- I. Use hangers with 1½ inch minimum vertical adjustment.
- J. Support vertical piping at every floor.
- L. Support riser piping independently of connected horizontal piping.
- M. All pipe hangers shall be galvanized steel or copper.
- N. Pipe strapping, duct tape or zip ties will not be allowed.

### 3.2 EQUIPMENT BASES AND SUPPORTS

- A. Provide equipment bases of concrete.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

### 3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

### 3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal arc welding, appearance and quality of welds.

### 3.5 FLASHING

- A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flexible sheet flash and counter-flash with sheet metal; seal watertight.

### 3.6 SLEEVES

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- D. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

END OF SECTION 15501



**SECTION 15504 - PIPING INSULATION-REFRIGERANT/CONDENSATE****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Mechanical Pipe Insulation.

## 1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
  - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
  - 2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

## 1.4 SEQUENCING AND SCHEDULING

- A. Schedule insulation application after testing of piping systems.
- B. Schedule insulation application after installation and testing of heat trace tape.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers
  - 1. Flexible Elastomeric Cellular:
    - a. Armstrong World Industries, Inc.
    - b. Halstead Industrial Products
    - c. IMCOA
    - d. Rubatex Corporation

## 2.3 FLEXIBLE ELASTOMERIC CELLULAR

- A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
- B. Form: Tubular materials conforming to ASTM C 534, Type I.
- C. Thermal Conductivity: 0.30 average maximum at 75 degrees F.
- D. Coating: Water based latex enamel coating recommended by insulation manufacturer.

## 2.5 ADHESIVES

- A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

**2.8 SEALING COMPOUNDS**

- B. Weatherproof Sealant: Flexible elastomer based, vapor barrier sealant designed to seal metal joints.
  - 1. Water Vapor Permeance: 0.02 perm maximum
  - 2. Temperature Range: Minus 50 to 250 degrees F

**PART III - EXECUTION****3.1 PREPARATION**

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

**3.2 INSTALLATION - GENERAL**

- A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- C. Keep insulation materials dry during application and finishing.
- D. Apply insulation continuously over fittings, valves, and specialties.
- E. Apply insulation with a minimum number of joints.
- F. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- G. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with fire stopping or fire resistant joint sealer.
- H. Flanges, Fittings, and Valves: Apply pre-molded, pre-cut, or field fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
  - 1. Use same material and thickness as adjacent pipe insulation.
  - 2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
  - 3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
  - 4. Insulate elbows and tees smaller than 3-inches pipe size with pre-molded insulation.
  - 5. Insulate elbows and tees Three (3) inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.
- J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified.

1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION INSTALLATION

- A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
- B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
  1. Miter cut materials to cover soldered elbows and tees.
  2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.6 FINISHES

- A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation. Paint all exterior insulation with UV resistant paint as recommended by Insulation manufacturer.

**INTERIOR COLD CONDENSATE DRAINS**

<b><u>PIPE SIZES (NPS)</u></b>	<b><u>MATERIALS</u></b>	<b><u>THICKNESS IN INCHES</u></b>
1/2 TO 4	FLEXIBLE ELASTOMERIC	3/4

**REFRIGERANT SUCTION**

<b><u>PIPE SIZES (NPS)</u></b>	<b><u>MATERIALS</u></b>	<b><u>THICKNESS IN INCHES</u></b>
1/2 TO 1-1/4	FLEXIBLE ELASTOMERIC	3/4
1-1/2 TO 4	FLEXIBLE ELASTOMERIC	1

END OF SECTION 15505





**SECTION 15507 - DUCTWORK INSULATION****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Duct and Plenum Insulation.

## 1.3 QUALITY ASSURANCE

- A. Fire Performance Characteristics: Conform to the following characteristics for insulation including linings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
  - 1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
  - 2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

**PART II – PRODUCTS**

## 2.1 MANUFACTURERS

- I. Glass Fiber:
  - a. Certain Teed Corporation
  - b. Knauf Fiberglass GmbH
  - c. Manville
  - d. Owens-Corning Fiberglass Corporation
  - e. USG Interiors, Inc. - Thermafiber Division

## 2.2 INSTALLATION

## A. GLASS FIBER

- 1. Material: Inorganic glass fibers, bonded with a thermosetting resin.
- B. Jacket: All purpose, factory-applied, laminated glass fiber reinforced, flame retardant Kraft paper and aluminum foil having self-sealing lap.
- C. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets-2” thick.
  - 1. Thermal Conductivity: 0.32 average maximum, at 75 degrees F mean temperature.
- D. Adhesive: Produced under the UL Classification and follow-up service.
  - 1. Type: Non-Flammable, solvent-based.
  - 2. Service Temperature Range: Minus 20 to 180 degrees F.

### 2.3 ACCESSORIES AND ATTACHMENTS

- A. Corner Angles: 28-gauge, 1-inch by 1-inch aluminum, adhered to 2-inch by 2-inch Kraft paper.
- B. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

### 2.4 SEALING COMPOUNDS

- A. Vapor Barrier Compound: Water-based, fire-resistive composition
  - 1. Water Vapor Permeance: 0.08 perm maximum
  - 2. Temperature Range: Minus 20 to 180 degrees F

## PART III - EXECUTION

### 3.1 PREPARATION

- A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale and dirt.

### 3.2 INSTALLATION

- A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.
- B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.
- C. Install insulation with smooth, straight, and even surfaces.
- D. Seal joints and seams to maintain vapor barrier.
- E. Seal penetrations for hangers, supports, anchors and other projections.
- F. Keep insulation materials dry during application and finishing.
- H. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
  - 1. Smaller Than 24 Inches: Bonding adhesive applied in 6-inch wide transverse strips on 12-inch centers.
  - 2. Twenty-four (24) Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
  - 3. Overlap joints three (3) inches.
  - 4. Seal joints, breaks, and punctures with vapor barrier compound.

END OF SECTION 15507

**SECTION 15513 – REFRIGERANT PIPING****PART I - GENERAL**

- 1.1 A. This section includes all pipe, pipe fittings, hangers, supports, etc. as may be required to provide a complete refrigerant piping system.
- B. Testing of all piping shall be made in the presence of a designated representative of the owner. No piping shall be covered or put into operation before such testing has been approved.
- C. The actual arrangement of the piping shall follow the general locations shown on the drawings such that clearances, line drainage, etc. shall be maintained.

**PART II - PRODUCTS****2.1 PIPING**

- A. Refrigerant piping shall be type “ACR” hard drawn copper conforming to ANSI B-31.5 or ASTM B280.

**2.2 PIPE FITTINGS**

- A. Copper pipe fittings shall be wrought metal solder joint type conforming to ANSI B16.22.

**PART III - EXECUTION****3.1 PIPING**

- A. The installation of piping and related items shall be made neatly and in such a manner as not to interfere with access to valves or equipment.
- B. All piping shall be reamed to remove all burrs, fins and foreign material. Pipe shall be thoroughly cleaned before soldering.
- C. “Sil-Fos” or silver solder shall be used with non-corrosive flux. During the soldering operation, the pipe shall be purged with nitrogen.
- D. Piping shall be arranged (and traps installed where necessary) to allow the proper return of oil to the compressor.

**3.2 HANGERS AND SUPPORTS**

- A. The spacing of hangers and supports shall not exceed five feet.
- B. Pipe covering protection saddles shall be used at all supports for insulated piping. Sheet metal shields shall be 10 gauge, one half the circumference of the insulation and minimum of twelve inches long.

**3.3 TESTING**

- A. All refrigerant equipment not tested at the factory shall be shut off from the rest of the system and tested. Piping systems shall be tested after installation is complete and before any insulation is applied. All controls and other apparatus that may be damaged by the test pressure shall be removed before tests are made.

- B. Refrigerant lines shall be tested at 150 psig with dry nitrogen. Pressure shall be maintained for 60 minutes without loss of pressure. Each joint shall be checked for leaks with a soap solution. Testing and repair shall continue until there is no loss of pressure. After a satisfactory pressure test, high vacuum pumps shall be connected to the system and the system evacuated to a pressure of 0.20 inches of mercury with the ambient temperature at not less than 36 degrees F. After this has been attained, the vacuum shall be broken by charging the system with refrigerant as soon as possible.

END OF SECTION 15055

**SECTION 15672 - SPLIT SYSTEM HEAT PUMP****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and a Division 1 Specification Sections, apply to work of this Section.

## 1.2 SUMMARY

- A. Section includes Split System Heat Pumps.

## 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), dimensions, required clearances, and methods of assembly of components, furnished specialties and accessories and installation and start-up instructions.
- B. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring required for final installation of heat pump units and controls. Clearly differentiate between portions of wiring which are factory-installed and portions to be field-installed.
- C. Operation and Maintenance Data: Submit maintenance data and parts list for each heat pump unit, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual in accordance with requirements of Division 1.

## 1.4 WARRANTY

- A. Provide Five (5) Year Warranty.
- B. Warranty: Include coverage for Refrigerant Compressors.

**PART II - PRODUCTS**

## 2.1 SPLIT SYSTEM HEAT PUMPS

- A. Acceptable Manufacturers:
  - 1. Carrier Air Conditioning: Division of Carrier Corp.
  - 2. Trane (The) Co.: Division of American Standard Inc.
  - 3. York: Division of York International

## 2.2 GENERAL

- A. Split System: The split-system unit shall be an outdoor heat pump unit and indoor factory-fabricated single-zone draw-through air-handling unit. Both indoor and outdoor unit shall be by the same manufacturer. The net capacities shall be as indicated and shall not exceeded by more than 5%. The minimum efficiency for systems less than 65,000 BTUH shall be 15.0 SEER. The minimum efficiency for systems of 65,000 BTUH or greater shall be in accordance with the 2012 N. C. State Building Code: Energy Conservation Code.

### 2.3 AIR HANDLER

- A. Direct Expansion Coil: Coil shall be provided with pressure-type brass distributors and solder connections. The coil shall be dehydrated after testing and charged with dry air. Maximum working conditions shall be 300 psig at 200 degrees F for cooling. Tests shall be conducted, subjecting the coil to a minimum air pressure of 350 psig with the coil submerged in water. The cooling coil shall be subject to ASHRAE 15-1978 Safety code for Mechanical Refrigeration. Coils shall be of the cartridge type, removable from other side of casing and supported the entire length in tracks. Staggered tube pattern shall be provided for all coils of more than one row deep. Tubing shall have a minimum outside diameter of 1/2 inch. Tubing shall be individually finned with smooth aluminum or copper fins, wound under tension. Tube joints for all coils shall be made with high temperature brazing alloys.
- B. Cabinet: Unit shall be provided with baked enamel finish and internally insulated. Fan shall be forward curved, and dynamically and statically balanced at the factory. Fan shall be belt driven. Provide adjustable sheaves for each air handler. Fan and motor bearings shall be permanently lubricated type.

### 2.4 OUTDOOR HEAT PUMP UNIT

- A. Unit shall be factory-assembled and tested. Unit shall provide liquid lift as required to suit installation. Unit shall deliver the specified capacity to the cooling coil with an ambient air temperature of 95 degrees F. Units shall be certified per ARI 240 and 270.
- B. Coil shall have aluminum plate fins, mechanically bonded to 1/2 inch aluminum tubes. Coil shall be circuited for sub-cooling.
- C. Outdoor Fans and Motors: Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation and built in current and thermal overload protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard.
- D. Compressor: Unit shall have compressors of serviceable hermetic design with external spring isolators and an automatically reversible oil pump. Compressor motors shall have across-the-line start.
- E. Controls shall be factory-wired and located in a separate enclosure. Safety devices shall consist of high and low pressure stats and compressor overload devices. Unit wiring shall incorporate a time delay relay to prevent short-cycling of the compressor. Relay shall prevent compressor from restarting for a 5-minute period. The unit shall include a transformer for 24-volt control circuit, pressure relief valves and circuit breakers.
- F. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be provided for power and refrigerant connections. Panel shall be removable to provide access for servicing. The unit shall be mounted on manufacturer's standard legs anchored to concrete pedestals with steel bearing plates and neoprene pads.
- G. Connections: Only one liquid line, one suction line, required for units under 15 tons in capacity shall be provided. A 15-ton unit shall be dual circuited. Double suction risers for the refrigerant lines shall be provided.
- H. Piping shall be sized by the manufacturer.

**2.5 TEMPERATURE CONTROL SYSTEM**

- A. See Section 15973, Direct Digital Controls

**2.6 FILTRATION**

- A. Provide a filter rack and a 1" replaceable pleated throwaway filter. Filter rack size shall be as required by AHU manufacture.
- B. Provide additional sets of filters (minimum of 3) as required during construction. Install a clean set of filters for the Final Inspection.

**PART III - EXECUTION****3.1 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service.
- C. Install units with vibration isolation.
- D. Install units on concrete base as indicated.

**3.2 MANUFACTURER'S FIELD SERVICES**

- A. Prepare start systems under provisions of Section 15500.
- B. Provide initial start-up.
- C. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION 15672





**SECTION 15674 DUCT FREE SPLIT SYSTEM AIR CONDITIONER****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and a Division 1 Specification Sections, apply to work of this Section.

## 1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), dimensions, required clearances, and methods of assembly of components, furnished specialties and accessories and installation and start-up instructions.
- B. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring required for final installation of heat pump units and controls. Clearly differentiate between portions of wiring which are factory-installed and portions to be field-installed.
- C. Operation and Maintenance Data: Submit maintenance data and parts list for each heat pump unit, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual in accordance with requirements of Division 1.

## 1.3 WARRANTY

- A. Provide Five (5) Year Warranty.
- B. Warranty: Include coverage for Refrigerant Compressors.

**PART II - PRODUCTS**

## 2.1 SPLIT SYSTEM AIR CONDITIONER

- A. Acceptable Manufacturers:
  - 1. Mitsubishi
  - 2. Sanyo.
  - 3. Freidrich
  - 4. Amana

## 2.2 GENERAL

- A. Split System: The split-system unit shall be an outdoor condensing unit and indoor factory-fabricated single-zone draw-through air-handling unit. Both indoor and outdoor unit shall be by the same manufacturer. The net capacities shall be as indicated and shall not be exceeded by more than 5%. The minimum efficiency for systems less than 65,000 BTUH shall be 13.0 SEER and shall be in accordance with the 2012 N. C. State Building Code: Energy Conservation Code.

## 2.3 AIR HANDLER

- A. Direct Expansion Coil: Coil shall be provided with pressure-type brass distributors and solder connections. The coil shall be dehydrated after testing and charged with dry air. Maximum working conditions shall be 300 psig at 200 degrees F for cooling. Tests shall

be conducted, subjecting the coil to a minimum air pressure of 350 psig with the coil submerged in water. The cooling coil shall be subject to ASHRAE 15-1978 Safety code for Mechanical Refrigeration. Staggered tube pattern shall be provided for all coils of more than one row deep. Tubing shall have a minimum outside diameter of 1/2 inch. Tubing shall be individually finned with smooth aluminum or copper fins, wound under tension. Tube joints for all coils shall be made with high temperature brazing alloys.

- B. Cabinet: Unit shall be provided with baked enamel finish and internally insulated. Fan shall be forward curved, and dynamically and statically balanced at the factory. Fan and motor bearings shall be permanently lubricated type.

#### 2.4 OUTDOOR CONDENSING UNIT

- A. Unit shall be factory-assembled and tested. Unit shall provide liquid lift as required to suit installation. Unit shall deliver the specified capacity to the cooling coil with an ambient air temperature of 95 degrees F. Units shall be certified per ARI 240 and 270.
- B. Coil shall have aluminum plate fins, mechanically bonded to ½ inch aluminum tubes. Coil shall be circuited for sub-cooling.
- C. Outdoor Fans and Motors: Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation and built in current and thermal overload protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard.
- D. Compressor: Unit shall have compressors of serviceable hermetic design with external spring isolators and an automatically reversible oil pump. Compressor motors shall have across-the-line start.
- E. Controls shall be factory-wired and located in a separate enclosure. Safety devices shall consist of high and low pressure stats and compressor overload devices. Unit wiring shall incorporate a time delay relay to prevent short-cycling of the compressor. Relay shall prevent compressor from restarting for a 5-minute period. The unit shall include a transformer for 24-volt control circuit, AND pressure relief valve.
- F. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be provided for power and refrigerant connections. Panel shall be removable to provide access for servicing. The unit shall be mounted on manufacturer's standard legs anchored to concrete pedestals with steel bearing plates and neoprene pads.
- G. Piping shall be sized by the manufacturer.

#### 2.5 FILTRATION

- A. Provide a throw away filter.
- B. Provide additional sets of filters (minimum of 3) as required during construction. Install a clean set of filters for the Final Inspection.

### PART III - EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service.

- C. Install units with vibration isolation.
- D. Install units on concrete base as indicated.

### 3.2 MANUFACTURER'S FIELD SERVICES

- A. Prepare start systems under provisions of Section 15500.
- B. Provide initial start-up.
- C. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION



**SECTION 15782 –Energy Recovery Ventilator****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 DESCRIPTION OF WORK

- A. Extent of Air Conditioning Unit work required by this Section is indicated on Drawings and Schedules and by Requirements of this Section.

## 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities for each unit indicated, weights (shipping, installed, and operating), furnished specialties and accessories; and rigging, installation, and start-up instructions.
- B. Maintenance Data: Submit Maintenance Data and Parts List for each unit, control, and accessory; including "trouble- shooting" maintenance guide. Include this data and product data in Maintenance Manual in accordance with requirements of Division 1.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Handle unit and components properly to prevent damage, breaking, denting and scoring. Do not install damaged roof top unit or components; replace with new. Comply with manufacturer's rigging and installation instructions for unloading the unit, and transporting the unit to final location.

## 1.5 WARRANTY

- A. General Warranty: The special warranty specified in this Section shall not deprive the owner of other rights the owner may have under other provisions of the contract documents and shall be in addition to, and run concurrent with, other warranties made by the contractor under requirements of the contract documents.
- B. Special Warranty: A written warranty, executed by the manufacturer and signed by the contractor, agreeing to replace the components that fail in material or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.
  - 1. Unit warranty period: Not less than one year after date of start-up, but not to exceed 14 months from date of shipment.
  - 2. Heat Wheel: Non-prorated full parts replacement not less than 5 years from date of shipment.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Micrometal
  - 2. Semco
  - 3. RenewAire

## 2.2 MANUFACTURED UNITS

- A. Provide complete unit with heat wheel energy recovery.
- B. Unit shall be self-contained, packaged, factory assembled and pre-wired, consisting of cabinet and frame, supply fan, exhaust fan, heat recovery wheel, controls, air filters.

## 2.3 FABRICATION

- A. Cabinet: Galvanized steel with baked enamel finish, access doors or removable access panels with quick fasteners [locking door handle type with piano hinges. Structural members shall be minimum 18 gauge (1.20 mm), with access doors or removable panels of minimum 20 gauge (0.90 mm).
- B. Insulation: One inch thick neoprene coated glass fiber on surfaces where conditioned air is handled. Protect edges from erosion.
- C. Heat Exchangers: Aluminized steel of welded construction.
- D. Supply and Exhaust Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted motor.
- E. Air Filters: 2 inch thick pleated glass fiber disposable media in metal frames. Provide at total of 4 complete sets.

## 2.4 ENERGY RECOVERY SECTION

- A. The unit shall have a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings.
- B. The energy recovery cassette shall be rated in accordance with ARI Standard 1060 and shall bear the ARI certification symbol.
- C. The energy recovery cassette shall contain a total energy recovery heat wheel constructed of a light-weight polymer material with permanently bonded desiccant coating. The energy recovery wheel media shall be capable of removal from the cassette and replacement without the use of tools. Wheel media shall be cleanable using hot water or light detergent without degrading the efficiency.
- D. The exhaust fan shall be backward inclined type. Fan and motor shall be dynamically balanced. A back draft damper shall be included with the exhaust fan. Outside air filters shall be 4" thick pleated disposable media. Provide a total of 4 sets.
- E. Motors shall be standard efficiency with ball bearings and external lubrication connections.

**PART III - EXECUTION**

## 3.1 EXAMINATION

- A. Verify that proper power supply is available.

## 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on field built mounting frame. Install mounting frame level. Mounting frame shall be provided by the HVAC Contractor. Field Coordinate frame and installation required.
- C. See structural drawings for design of mounting frame.

## 3.3 MANUFACTURER'S FIELD SERVICES

- A. Provide initial start-up and standard maintenance during first year of operation, including routine service and check-out.

END OF SECTION 15782





**SECTION 15870 - POWER VENTILATORS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Power Ventilators.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:
  - 1. Product data for selected models, including specialties, accessories, and the following:
    - a. Motor ratings and electrical characteristics plus motor and fan accessories.
    - b. Materials gauges and finishes.
  - 2. Shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Carnes Company, Inc.
  - 2. Cook (Loren) Co.
  - 3. Greenheck Fan Corp.
  - 4. Penn Ventilator Co., Inc.

## 2.2 ROOF EXHAUSTERS

- A. Centrifugal Fan Unit: V-belt driven with spun aluminum housing; resilient mounted motor, ½ inch mesh, 16 gauge aluminum bird screen; square base to suit roof curb with continuous curb gaskets; secured with cadmium plated bolts and screws.
- B. Roof Curb: 16 inch high with continuously welded seams and factory installed door nailer strip.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- D. Back Draft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.

- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### 2.3 WALL EXHAUSTERS

- A. Centrifugal Fan Unit: V-belt driven with spun aluminum housing; resilient mounted motor, ½ inch mesh, 16 gauge aluminum bird screen; secured with cadmium plated bolts and screws.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Back Draft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### 2.4 CEILING EXHAUST FANS

- A. Centrifugal Fan Unit: V-belt or direct drive with galvanized steel housing lined with ½ inch acoustic insulation, resilient mounted motor, gravity back draft damper in discharge.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Grille: Molded white plastic or aluminum with baked white enamel finish.
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required RPM is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### 2.5 IN-LINE CABINET EXHAUST FANS

- A. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with ½ inch acoustic insulation, resilient mounted motor, gravity back draft damper in discharge.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required RPM is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

### 2.6 ROOF SUPPLY FAN

- A. Fan Unit: Direct driven axial type, aluminum hood, bird screen, die formed aluminum propeller blades riveted to steel hub, resilient mounted motor square base to suit roof curb.
- B. Roof Curbs: 16 inch high, continuously welded seams, and factory door nailed strip. Roof curb shall have same manufacturer as fan and be supplied by Mechanical Contractor and installed by the General Contractor.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected

motor.

**PART III - EXECUTION**

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with lag screws to roof curb.

END OF SECTION 15870



**SECTION 15891 - METAL DUCTWORK****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes low pressure ducts and plenums for heating, ventilating, and air conditioning systems

**PART II - PRODUCTS**

## 2.1 MATERIALS

- A. Steel Ducts: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of G-90 for each side in conformance with ASTM A90.
- B. Insulated Flexible Ducts: Flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 degrees F.
- C. Fasteners: Rivets, bolts, or sheet metal screws
- D. Sealant: Liquid non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.
- E. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

## 2.2 LOW PRESSURE DUCTWORK

- A. Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, re-inforcing and sealing for operating pressures indicated.
- B. No variation of duct configuration or sizes permitted except by written permission.
- C. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on center line. Where not possible and where rectangular elbows are used, provide turning vanes.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- E. Connect flexible ducts to metal ducts with liquid adhesive.
- F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.

2.3 FACTORY FABRICATED DUCTWORK

- A. Duct shall be of standard spiral lock seam or single-rib construction and shall be provided according to the gages given in the following table:

<b>Diameter (inches)</b>	<b>Thickness (inches)</b>
3 - 8	.032
9 - 14	.040
15 - 36	.050

- B. Duct shall be provided in continuous, unjoined lengths wherever possible. Except when interrupted by fittings, round duct sections.
- C. Fittings shall be round and shall have a wall thickness in accordance with the following table:

<b>Fitting Body Diameters (inches)</b>	<b>Minimum Round Fitting Thickness (inches)</b>
3-14	.040
15-26	.050
27-36	.063

- D. Elbows shall be of die-stamped, gored or pleated construction. The bend radius of stamped, gored and pleated elbows shall be 1.5 time the elbow diameter.
- E. All round elbows in diameter of 8 inches or less shall be of die-stamped or pleated construction.
- F. All round elbows in diameter of 9 inches through 14 inches shall be of gored or pleated construction.
- G. All round elbows in diameter greater than 14 inches shall be of gored construction.
- H. Diverging-flow fittings shall be constructed with a radiused entrance to all branch taps and with no excess material projecting from the body into the branch tap entrance.
- I. All take-off or branch entrances shall be by means of factory fabricated fittings.
- J. All fitting ends shall be sized to slip inside mating duct sections. They shall provide a tight fit and have a minimum 2-inch insertion length with a stop bead. No additional coupling shall be required for duct to fitting joints.

**PART III - EXECUTION**

3.1 INSTALLATION

- A. Factory Fabricated ductwork can be substituted for low-pressure field constructed ductwork.
- B. All factory fabricated spiral duct and fittings shall be installed in accordance with manufacturer's recommendations.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

- D. Connect diffusers or troffer boots to low pressure ducts with 5 feet maximum length of flexible duct. Hold in place with strap or clamp.
- E. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

### 3.3 ADJUSTING AND CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that may be harmed by excessive dirt with temporary filters or bypass during cleaning.
- B. Clean duct systems with high power vacuum machines. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION 15891





**SECTION 15910 - DUCT ACCESSORIES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Not used
  - 2. Turning Vanes
  - 3. Duct Mounted Access Doors and Panels
  - 4. Flexible Connectors
  - 5. Flexible Ducts

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data including details for materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings from manufacturer detailing assemblies: Include dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

**PART II - PRODUCTS**

## 2.3 AIR TURNING DEVICES

- A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

## 2.4 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- B. Provide factory made spin-in starting collars for connections to trunk ducts.

## 2.5 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.
- B. Review locations prior to fabrication.
- C. Fabricate rigid and close fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one-inch thick insulation with sheet metal cover.
- D. Access doors smaller than 12 inches square may be secured with sash locks.

- E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.
- F. Access doors with sheet metal screw fasteners are not acceptable.

### **PART III - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions.
- B. Provide balancing dampers at points on low pressure supply systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.
- C. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- D. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.
- E. Provide duct test holes where indicated and required for testing and balancing purposes.

END OF SECTION 15910

**SECTION 15932 - AIR OUTLETS AND INLETS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 DESCRIPTION OF WORK

- A. Extent of air outlets and inlets work is indicated by Drawings and Schedules and by Requirements of this Section.
- B. Types of outlets and inlets required for this Project include the following:
  - 1. Ceiling Air Diffusers
  - 2. Wall Registers and Grilles
  - 3. Louvers

## 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:
  - 1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size and accessories furnished.
  - 2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish and mounting details.
  - 3. Performance data for each type of air outlet and inlet furnished, throw and drop; and noise criteria ratings. Indicate selections on data.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

**PART II - PRODUCTS**

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Diffusers & Grilles
  - 1. Titus, Inc.
  - 2. Metalaire, Inc.
  - 3. Carnes, Inc.
  - 4. E. H. Price
- B. Louvers
  - 1. Arrow United Industries, Inc.
  - 2. Louvers & Dampers, Inc.
  - 3. Penn Ventilator Co., Inc.
  - 4. Ruskin Mfg. Co.
  - 5. Safe-Air Inc.
  - 6. Vent Products Co., Inc.
  - 7. NCA

## 8. Cesco Products

## 2.2 RECTANGULAR CEILING DIFFUSERS

- A. Rectangular, extruded aluminum, multi-core type diffuser to discharge air in 360 degree pattern.
- B. Provide inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabricate of aluminum with baked enamel off-white finish.
- D. Provide opposed blade damper with damper adjustable from diffuser face.

## 2.3 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

- A. Fixed grilles of 1/2 x 1/2 x 1 inch egg crate.
- B. Provide inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabricate of aluminum with baked enamel off-white finish.
- D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

## 2.4 WALL SUPPLY REGISTERS/GRILLES

- A. Streamlined and individually adjustable blades, depth of which exceeds 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
- B. Fabricate 1 1/4 inch margin frame with countersunk screw mounting and gasket.
- C. Fabricate of aluminum extrusions with 20 gauge minimum frames and 22 gauge minimum blades, with baked enamel off-white finish.
- D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

## 2.6 LOUVERS

- A. Provide 4-inch deep louvers with blades on 45 degree slope with center baffle and return bend, heavy channel frame, bird screen with 1/2 inch square mesh.
- B. Fabricate of 12-gauge extruded aluminum, welded assembly, with factory baked enamel finish. Color selection from manufacturer standard.
- C. Furnish with interior screw holes in jambs for installation.

## 2.7 ROOF HOODS

- A. Fabricate air inlet or exhaust hoods in accordance with SMACNA Low Pressure Duct Construction Standards.
- B. Fabricate of aluminum, minimum 16 gauge base and 18 gauge hood; suitably reinforced; with removable hood; bird screen with 1/2 inch square mesh and factory prime coat baked enamel finish.
- C. Mount unit on minimum 12-inch high curb base with insulation between duct and curb.

- D. Make hood outlet area minimum of twice throat area.

**PART III - EXECUTION**

3.1 INSTALLATION

- A. Install items in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.
- C. Install diffusers to ductwork with air-tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION 15932



**SECTION 15990 - TESTING, ADJUSTING AND BALANCING****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section specifies the Requirements and Procedures of Total Mechanical Systems Testing, Adjusting and Balancing. Requirements include measurement and establishment of the fluid quantities of the Mechanical Systems as required to meet Design Specifications and Recording and reporting the results.
- B. Testing and Balancing must be conducted by an independent, Certified Testing and Balancing firm, registered with either the AABC or the NEBB.
- C. The Test and Balance Contractor shall be a subcontractor to the Mechanical Contractor.

## 1.3 SECTION INCLUDES

- A. Testing, adjustment and balancing of air systems.
- B. Measurement of final operating condition of HVAC Systems.
- C. Sound measurement of equipment operating conditions.
- D. Vibration measurement of equipment operating conditions.

## 1.4 SUBMITTALS

- A. Submit under provisions of Section 15500.
- B. Submit name of adjusting and balancing agency for approval within 30 days after Award of Contract.
- C. Field Reports: Submit under provisions of Section 15500.
- D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- E. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
- F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and for inclusion in operating and maintenance manuals.
- G. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Report shall reference the Contract Drawings for location of equipment and devices. Where reference to the contract drawings is not satisfactory, include a set of reduced drawings or sketches with equipment and devices identified to correspond with data sheets.
- H. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

- I. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or NEBB forms.

#### 1.5 QUALITY ASSURANCE

- A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111, and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- B. Maintain one copy of each document on site.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Sequence work under the provisions of Section 15500.
- B. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.
- C. Schedule work under the provisions of Section 15500.
- D. Schedule and provide assistance in final adjustment and test of Smoke Control System with Fire Authority.

### **PART II - PRODUCTS (Not Used)**

### **PART III - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  - 1. Systems are started and operating in a safe and normal condition.
  - 2. Control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.
  - 4. Ductwork Systems:
    - a. Final filters are clean and in place. If required, install temporary media in addition to final filters.
    - b. Duct systems are clean of debris.
    - c. Fans are rotating correctly.
    - d. Dampers are in place and open.
    - e. Air coil fins are cleaned and combed.
    - f. Access doors are closed and duct end caps are in place.
    - g. Air inlets and outlets are installed and connected.
    - h. Duct system leakage is minimized.
- B. Submit Field Reports: Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.



### 3.2 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

### 3.3 INSTALLATION TOLERANCES

- A. HVAC Systems: Adjust to within plus or minus 5 percent of design for supply and return systems and plus or minus 10 percent of design for exhaust systems.
- B. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### 3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of balancing devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### 3.5 AIR SYSTEM PROCEDURE

- A. Adjust equipment and distribution systems to provide required or design air quantities.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure and record air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Adjust air volume by adjusting duct internal devices such as dampers and splitters. Do not utilize opposed blade dampers at air inlets and outlets.
- F. Vary total system air quantities by adjusting sheave position at each fan. Vary branch air quantities by damper regulation.
- G. Measure and record static air pressure conditions at air supply and exhaust units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- H. Adjust settings and minimum set points for motorized and back draft dampers to design conditions.
- I. Measure and record inlet and outlet temperatures at each air supply unit at full cooling and heating capacity.

## 3.6 REPORT FORMS

## A. Forms shall include the following:

1. Title Page:
  - a. Name of Testing, Adjusting and Balancing Agency
  - b. Address of Testing, Adjusting and Balancing Agency
  - c. Telephone number of Testing, Adjusting and Balancing Agency
  - d. Project Name
  - e. Project Location
  - f. Project Architect
  - g. Project Engineer
  - h. Project Contractor
  - i. Project Altitude
  - j. Report Date
2. Summary Comments:
  - a. Design versus final performance
  - b. Notable characteristics of system
  - c. Description of systems operation sequence
  - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
  - e. Nomenclature used throughout report
  - f. Test Conditions
3. Instrument List:
  - a. Instrument
  - b. Manufacturer
  - c. Model Number
  - d. Serial Number
  - e. Range
  - f. Calibration Date
4. Electric Motors:
  - a. Manufacturer
  - b. Model/Frame
  - c. HP/BHP/Efficiency
  - d. Phase, Voltage, Amperage; Nameplate, Actual, No Load
  - e. RPM
  - f. Service Factor
  - g. Starter Size, Rating, Heater Elements
  - h. Sheave Make/Size/Bore
5. V-Belt Drive:
  - a. Identification/Location
  - b. Required Driven RPM
  - c. Driven Sheave, Diameter and RPM
  - d. Belt, Size and Quantity
  - e. Motor Sheave Diameter and RPM
  - f. Center to center distance, maximum, minimum, and actual
6. Equipment Data:
  - a. Identification/number
  - b. Manufacturer
  - c. Model number and Serial number

- d. Capacity
- e. Service
- f. Design flow rate, pressure drop, BHP
  
- g. Actual flow rate, pressure drop, BHP
- h. Temperature readings
  
- 7. Duct Traverse:
  - a. System zone/branch
  - b. Duct size
  - c. Area
  - d. Design velocity
  - e. Design air flow
  - f. Test velocity
  - g. Test air flow
  - h. Duct static pressure
  - i. Air temperature
  - j. Correction factor
  
- 8. Air Distribution Test Sheet:
  - a. Air terminal number
  - b. Room number/location
  - c. Terminal type
  - d. Terminal size
  - e. Area factor
  - f. Design velocity
  - g. Design air flow
  - h. Test (final) velocity
  - i. Test (final) air flow
  - j. Percent of design air flow

### 3.7 SOUND AND VIBRATION TESTING

- A. Test and adjust Mechanical Systems for sound and vibration in accordance with the detailed instructions of the referenced Standards.
  
- B. Sound Level Test and Report:
  - 1. Location
  - 2. Octave Bands - equipment off
  - 3. Octave Bands - equipment on
  
- C. Vibration Test and Report:
  - 1. Location of Points:
    - a. Fan bearing: drive end
    - b. Fan bearing: opposite end
    - c. Motor bearing: center (if applicable)
    - d. Motor bearing: drive end
    - e. Motor bearing: opposite end
    - f. Casing: (bottom or top)
    - g. Casing: (side)
    - h. Duct after flexible connection: (discharge)
    - i. Duct after flexible connection: (suction)
  
  - 2. Test Readings:
    - a. Horizontal, velocity and displacement
    - b. Vertical, velocity and displacement
    - c. Axial, velocity and displacement

3. Normally acceptable readings, velocity and acceleration
4. Unusual conditions at time of test
5. Vibration source (if non-complying)

END OF SECTION 15990

**DIVISION 16: ELECTRICAL**

16010	Basic Electrical Requirements
16050	Basic Electrical Materials and Methods
16100	Raceways, Boxes and Cabinets
16120	Wires and Cables
16140	Wiring Devices
16190	Supporting Devices
16195	Electrical Identification
16452	Grounding
16470	Panel Boards
16476	Disconnects
16515	Interior Lighting



**SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS****PART I - GENERAL**

## 1.1 GENERAL CONDITIONS

- A. The Stipulations and Conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions" and "Special Conditions", hereinbefore set forth, shall apply to this and the other Sections of Division 16.

## 1.2 GENERAL REQUIREMENTS

- A. The General Requirements hereinafter listed apply to the Electrical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

## 1.3 ALTERNATES

- A. Carefully examine all alternates at the back of this Specification and on the Drawings to determine if any work described under the Electrical Section will be affected thereby.

## 1.4 INTENT

- A. The intent of these Drawings and Specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on Drawings and not specifically called for in the Specifications, or any items specified and not specifically indicated or detailed on the Drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Electrical Contractor at his own expense.

## 1.5 DEFINITIONS

- A. The Electrical Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the Electrical systems. All items of equipment are specified in the singular; however, the Electrical Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

## 1.6 VISIT TO THE SITE

- A. The Electrical Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

## 1.7 REGULATORY REQUIREMENTS

- A. All work under this section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern.
- B. The Electrical Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.
- C. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL),

- and National Fire Protection Association (NFPA) are a minimum installation requirement.
- D. The following regulatory shall be used as minimum standards:

AEIC	American Association of Edison Illuminating Companies
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers
NCCM	N.C. Construction Manual w/G.S. as listed
NCSBC	N.C. State Building Code
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
U/L	Underwriters' Laboratories, Inc.
OSHA	Occupational Safety and Health Standards
ASHRAE/IES	90.1 energy code

#### 1.8 TEST STANDARDS

- A. All material and equipment shall be listed, labeled or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., or third party agencies accredited by the North Carolina Building Code Councils latest edition or amendment.

#### 1.9 PERMITS AND FEES

- A. NA

#### 1.10 DRAWINGS AND SPECIFICATIONS

- A. The Electrical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The Drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between General Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Electrical Contractor shall include in his bid the most expensive of the items in conflict.
- B. The Electrical Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No Contractor shall under any circumstances scale drawings for the location of equipment. The Electrical Contractor shall verify the locations of all utility services and electrical equipment.
- C. The Electrical Contractor shall keep at least one set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit Drawings to Architect/Engineer before final payment is made.

#### 1.11 SUPERVISION

- A. The Electrical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels and locating chases, openings, hangers, inserts, sleeves, etc.



**PART II - PRODUCTS****2.1 STANDARD PRODUCTS**

- A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

**2.2 SUBMITTAL**

- A. The Electrical Contractor shall submit, for approval, detailed Shop Drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Electrical Contractor has in his possession the approved Shop Drawing for the particular material or equipment. The Electrical Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.
- B. Submitted material shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specifications governing, Contractor's name and name of job.
- C. Approval of equipment will not relieve the Electrical Contractor of compliance with the Specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other Contractors and suppliers shall be solely the responsibility of the Electrical Contractor and with no additional expense to the Owner.

**2.3 SUBSTITUTIONS**

- A. Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Electrical Contractor shall purchase and install all materials required, unless otherwise noted.
- B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.
- C. All products shall be furnished in compliance with NC General Statute 133-3.

**2.4 PRODUCT HANDLING**

- A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.

- B. The Electrical Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

## 2.5 MATERIALS AND WORKMANSHIP

- A. The Electrical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Electrical Contractor at the Electrical Contractor's expense.
- B. The material used throughout the work, except when otherwise noted, shall be new and of Specification grade and the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.
- C. Any equipment furnished by the Mechanical Contractor or any other Contractor that is larger than those indicated on the Drawings and described in these Specifications or have different Electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

## PART III - EXECUTION

### 3.1 EXCAVATION AND BACKFILL

- A. The Electrical Contractor shall perform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding 4 inches in depth, wetting each layer as it is placed and thoroughly compacting each layer with Mechanical tamper or other approved means. Any damage done during excavation and backfilling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its original condition prior to construction at no expense to the owner. All work will be approved by the Engineer.

### 3.2 SCAFFOLDING, RIGGING AND HOISTING

- A. The Electrical Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

### 3.3 CUTTING AND PATCHING

- A. The Electrical Contractor shall provide all cutting and patching necessary to install the work specified in the 16000 Sections. The patching shall match adjacent surface material and finishes.
- B. No Structural member shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.
- C. Cutting or Holes:
  - 1. Locate holes in advance where they are proposed in the Structural Sections such as ribs or beams. Obtain the approval of the Engineer prior to drilling through Structural Sections.
  - 2. Cut holes through concrete and masonry in new and existing structures with a

diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed.

### 3.4 WATERPROOFING

- A. At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight. All work subject to approval of the Engineer.

### 3.5 EQUIPMENT SPACE AND ARRANGEMENT

- A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Electrical Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements. Working clearances shall be not less than N.E.C or other regulatory requirements.
- B. These drawings indicate the extent and general arrangement of equipment. If any departures are deemed necessary by the Electrical Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after Award of the Contract. No departure shall be made without written approval of the Architect/Engineer. Any delay on the Contractor's part to provide such submittal will not constitute an extension of the Contract time.

### 3.6 DAMAGE TO WORK ALREADY IN PLACE

- A. The Electrical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by Mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

### 3.7 JURISDICTION OF WORK

- A. It may become necessary for the Electrical Contractor to furnish labor or materials which are not generally accepted as part of this trade. In cases of this type, he shall contract the work or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of Trade Agreements as to jurisdiction, alleged or actual.

### 3.8 COORDINATION WITH OTHER TRADES

- A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Electrical Contractor shall make required changes or relocations at no additional cost to the Owner.
- B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, a Ceiling Suspension System may be installed as required for coordination.
- C. The Electrical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of

any work directed shall be borne by the Subcontractor or Contractors directed to do this work.

### 3.9 DIVISION OF WORK

- A. These paragraphs are intended to show exactly the point of division of work between the Electrical Division and the Mechanical Division or any other division.
- C. All equipment covered in the Mechanical Division or any other Division of the Specifications shall be furnished, mounted, and aligned under the respective Division. All starters, controls and wiring for this equipment, including final connection to the same, shall be furnished and installed under that Division.
- D. Divisions of the Specifications shall be completed under the respective Division.
- E. Under Division 16, the Contractor shall be responsible for providing all line side power wiring, conduit, disconnect switches, and junction boxes as shown on the electrical drawings.

### 3.10 EQUIPMENT INSTALLATION

- A. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these Drawings and Specifications.

### 3.11 OPERATION AND MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT". In addition to the requirements specified in Division 1, include the following information for equipment items:
  - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
  - 2. Manufacturer's printed Operating Procedures to include start-up, break-in, and routine and normal Operating Instructions; regulation, control, stopping, shutdown, and emergency instructions and summer and winter operating instructions.
  - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.
  - 4. Servicing Instructions and Lubrication Charts and Schedules.

### 3.12 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT". In addition to the requirements specified in Division 1, indicate installed conditions for:
  - 1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.

2. Equipment locations (exposed and concealed) dimensioned from prominent building lines.
3. Approved substitutions, Contract modifications and actual equipment and materials installed.

### 3.13 GUARANTEE

- A. The Electrical Contractor shall present to the Owner a written guarantee covering his work, including all equipment, material and workmanship. This guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.
- B. Any defective work, equipment, material and/or workmanship that develops within the Guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Electrical Contractor without cost to the Owner.

### 3.14 FINAL INSPECTION

- A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Electrical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.
- B. An authorized Inspector from the North Carolina Department of Insurance shall inspect the project during construction and upon completion of the construction phase. It shall be the responsibility of the Electrical Contractor to notify the Inspector as the work progresses. The NCDOI Inspector can be reached at (919) 661-5880.**

### 3.15 FINAL PAYMENTS

- A. All Final Payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

### 3.16 DOCUMENTATION

- A. All tests shall be completely documented indicated time of day, temperature, and all pertinent test information.
- B. All required documentation of readings shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

END OF SECTION 16010



**SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes limited Scope, General Construction Materials and Methods for Application with Electrical Installations as follows:
  - 1. Miscellaneous metals for support of electrical materials and equipment.
  - 2. Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.

## 1.3 DEFINITIONS

- A. The following definitions apply to excavation operations:
  - 1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.
  - 2. Sub-Base: As used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.
  - 3. Sub-Grade: As used in this Section refers to the compacted soil immediately below the slab or pavement system.
  - 4. Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific direction from the Architect.

## 1.4 SEQUENCE AND SCHEDULING

- A. Coordinate the shut-off and disconnection of electrical service with the Owner and the utility company.

**PART II - PRODUCTS**

## 2.1 SOIL MATERIALS

- A. Sub-Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.
- B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1½ inch sieve, and not more than 5 percent passing a No. 4 sieve.
- C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP; free of clay, rock, or gravel larger than 2 inches

in any dimension; debris; waste; frozen materials; and vegetable and other deleterious matter.

## 2.2 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Fasteners: Zinc-coated, type, grade and class as required.

## PART III - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 EXCAVATION

- A. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.
- B. Install sediment and erosion control measures in accordance with local codes and ordinances.
- C. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
  - 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials.
  - 2. Provide and establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- D. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
  - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
  - 2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.
- E. Trenching: Excavate trenches for electrical installations as follows:
  - 1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of raceways and equipment.



2. Excavate trenches to depth indicated or required.
  3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.
  4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.
- F. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree 2 C).
- G. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.
1. Under walks and pavements, use a combination of sub-base materials and excavated or borrowed materials.
  2. Under building slabs, use drainage fill materials.
  3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
  4. For raceways less than 30 inches below surface of roadways, provide 4-inch thick concrete base slab support. After installation of raceways, provide a 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway sub-base.
  5. Other areas, use excavated or borrowed materials.
- H. Backfill excavations as promptly as work permits, but not until completion of the following:
1. Inspection, testing, approval, and locations of underground utilities have been recorded.
  2. Removal of concrete formwork.
  3. Removal of shoring and bracing and backfilling of voids.
  4. Removal of trash and debris.
- I. Placement and Compaction: Place backfill and fill materials in layers of not more than eight (8) inches in loose depth for material compacted by heavy equipment, and not more than four (4) inches in loose depth for material compacted by hand operated tampers.
- J. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- K. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
- L. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils), 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 (cohesion-less soils).
2. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of material, or 95 percent relative density for cohesionless material.
  - a. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material or 95 percent relative density for cohesionless material.
  - b. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.
3. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.
4. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

### 3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code".

END OF SECTION 16050

**SECTION 16100 - RACEWAYS, BOXES AND CABINETS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Raceways, Fittings, Boxes, Enclosures and Cabinets for Electrical Wiring.

**PART II - PRODUCTS**

## 2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1
- B. Intermediate Metal Conduit: ANSI C80.6
- C. Electrical Metallic Tubing and Fittings: ANSI C80.3 with compression-type fittings.
- D. Flexible Metal Conduit: Zinc coated steel
- E. Liquid tight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.
- F. Fittings: NEMA FB 1, compatible with conduit/tubing materials.
- G. Non-Metallic Rigid Conduit: Schedule 40 pvc as where shown on the drawings.
- H. "MC" type cable.

## 2.2 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1
- B. Cast Metal Boxes: NEMA FB 1, type FD, cast alloy box with gasketed cover

## 2.3 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- C. Pull Boxes: Code gauge steel with screw type removable cover. NEMA rated for the condition.

**PART III - EXECUTION**

## 3.1 EXAMINATION

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been

corrected.

3.2 MINIMUM CONDUIT SIZE: (unless indicated otherwise) on the drawings conduit shall be sized as follows:

- A. Indoors: The minimum conduit size shall be 1/2".
  - 1. Flexible metal conduit may be used for tap connection to recessed lighting fixtures.
- B. Outdoors: Branch circuit conduit installed below grade to exterior equipment shall be one (1) inch minimum unless noted otherwise.

3.3 WIRING METHODS: Unless noted otherwise on the drawings the following materials shall be used:

- A. Outdoors: Use the following wiring methods:
  - 1. Exposed: Rigid or intermediate metal conduit.
  - 2. Underground: Galvanized Rigid Conduit.
  - 3. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquid tight flexible metal conduit.
  - 4. Boxes and Enclosures: NEMA Type 3R or Type 4.
- B. Indoors: Use the following wiring methods:
  - 1. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquid tight flexible metal conduit.
  - 2. Damp or Wet Locations: Rigid steel conduit.
  - 3. Exposed: Electrical metallic tubing above 8 feet and rigid metallic conduit below eight (8) feet.
  - 4. Concealed: Electrical metallic tubing or MC cable.
  - 5. Boxes and Enclosures: NEMA Type 1, except in damp or wet locations use NEMA Type 3R, unless otherwise noted.

3.4 INSTALLATION

- A. Telephone/Data/Cable TV outlet boxes shall be 2 gang with appropriate trim and cover. Coordinate cover plates with Owner.
- B. Provide insulated bushings for all conduit ends.
- C. Conceal rigid conduit and EMT, unless otherwise indicated, within finished walls, ceilings, above attic space and below floors.
- D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.
- E. Install raceways level and square and at proper elevations. Provide adequate headroom.
- F. Complete raceway installation before starting conductor installation.

- G. Use temporary closures to prevent foreign matter from entering raceway.
- H. Protect stubs from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- I. **Where non-metallic conduit is shown to be used below the slab provide rigid conduit to turn up into the building space or at all exterior walls, poles or equipment.**
- J. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.
- K. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated. Where the number of bends exceed the total number required by the N.E.C., provide pull boxes as required by code.
- L. Install raceways parallel to or at right angles to surfaces or structural members, and follow the surface contours as much as practical.
1. Run parallel or banked raceways together, on common supports where practical.
  2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.
- M. Join raceways with fittings designed and approved for the purpose and make joints tight.
1. Use bonding jumpers where joints cannot be made tight.
  2. Use insulating bushings to protect conductors.
  3. Provide expansion joint fittings where required for the raceway used.
- N. IMC and GRC shall terminate with either a double locknut/bushing set or in a threaded hub.
- O. Where conduit type "LB" fittings are used all conduits on conduits over 2" in size shall be "MOGAL" type.
- P. **"EMT" connectors shall be steel plated hexagonal compression type only. Do not use pot metal, set-screw, or indenter type connectors.**
- Q. Where concentric, eccentric, or oversized knockouts are encountered, a grounding-type insulated bushing shall be provided.
- R. Where conduits of any type pass over a building expansion joint, a standard "expansion joint" fitting, compatible with the type raceway, shall be provided.
- S. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.
- T. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the

raceway so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

- U. Install pull cords in all empty raceways. Use monofilament plastic line having not less than 200-lb (90 kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull cord.
- V. Telephone and Signal System Raceways 2 Inch Trade Size and Smaller: In addition to the above requirements, install in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements. Pull boxes shall be a minimum of 10" square x 6" deep with removable cover.
- W. Install raceway sealing fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
  - 1. Where conduits enter or leave hazardous classified locations.
  - 2. Where conduits pass from warm locations to cold locations, such as exterior spaces and air-conditioned spaces.
  - 3. Where otherwise required by the NEC.
- X. Stub-Up Connections: Extend conduits through concrete floor a minimum of 6" for connection to freestanding equipment. Extend conductors to equipment with flexible metal conduit. Where equipment connections are not made under this Contract verify the length of the flexible connectors.
- Y. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor.
- AA. Provide grounding connections for raceway, boxes and components. Tighten connectors and terminals according to tightening torques specified in UL Standard 486A.
- BB. All underground raceways shall be identified by "UNDERGROUND LINE MARKING TAPE" located directly above the raceway at 6" below finished grade. Tape shall be permanent, bright-colored, continuous, magnetic strip, printed, plastic tape compounded for direct burial not less than 6" wide and 4 mils thick. Printed legend shall be indicative of the service it is marking. Provide sufficient tape not less than 2/3 of the width of the item marked for the full length of the Raceway.
- CC. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the sub-up out of the slab or earth shall be rigid steel.
- DD. Where shown to be used on the drawings PVC non-metallic conduit used exterior to the building for grouped circuits it shall be encased in a minimum of 3" of 3000 psi rated concrete. Concrete encased non-metallic ducts shall be supported on plastic separators coordinated with duct size and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Secure separators to the earth and to ducts to prevent floating during placement of concrete. Do not use steel or tie wires in such a way to form conductive or magnetic loops around ducts or duct groups.
- EE. The Raceway System shall not be relied on for grounding continuity. A green grounding conductor, properly sized per NEC Table 250-122, shall be run in all power raceways.

- FF. Where non-metallic conduit is allowed on the drawings all bends and off-sets shall be made by approved mechanical benders per the manufacturers instruction. Any conduit not in compliance will be removed.

### 3.5 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 2. Repair damage to paint finishes with matching touch-up coating recommended by the manufacturer.

### 3.6 CLEANING

- A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt and construction debris and repair damaged finish, including chips.

END OF SECTION 16100





**SECTION 16120 - WIRES AND CABLES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Building Wires and Cables and Associated Splices, Connectors and Terminations for Wiring Systems rated 600 Volts and Less.

**PART II - PRODUCTS**

## 2.1 BUILDING WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Applications" Article.
- B. Rubber Insulation: Conform to NEMA WC 3.
- C. Thermoplastic Insulation: Conform to NEMA WC 5.
- D. Cross-Linked Polyethylene Insulation: Conform to NEMA WC 7.
- E. Ethylene Propylene Rubber Insulation: Conform to NEMA WC 8.
- F. Solid conductor for 10 AWG and smaller: Stranded conductor for larger than 10 AWG.

## 2.2 CONNECTORS AND SPLICES

- A. UL-listed factory fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.

**PART III - EXECUTION**

## 3.1 EXAMINATION

- A. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

## 3.2 APPLICATIONS

- A. Feeders and Branch Circuits: Type THHN\THWN or XHHW, copper conductor, in raceway.

## 3.3 INSTALLATION

- A. All conductors shall be copper.
- B. Minimum conductor size for power and lighting circuits shall be #12 AWG. Maximum conductor size shall be 500 KCMIL AWG.

- C. All power and lighting circuits #10 awg and smaller shall be solid copper conductors. Conductor sizes #8 awg and larger shall be Class "B" stranded copper conductors.
- D. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.
  - 1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
  - 2. Use pulling means, including fish tape, cable, rope, and basket weave wire/cable grips that will not damage cables or raceway.
- E. Conductor Splices: Keep to minimum.
- F. Wiring at Outlets: Install with at least 8 inches of slack conductor at each outlet.
- G. Connect outlets and components to wiring and to ground as indicated. Tighten to UL Standard 486A.
- H. Power and Lighting circuits shall have individual neutral conductors.**
- I. All power circuits noted for computer equipment with isolated grounding shall be individually installed in a separate conduit with separate phase, neutral conductor, grounding conductor, and isolated grounding conductor, unless noted otherwise.
- J. In no case shall any wire installed to a device exceed the U.L. rating of the device.

#### 3.4 SPLICING

- A. Joints in solid conductors shall be using Idea "wire nuts", 3M Company "scotch lock", or "T&B" "PIGGY" connectors in junction boxes, outlet boxes and lighting fixtures.
- B. "Sta-kon" or other permanent type crimp connectors shall not be used for branch circuit connections.
- C. Joints in stranded conductors shall be spliced by approved mechanical connectors. Solderless mechanical connectors similar to "NSI" multi-cable connector blocks for splices and taps, provided with UL approved insulating covers, may be used instead of mechanical connectors plus tape.
- D. Conductors in all cases, shall be continuous from outlet to outlet unless "taps" are required and shall be made only within outlet, junction boxes, troughs and gutters.

#### 3.5 VOLTAGE DROP

- A. Where conductor length from the panel to the first outlet on a 120 volt circuit exceeds 100 feet, the branch circuit conductors from the panel to the first outlet shall be not smaller than #10 awg.

#### 3.6 FIELD QUALITY CONTROL

- A. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1.Procedures: Perform each Visual and Mechanical Inspection and Electrical Test stated in NETA Standard ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Correct malfunctioning products at site, where possible, and re-test to demonstrate

compliance; otherwise, remove and replace with new units and re-test.

3.7 ELECTRICAL TESTING

A. Feeder Insulation Resistance Testing:

1. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt megger. The procedures listed below shall be followed:
2. Minimum readings shall be one million (1,000,000) or more ohms for # 6 AWG wire and smaller, 250,000 ohms or more for #4 wire or larger, between conductor and the grounding conductor.
3. After all devices and equipment are installed and all connections completed to each panel, the Contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the Contractor shall disconnect the branch circuit neutral wires from the neutral bar. Test each neutral conductor separately until the low readings are found. The Contractor shall correct troubles, reconnect and re-test until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
4. The Contractor shall send a letter to the Engineer certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.
5. At the final inspection, the Contractor shall furnish a megger and show the Engineers that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and a voltmeter and take current and voltage readings as directed by the representatives.

END OF SECTION 16120



**SECTION 16140 - WIRING DEVICES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes various types of receptacles, connectors, switches and finish plates.

## 1.3 SUBMITTALS

- A. Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each product specified.

**PART II - PRODUCTS**

## 2.1 WIRING DEVICES

- A. Comply with NEMA Standard WD 1-101968, "General Purpose Wiring Devices".
- B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.
- C. Color: Selected by Architect.
- D. Duplex receptacles shall be of the grounding type arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall be straight blade, rated 20 amp, 125 volt and the face configuration shall conform to the NEMA Standard No. WDI.101968, and shall be approved third party listed. Self-grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct green insulated conductor connection to the equipment grounding system. Receptacles shall be specification grade mounted vertically.
- E. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicated, and with the following additional requirements:
  - 1. Ground Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, "Ground Fault Circuit Interrupters" with integral NEMA 5-20R duplex receptacle. Design units for installation in a 2¾ inch (70-mm) deep outlet box without an adapter.
  - 2. Isolated Ground Receptacles: Equipment grounding contacts are connected only to the green grounding screw terminal of the device and have inherent electrical isolation from the mounting strap.
    - a. Devices: Listed and labeled as isolated ground receptacles.
    - b. Isolation Method: Integral to the receptacle construction and not dependent on removable parts.
    - c. Color: Orange with "green" triangle.

- F. Receptacles, Industrial Heavy-Duty: Conform to NEMA Standard PK 4 "Plugs, Receptacles and Cable Connectors of the Pin and Sleeve type for Industrial Use".
- G. Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.
- H. Single pole and three/four-way toggle type Snap Switches: Shall be 20 amp 120/277v. a.c. rated, quiet-type a.c. switches, NRTL listed and labeled as complying with UL Standard 20 "General Use Snap Switches" and with Federal Specification W-S-896. Color selected by Architect.
- I. Dimmer Switches: Modular full-wave solid-state units with integral, quiet On/Off switches, and audible and electromagnetic noise filters. See plans for model numbers.
  - 1. Wattage rating shall be 2000 watts minimum, except as otherwise indicated.
  - 2. Control: Continuously adjustable slide or toggle. Single pole or 3-way switch to suit conditions.
- J. Motion Sensor Switches
  - 1. Single Pole-single switching- Hubbell Model LHMTS1
  - 2. Single Pole-double switching-Hubbell Model LMHTD2
  - 3. Switches shall be combination ultrasonic and passive infrared.
  - 4. 100 square foot coverage, 180 degree.
  - 5. 120 volt: 800 watt incandescent, 1000 watt fluorescent.
  - 6. 277 volt, 1800 watt fluorescent.
  - 7. 5 year warranty.
  - 8. Equals by Wattstopper and Lutron.
- K. Wall Plates: Single and combination types that mate and match with corresponding wiring devices. Features include the following:
  - 1. Color: Matches wiring device except as otherwise indicate.
  - 2. Plate-Securing Screws: Metal with heads colored to match plate finish

## 2.2 FLOOR SERVICE OUTLET ASSEMBLIES

- A. Types: Modular, above-floor, or recessed in floor, dual service units suitable for the wiring method indicated.
- B. Compartmentation: Barrier separates power and signal compartments.
- C. Housing Material: Die-cast aluminum, satin finished.
- D. Power Receptacle: NEMA configuration 5-20R, ivory finish, except as otherwise indicated.
- E. Signal Outlet: Blank cover with bushed cable opening, except as otherwise indicated.

### 2.3 MULTI-OUTLET ASSEMBLIES

- A. Comply with Standard UL 5, "Surface Metal Raceways and Fittings".
- B. Components of Assemblies: Products of a single manufacturer designed to be used together to provide a complete matching assembly of raceways and receptacles.
- C. Raceway Material: Metal with manufacturer's standard corrosion-resistant finish.

## PART III - EXECUTION

### 3.1 INSTALLATION

- A. Install devices and assemblies plumb and secure.
- B. Install wall plates when painting is complete.
  - 1. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- C. Protect devices and assemblies during painting.
- D. Adjust locations at which floor service outlets are installed to suit the indicated arrangement of partitions and furnishings.
- E. Field verify the actual location of all outlet devices above equipment or counter tops before rough-in and installation. Any outlet installed in conflict with equipment or conditions that could have been avoided, will be corrected at the Contractor's expense.
- F. Provide weatherproof cast aluminum cover plates for all device's exterior to the building or in "wet" locations, Hubbell WP26M or equal. Ensure covers for outdoor receptacles are Extra Duty rated per 2017 NEC 406.9(B)(1).
- G. GFCI protection shall be provided for all receptacles exterior to the building, in restrooms or where required by Code.
- H. Locate all receptacles in rated walls with 24" minimum horizontal separation. This includes devices located opposite each other in the walls.

### 3.2 IDENTIFICATION

- A. Comply with Division 16 Section "Electrical Identification".
  - 1. Switches: Where 3 or more switches are ganged and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.
  - 2. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

### 3.3 GROUNDING

- A. Isolated Ground Receptacles: Connect to isolated grounding conductor routed to designated isolated equipment ground terminal of Electrical System.

### 3.3 FIELD QUALITY CONTROL

- A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least six (6) times.
- B. Test ground-fault circuit interrupter operation with both local and remote fault simulations according to manufacturer recommendations.
- C. Replace damaged or defective components.

### 3.4 CLEANING

- A. General: Internally clean devices, device outlet boxes and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 16140



**SECTION 16190 - SUPPORTING DEVICES****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes secure support from the building structure for Electrical items by means of Hangers, Supports, Anchors, Sleeves, Inserts, Seals and Associated Fastenings.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.

**PART II - PRODUCTS**

## 2.1 COATINGS

- A. Coating: Supports, support hardware and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish and inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

## 2.2 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C clamps with retainers, ceiling trapeze hangers, wall brackets and spring steel clamps.
  - 1. Expansion Anchors: Carbon steel wedge or sleeve type.
  - 2. Toggle Bolts: All steel spring-head type.
- B. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps and cap screws.
- C. U-Channel Systems: 16-gage steel channels, with 9/16-inch diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

## 2.3 FABRICATED SUPPORTING DEVICES

- A. General: Shop or field fabricated supports or manufactured supports assembled from U-Channel components.
- B. Steel Brackets: Fabricated of angles, channels and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snap-lock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
    - a. 3-inch and smaller: 20-gage
    - b. 4-inch to 6-inch: 16-gage
  2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
  3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

### PART III - EXECUTION

#### 3.1 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
  1. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
  2. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
  3. Support parallel runs of horizontal raceways together on trapeze-type hangers.
  4. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use ¼ inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
  5. Space supports for raceway's types not covered by the above in accordance with NEC.
  6. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
  7. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
  8. In interior spaces provide a minimum of ¼ inch space for all conduits installed on the exterior building walls. Approved "clamp-back" or strut devices shall be used.

- D. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers and other devices.
- E. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- F. Conduit Seals: Install bushing seals for conduit penetrations of slabs on grade and exterior walls below grade. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- G. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, bus ways, cabinets, panelboards, transformers, boxes, disconnect switches and control components in accordance with the following:
  - 1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry and machine screws, welded threaded studs, or spring-tension clamps on steel. Do not weld conduit, pipe straps or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

END OF SECTION 16190



**SECTION 16195 - ELECTRICAL IDENTIFICATION****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Identification of Electrical Materials, Equipment and Installations.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Ideal Industries, Inc.
  - 2. National Band and Tag Co.
  - 3. Panduit Corp.
  - 4. Seton Name Plate Co.
  - 5. Standard Signs, Inc.
  - 6. W.H. Brady, Co.

## 2.2 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width. Colors to match color schemes noted herein.
- B. Underground Line Marking Tape: Permanent, bright colored, continuous printed, metallic strip, plastic tape compounded for direct burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- C. Wire/Cable Designation Tape Markers: Vinyl or vinyl cloth, self adhesive, wrap-around, cable/conductor markers with pre-printed numbers and letter.
- D. Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, switchboard branch breakers, motor control centers and other electrical equipment. Nameplates shall be securely attached with self-tapping stainless steel screws, if the screw end is protected; otherwise rivets shall be used. Letters shall be approximately 1/2" high minimum. Embossed self-adhesive tape is not acceptable for marking equipment.
- E. Cable Ties: Fungus inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50 degrees F to 350 degrees F. Provide ties in specified colors when used for color coding.

**PART III - EXECUTION**

## 3.1 INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors and other designations used in Electrical Identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.
- B. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- C. Identify Junction, Pull, and Connection Boxes: Install on outside of box cover. Label box covers with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels concealed boxes. Color code boxes as indicated below. Method shall be by colored adhesive not less than 4 square inches for 4" boxes and larger boxes. Permanent type "magic" markers are not accepted as a means of identification.

120/208 volt blue

- D. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal and communications lines, install continuous underground plastic line marker, located directly above line at 6 inches below finished grade where multiple lines are installed in a common trench or concrete envelope. Provide marker tape to cover 2/3 of the overall width.
- E. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

<b><u>230/120 Volts</u></b>	<b><u>Phase</u></b>
Black	A
Red	B
White	Neutral
Green	Ground

- G. Use conductors with color factory-applied the entire length of the conductors except as follows:
1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
    - a. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration minimum width 2".
- H. Tag or label conductors as follows:
1. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at

terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.

2. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.
- I. Install equipment/system circuit/device identification as follows:
    1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2 inch high lettering on 1½ inch high label (2 inch high where two lines are required), white lettering in blue field for normal power equipment other face colors shall match the equipment served. Text shall match terminology and numbering of the Contract Documents and shop drawings.
    2. All Phenolic labels shall be securely attached to the equipment by self-tapping stainless steel screws.
    3. Name plate colors shall be as follows:

....Blue surface with white core for 120/230 Volt Equipment.
  - J. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker. Pencil in all spare and leave spaces blank.
  - K. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme specified. This includes covers on boxes above lay-in and other type accessible ceilings.
  - L. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by pressure sensitive label applied to the conduit or outlet; designate "use" and "location served".

END OF SECTION 16195





**SECTION 16452 - GROUNDING****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Solid Grounding of Electrical Systems and Equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

## 1.3 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

**PART II - PRODUCTS**

## 2.1 GROUNDING AND BONDING PRODUCTS

- A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.
- B. Conductor Materials: Copper

## 2.2 WIRE AND CABLE CONDUCTORS

- A. General: Comply with Division 16 Section "Wires and Cables". Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
- B. Equipment Grounding Conductor: Green insulated
- C. Grounding Electrode Conductor: Stranded cable
- D. Bare Copper Conductors: Conform to the following:
  - 1. Solid Conductors: ASTM B-3
  - 2. Assembly of Stranded Conductors: ASTM B-8
  - 3. Tinned Conductors: ASTM B-33

## 2.3 MISCELLANEOUS CONDUCTORS

- A. Ground Bus: Bare annealed copper bars of rectangular cross section, full-size rated.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.
- C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

## 2.4 CONNECTOR PRODUCTS

- A. General: Listed and labeled as Grounding Connectors for the materials used.
- B. Pressure Connectors: High conductivity-plated units
- C. Bolted Clamps: Heavy-duty units listed for the application

## 2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel with high strength steel core and electrolytic grade copper outer sheath, molten welded to core.
  - 1. Size: 3/4 inch by 10 feet

## PART III - EXECUTION

### 3.1 APPLICATION

- A. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.
  - 1. The raceway system shall not be relied on for ground continuity .Install an equipment ground conductor in all power related conduits. Size conductor as required by NEC Table 250-122. Data and Signal conduits do not require a separate grounding conductor unless required by the manufacturer of the equipment to be installed.
- C. Signal and Communications: For telephone, alarm, and communication systems, provide a #6 AWG minimum green insulated copper conductor in raceway from the grounding electrode system to each terminal equipment location. Leave 3' pigtail wiring at termination point where equipment boards are shown. Make direct connection where equipment is provided.

### 3.2 INSTALLATION

- A. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.
- B. The electrical service shall be grounded by three (3) means:
  - 1. To the cold water main, if metallic and in direct contact with the earth for at least 10 feet as per the NEC Article 250-81.
  - 2. To the steel frame of the building, provided the building frame is effectively grounded.
  - 3. To ground rod(s)
- C. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use 3/4 inch by 10 ft. ground rods except as otherwise indicated. Drive rods until tops are 6

inches below finished floor or final grade except as otherwise indicated. All ground connections shall be accessible.

- D. Metallic Water Service Pipe: Provide insulated copper ground conductors, sized as indicated, in conduit from the building main service equipment, or the ground bus, to main metallic water service entrances to the building. Connect ground conductors to the main metallic water service pipes by means of ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fitting. Do not install a grounding jumper around dielectric fittings. Bond the ground conductor conduit to the conductor at each end.
- E. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

### 3.3 CONNECTIONS

- A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - 1. Use electroplated or hot tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
  - 2. Make connections with clean bare metal at points of contact.
  - 3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
  - 4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
  - 5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.
- C. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- D. Compression-Type Connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

### 3.4 FIELD QUALITY CONTROL

- A. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being

moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2 point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System".

B. Service Grounding Test

1. After completion of the electrical grounding and bonding systems, test the ground resistance with a ground resistance tester. Where test shown resistance-to-ground is over 25 ohms, provide additional ground rods until the minimum of 25 ohms is achieved.

C. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are detected that exceed those indicated the provisions of the Contract, covering changes will apply.

D. Report: Prepare test reports of the ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.5 CLEANING AND ADJUSTING

A. Restore surface features at areas disturbed by excavation and re-establish original grades. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition. Include necessary topsoil, fertilizing, liming, seeding, sodding, sprigging, or mulching.

END OF SECTION 16452

**SECTION 16470 – PANEL BOARDS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Lighting and Power Panel Boards and Associated Auxiliary Equipment Rated 600 V or Less

## 1.3 DEFINITIONS

- A. Panel Boards: A panel board with thermal magnetic circuit-breaker branches, designed for residential and light commercial projects, operating at 600 V and below, available in both single and 3-phase versions, and equipped with combination flush/surface mounting trim.
- B. Over-current Protective Device (OCPD): A device operative on excessive current that causes and maintains the interruption of power in the circuit it protects.

## 1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type panel board, accessory item, and component specified.
- C. Shop Drawings from manufacturers of panel boards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features and voltage rating.
- D. Include the following:
  - 1. Enclosure type with details for types other than NEMA Type 1.
  - 2. Bus configuration and current ratings.
  - 3. Short-circuit current rating of panelboard.
  - 4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

## 1.5 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  - 1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code".
- C. NEMA Standard: Comply with NEMA PB1, "Panel Boards".
- D. UL Standards: Comply with UL 61, "Panel Boards", and UL 50, "Cabinets and Boxes".

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

## A. Acceptable Manufacturers:

1. Cutler Hammer
2. Square D
3. Siemens

## 2.2 PANELBOARDS - GENERAL REQUIREMENTS

- A. Over-current Protective Devices (OCPDs): Provide type, rating, and features as indicated on the schedules. Tandem circuit breakers shall not be used. Multiple breakers shall have common trip.
- B. Circuit Breakers shall be bolt-on type.
- C. 100% rated copper Ground and Neutral Bus (unless noted otherwise).
- D. Enclosures: Cabinets, flush or surface mounted as indicated. NEMA Type 1 enclosure.
- E. Front: Secured to box with concealed trim clamps except as indicated. Front for surface-mounted panels shall be same dimensions as box. Fronts for flush panels shall overlap box except as otherwise specified.
- F. Directory Frame: Metal, mounted inside each panel door.
- G. Bus: Hard drawn copper of 98 percent conductivity
- H. Main and Neutral Lugs: Bolt-on type
- I. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors.
- K. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the OCPD ampere ratings indicated for future installation of devices.
- L. Feed-through panels are not permitted.
- M. The use of series breakers is not permitted.
- N. Flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 and NFPA 70E requirements.

## 2.3 IDENTIFICATION

- A. Panel Board Nameplates: Engraved laminated plastic or metal nameplate for each panel board mounted with self-tapping stainless steel screws.

**PART III - EXECUTION**

## 3.1 INSTALLATION

- A. General: Install panel boards and accessory items in accordance with NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panel Boards

- B. Rated 600 Volts or Less" and manufacturers' written installation instructions.  
Mounting Heights: Top of trim 6'-2" above finished floor, except as indicated.
- C. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.
- D. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval before installing. Pencil all spares. Spaces shall be left blank.
- E. Install filler plates in unused spaces.
- F. Provision for Future Circuits at Flush Panel Boards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future.
- G. Wiring in Panel Gutters: Train conductors neatly in groups, bundle and wrap with wire ties after completion of load balancing.

### 3.2 GROUNDING

- A. Connections: Make equipment grounding connections for panelboards as indicated.
- B. Provide ground continuity to main electrical ground bus indicated.

### 3.3 CONNECTIONS

- A. All connections shall be provided per UL 486A and UL 486B.

### 3.4 FIELD QUALITY CONTROL

- A. Quality Control Program: Conform to the following:
  - 1. Procedures: Field tests and Inspections will be made by the Engineer at time of completion of the work and in accordance these Specifications.
  - 2. Schedule tests with at least one (1) week in advance notification.
- B. Visual and Mechanical Inspection: Include the following inspections and related work:
  - 1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date Drawings and Panel Board Schedules.
  - 2. Exercise and perform of operational tests of all Mechanical components and other operable devices in accordance with manufacturer's Instruction Manual.
  - 3. Check panel board mounting, area clearances and alignment and fit of components.
  - 4. Check tightness of bolted electrical connections with calibrated torque wrench.

### 3.5 CLEANING

- A. Upon completion of installation, inspect interior and exterior of panel boards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.





**SECTION 16476 – DISCONNECTS****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes Equipment and Service disconnects.

## 1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for Switches and Accessories specified in this Section.

## 1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code", Article 100.

**PART II - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Cutler-Hammer Products; Eaton Corp.
  - 2. Siemens
  - 3. Square D Company

## 2.2 ENCLOSED SWITCHES

- A. Enclosed Non-Fusible Switch: NEMA KS 1, Type HD, handle lockable with 2 padlocks.
- B. Enclosed Fusible Switch, 800 Amperes and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.
- C. Enclosure: NEMA KS 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.
- D. Outdoor Locations: Type 3R
- E. Other Wet or Damp Indoor Locations: Type 4
- F. All switches shall be "Heavy Duty" rated for the voltage required.
- G. Coordinate all fuse rated switches with the equipment to be furnished. Furnish fuses.

- H. Safety switches shall be third-party listed.
- I. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the open position.
- J. Switches shall have handles whose positions are easily recognizable in the "on" or "off" position. For safety reasons, padlocks shall be provided for switches located in the public areas.
- K. Switches shall have nonteasible, positive, quick make-quick-quick-break mechanisms.
- L. Switches shall be properly labeled. See section 16195, Electrical Identification.

### **PART III - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install enclosed switches level and plumb.
- B. Where fuses are required, the fuses shall be matched with the equipment supplier's requirements.
- C. Provide one additional set of fuses for each disconnect switch.

#### **3.2 FIELD QUALITY CONTROL**

- A. Testing: After installing enclosed switches and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
- B. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance. Otherwise, remove and replace with new units and re-test.

#### **3.3 CLEANING**

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, construction debris and repair damaged finish including chips, scratches and abrasions.

END OF SECTION 16476

**SECTION 16515 - INTERIOR LIGHTING****PART I - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

## 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:
  - 1. Outline drawings of fixtures indicating dimensions and principal features.
  - 2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.
  - 3. Data on batteries and chargers of emergency lighting units.
  - 4. Shop Drawings from manufacturers detailing non-standard fixtures and indicating dimensions, weights, methods of field assembly, components, features and accessories.
  - 5. Non-returnable samples, when requested by Engineer, for verification purposes of specific individual fixtures.

## 1.4 QUALITY ASSURANCE

- A. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Listing and Labeling: Provide fixtures that are listed and labeled for their indicated use on the Project.
- C. Coordination of Fixtures With Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system. Provide plaster or sheet-rock trims when required on the project whether indicated or not at no additional cost to the Owner. Coordinate with Architectural Plans before ordering fixtures.

## 1.5 WARRANTY

- A. Minimum warranty period on emergency lights shall be three (3) years from date acceptance. Warranty shall include all parts (less lamps).
- B. All other lighting products shall be warranted for a period of not less than 1 year from date of acceptance. This warranty does not include miscellaneous parts which are external to the product (i.e. lamps) which are considered maintenance item.

**PART II - PRODUCTS****2.1 FIXTURES - GENERAL**

- A. Comply with the requirements specified in the Articles below and the Lighting Fixture Schedule on the Drawings.

**2.2 FIXTURE COMPONENTS - GENERAL**

- A. Metal Parts: Free from burrs and sharp corners and edges.
- B. Sheet Metal Components: Steel, except as indicated. Components are formed and supported to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in the operating position. Light seal strips inside the fixture will not be allowed.
- D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:
 

1. White Surfaces:	85 percent
2. Specular Surfaces:	83 percent
3. Diffusing Specular Surfaces:	75 percent
4. Laminated Silver Metalized Film:	90 percent
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic
  - 1. Plastic: Highly resistance to yellowing and other changes due to aging, exposure to heat and UV radiation.
  - 2. Lens Thickness: 0.125 inches minimum

**2.3 SUSPENDED FIXTURE SUPPORT COMPONENTS**

- A. Single-Stem Hangers: ½ inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
- B. Twin-Stem Hangers: Two, ½ inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
- C. Rod Hangers: 3/16 inch diameter cadmium plated, threaded steel rod.

**2.4 FLUORESCENT FIXTURES**

- A. Electronic Ballast:
  - 1. Ballast to be "UL listed, Class P".
  - 2. Ballast to be "Sound Rated A".
  - 3. Ballast enclosure size shall be same as or smaller than, magnetic ballast.

4. Light regulation shall be +/- 10% input voltage variation.
  5. Ballast shall have high power factor (minimum of 90%).
  6. Lamp current crest factor shall be equal to, or less than, 1.7.
  7. Input current third harmonics shall not exceed ANSI recommendations (32% total harmonic distortion, 27.5% of the third triplets).
  8. Flicker shall be 15% or less with any lamp suitable for the ballast.
  9. Ballast design shall withstand line transients per IEEE 587, Category A.
  10. Ballast case temperature shall not exceed 25 degrees C rise over 40 degrees C ambient.
  11. Ballast shall meet FCC Rules and Regulations, Part 18.
  12. Parallel wiring between the ballast and fixture is recommended.
  13. Minimum of five (5) years warranty is required with each electronic ballast.
  14. The manufacturer shall have not less than 5 years of experience in manufacturing electronic ballast.
- B. Provide disconnecting means per NEC 410.130 G.
- C. Low Temperature Ballast Minimum Starting Temperature: Minus 20 degrees C
- D. Where compact fluorescent light fixtures are specified, "High Power Factor" electronic ballast shall be standard.

## 2.5 FLUORESCENT LAMPS

- A. All fluorescent lamps to be {41} K-rated unless noted otherwise.

## 2.6 EXIT SIGNS

- A. Conform to UL 924, "Emergency Lighting and Power Equipment".
1. Arrows: Include as indicated.
- B. Emergency Exit Signs shall be of the "LED" style.
- C. Units shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy code, NFPA-101, and NEMA Standards.
- D. BATTERY-It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and – negative terminal.
- E. CHARGER- It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD

battery is used to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

- F. ADDITIONAL FEATURES- Pilot light to indicate the unit is connected to AC power. The battery shall have rate discharge pilot light, unless self-diagnostic type. Test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.
- G. WARRANTY-The entire unit shall be warranted for 3 years. The battery must have an additional 2 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.
- H. LED-The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.

## 2.7 EMERGENCY LIGHTING UNITS

- A. Conform to UL 924, "Emergency Lighting and Power Equipment" requirements for "Unit Equipment". Provide self-contained units with the following features and additional characteristics as indicated.
- B. Units shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy code, NFPA-101, and NEMA Standards.
- C. BATTERY-It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and – negative terminal.
- D. CHARGER- It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD battery is used to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.
- E. ADDITIONAL FEATURES- Pilot light to indicate the unit is connected to AC power. The battery shall have rate discharge pilot light, unless self-diagnostic type. Test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.
- F. WARRANTY-The entire unit shall be warranted for 3 years. The battery must have an additional 2 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

## 2.8 FINISH

- A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.
- B. Paint parts after fabrication.

## PART III – EXECUTION

### 3.1 INSTALLATION

- A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved Shop Drawings.
- B. Support For Recessed and Semi-Recessed Fixtures: Units shall be supported independent from suspended ceiling. Install fixture with support wires at 2 diagonal corners to the structure or building steel.
  - 1. Fixtures of Sizes Less Than Ceiling Grid: Center in the acoustical panel. Support fixtures independently with at least two  $\frac{3}{4}$  inch metal channels spanning and secured to the ceiling tees.
  - 2. Install support clips or screws for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corners.
  - 3. Support wires shall be not less than the support wires for the ceiling system.
- C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit swinging. Support stem mounted single unit suspended fluorescent fixtures with twin stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.
- D. Lamping: See Schedule on Drawings, or provide standard lamp for the rating of the fixture.
- E. Where mounting height for fixtures are not scheduled, coordinate with the Engineer before any installation.

### 3.2 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Emergency Battery Units Test: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy for a period of not less than 90 minutes to demonstrate proper operation of Emergency Lighting installation. Include the following in tests of emergency lighting equipment.
  - 1. Duration of supply
  - 2. Low battery voltage shut-down
  - 3. Normal transfer to battery source and retransfer to normal
  - 4. Low supply voltage transfer
- C. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.
- D. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced and tested again. Copy of the test report shall be sent to the State Construction Office.

### 3.3 ADJUSTING AND CLEANING

- A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.

- B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16515



**REST AREA SITE WORK**  
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**1 4" CONCRETE SIDEWALK**

**General:**

This provision covers 4" concrete sidewalks and 4" concrete borders. All applicable sections of the Standard Specifications Section 825, Incidental Concrete Construction - General and Section 848, Concrete Sidewalks, Driveways and Wheelchair Ramps, will apply.

**Materials:**

Concrete shall be Class-B and meet the requirements of Section 1000 of the Standard Specifications. See Standard Specifications Section 848 for concrete. For Wheel Chair Ramps, see the NCDOT Standard Drawings and Specifications.

**Construction/Installation:**

Remove all construction and vegetative debris and compact the subgrade in the area to be paved. Construct expansion joints a minimum of every 30' and place control joints as shown on plans and as directed in Section 825-10 of the Standard Specifications and as detailed in Section 848.01 of the Standard Drawings. Scoring patterns will be as shown on the hardscapes plan unless field revisions necessitate changes. All Concrete should have a brushed finish unless otherwise noted. Any revisions will be at the direction of the Division Roadside Environmental Engineer.

**Compensation:**

The concrete sidewalk will be paid for as '4" Concrete Sidewalk' in square yards measured along the surface of the completed and accepted work. Such price includes, but is not limited to, excavating and backfilling, furnishing and placing concrete, constructing and sealing joints, and any equipment, materials, and labor needed to complete the work.

**Payment will be made under:**

4" Concrete Sidewalk.....SY

**2 CONCRETE SEAT WALL & FOUNTAIN**

**General:**

The work covered by this section consists furnishing and installing the reinforced concrete and brick seat wall, low voltage lighting within the seat wall, the concrete fountain structure and all of its components, the topsoil between the seat wall and fountain, and all plumbing, electrical conduit, wall underdrains, and sleeves at the locations shown on the plans and details and as directed by the Engineer. All fountain work must be completed by a licensed fountain/pool contractor.

**A - Reinforced Concrete/Brick Seat Wall**

All applicable requirements of Section 825, Incidental Concrete Construction-General; Section 832, Reinforced Brick Masonry Construction – General; and Section 425, Fabricating and Placing Reinforcement of the Standard Specifications will apply. Concrete shall be Class-B and meet the requirements of Section 1000 of the Standard Specifications.

**Construction/Installation:**

Construct concrete in accordance with Section 825, unless otherwise noted. Furnish and place reinforcement as shown on the plans and details and in accordance with the provisions of Section 425. Brick that will be used in the wall shall be modular structural brick similar in color and texture to the brick used in the building. Submit a sample for approval to the Engineer. All brick mortar joints are to be tooled concave mortar joints above grade (Type N) and flush mortar joints below grade (Type S). The mortar shall be light grey in color. The top of the wall will be capped with a precast concrete cap with rounded edges that is light grey in color. There shall be a stainless steel, single hose bib hydrant box installed within the wall flush with the outside of the brick that can be accessed only by a key for maintenance purposes (see plans for details). The concrete and brick seat wall shall be constructed as shown in the plans and details.

**B - Low Voltage Lighting**

**Materials:**

Provide and install a low-voltage lighting system (5 seat lights) under the concrete seat cap of the seat wall at each point of the star as shown in the plans. The light shall be a low-profile, 6-7" LED hardscape fixture with a mounting bracket. It shall be a Kichler (Model: 3-LED Hardscape Light 15745AZT27), Volt (Model: VOLT® 6" LED Hardscape Light), Dekor (Model: Hardscape Slim Line LED Wall Light), or equivalent. See the concrete seat wall & fountain details and the utilities/drainage plan for more details on the low voltage lighting system. Submit a copy of the catalogue cut sheets for the seat lights for approval prior to installation.

***Installation:***

The seat lights are to be installed under the overhang of the seat cap as shown on the plans. The wiring shall be laid within a channel in the top of the seat wall's concrete form and exit the wall via a PVC sleeve within the concrete form as shown in the detail. The building contractor will provide an electrical source from the building to the location behind the NC welcome sign for the low voltage junction box and controller as designated in the plans. All subsurface wiring that will be run underground or under concrete shall be placed in PVC conduit. All lighting contractors must be licensed to perform work associated with construction of lighting systems. Follow the manufacturer's recommendations for installation and as required per state building code.

**C - Concrete Fountain**

The work covered by this section consists of the construction of the water feature as shown, as noted on the drawings, and as specified herein, and includes the furnishing of all materials, equipment, and services necessary for the completion of the described water feature system. The fountain system that is furnished must meet the design criteria specified in the design description. The furnishing and installation of materials shall include but is not limited to the following items:

- Water supply plumbing, pipes accessories, and equipment.
- Water stand pipe/floor drain, drainage lines, equipment, and all associated materials
- All associated concrete, tile, and associated masonry work.
- UL listed Submersible Pump and equipment.
- Liners, and waterproofing materials and equipment.
- Water level/ cutoff sensor, controller, and equipment
- Water make-up floor inlet device, inlet pipe, electric valve, equipment, and all associated materials
- Water display nozzles, pipes, and associated materials and equipment.
- Utility Service connection and coordination to noted areas for power, fill water, and waste water.
- Fountain component controller/ cut-off switch
- Any and all special tools required to complete the work

The installation contractor(s) shall coordinate and schedule the contract work so to integrate the fountain work into the other project work.

***Materials:***

- The tile that will cover the entire fountain structure shall a glazed/textured cobalt blue in 2" x 2" squares with a light grey grout. Submit a sample to be reviewed/approved by the Engineer.
- The liner/waterproof membrane shall be dark grey, dark blue, or black in color.

***Quality Assurance:***

- Approved Equipment Supplier:

The design shown on the drawings and the specifications and listed herein are based on the design data, services, and materials readily available through national suppliers of fountain, pond, and plumbing materials. The contractor shall only use reputable equipment suppliers approved by the Engineer.

- Fountain equipment supplier's design responsibility and support:

The fountain equipment supplier shall be responsible for providing the engineering design data that relates directly to the fountain system. This design shall describe the mechanical (hydraulic) and electrical system. Included in this design will be the appropriate sizing, selecting, and assembling of all fountain equipment and supply lines. The provided detail in the plans shall only be used as a guide during this process. A final start-up and adjustment meeting shall be provided for the proper adjustments to be made to the fountain system to meet the performance levels

established. This is also the time to familiarize the maintenance staff with the correct procedures to operate the fountain system equipment. Before the final inspection of the water feature, the following items need to be complete:

- Electrical connections made and tested.
- Hydraulic piping and fittings complete, tested for leaks, repaired if necessary, and flushed clean.
- The water reservoir cleaned and filled to the correct operating depth and freeboard.

Site visits by NCDOT project engineers and designers can be made during certain construction phases of the project. A pre-construction meeting shall be arranged with the general contractor for the coordination of the trades involved in the fountain construction and installation. This allows for a detailed explanation of the suggested installation techniques and the sequence of the installation.

***Industry Standards and Applicable Codes:***

Materials shall be installed in accordance with all applicable provisions of the most recent edition of the following:

- ANSI
- ASTM
- ASSE
- ASME
- AWWA
- CS
- NEMA
- NSF
- UL
- NEC
- OSHA
- NFPA
- American National Standards Institute
- American Society for Testing and Materials
- American Society of Sanitary Engineering
- American Society of Mechanical Engineers
- American Water Works Association
- Commercial Standards
- National Electrical Manufacturers Association
- National Sanitation Foundation
- Underwriters Laboratory
- National Electric Code
- Occupational Safety and Health Act
- National Fire Protection Agency
- Other state or local code(s) which are applicable.

The above referenced guidelines shall be considered minimum standards for the materials and installation practices applicable for the fountain system.

***Shop Drawings and Submittals:***

The plumbing and water supply systems noted on the plans shall be considered schematic in design. Final design specifications shall be defined and supplied by the contractor. The contractor shall submit drawings in accordance with the conditions of the Contract Specification section describing the size(s), location(s), and installation details of the interconnecting piping, fountain water management equipment, and electrical systems. After the approval review and prior to construction, a total of four (4) drawing sets will be provided to the Engineer for distribution to the respective engineers and installation contractors. All pertinent data on any substitute system(s), including engineering performance calculations on the pumping system(s), drainage, equipment, and electrical system diagrams and schematics, shall be provided to the Engineer for review and evaluation prior to installation. The landscape architect may add other drawings during the period of construction as required for clarification. The drawings are essentially diagrammatic and are used only to define the scope of work to be done. Three (3) complete

sets of As-Built Drawings shall be provided in the Operation and Maintenance manuals by the Engineer at the conclusion of the project.

***Substitutions:***

Submittals for “equal” items shall include the following information where applicable:

- Operation design description.
- Component materials and finishes.
- Pump performance curve(s).
- Certification of conformance with specified codes and standards.

Proposed substitutions for equipment or materials must be submitted within ten working days prior to the final bid date for consideration as approved equals. Proposals for substitutions shall be made only by the prime bidders in writing to the Engineer, and sub-contractors shall not make any substitution proposals to the landscape architect directly. Contractors submitting bids, including substitute equipment and/or materials, must also submit a bid for the "as specified" equipment and materials at the same time. All substitute bids must provide a written performance guarantee certifying the water display's performance and Engineer's pre-approval. All equipment supplied to the Contractor shall be done so by a single fountain equipment supplier unless otherwise approved.

Submittals of equal systems or components may be rejected if the equipment or material should require any change to the electrical, mechanical, structural, or architectural design or if the dimensions of the equal equipment or material vary from the specified equipment or material and impair accessibility or clearances. Should a substitution be allowed and then become defective or otherwise unsatisfactory within the guarantee period the Contractor shall replace it at no cost to the owner.

***Submittals:***

Submittals shall include the following:

- Shop drawings and product information for all equipment and materials furnished
- A complete materials list
- Equipment space layout showing all electrical and mechanical equipment in addition to all piping and conduit
- A design description
- Installation details for each piece of equipment being provided

Submittals shall be rejected if they are difficult to read due to poor imagery, drafting quality, insufficient scales, or missing data.

***Guarantee:***

The fountain equipment supplier and installing contractor(s) shall issue a joint guarantee that any equipment found defective within one (1) year of the final acceptance shall be replaced at no cost to the owner. The owner will assume full responsibility for the proper operation and maintenance of the fountain upon final acceptance. The guarantee does not extend to damage incurred through operation and maintenance by the owner.

***General Installation:***

Protect all pipes, conduit, equipment, and other parts of the work from damages caused by exposure to the weather while stored during construction or after installation. Install and connect all equipment in accordance with manufacturer's instruction and recommendations unless otherwise noted. If a specified installation is contrary to the manufacturer's instructions, cease the installation of the affected components or systems, and notify the Engineer. Properly and accurately locate all in-slab items being cast in concrete before concrete is poured and rigidly support them to resist loads during the pour.

***Pipe Installation:***

Make sure all pipe runs are as direct as possible using a minimum number of fittings. Cut pipe and tubing ends square. Remove rough edges and burrs to create a smooth, unobstructed flow. Protect all openings in piping during

construction to prevent entry of foreign matter. All connections between dissimilar metals shall be made with dielectric fittings.

**Compensation:**

The concrete seat wall and fountain will be paid for as a lump sum for the completed and accepted work. Such price includes, but is not limited to, excavating and backfilling, furnishing and placing the concrete, brick, tile, lighting, and all of the fountain and wall components, constructing and sealing joints, and any equipment, materials, and labor needed to complete the work.

**Payment will be made under:**

*Concrete Seat Wall & Fountain*.....LS

**3 CONCRETE STAIRS W/ HANDRAILS**

**General:**

The work covered under this provision consists of constructing concrete stairs, concrete cheek walls, and handrails as shown on the plans and details. All applicable requirements of Incidental Concrete Construction-General, Section 825 and Fabricating and Placing Reinforcement, Section 425 of the Standard Specifications will apply.

**Materials:**

Concrete stairs and cheek wall will be Class B concrete. The handrail shall be constructed of Schedule 40, black powder coated steel pipe with an outside diameter of 1 ½". Steel pipe that is to be bent or welded in fabricating shall meet the requirements ASTM A53 for standard weight pipe.

**Construction/Installation:**

Construct the concrete stairs and cheek wall in accordance with Section 825, except as otherwise noted herein. Furnish and place reinforcement, as shown on the plans and details, in accordance with the provisions of Section 425. All stair treads shall have a non-slip stair nosing as shown in the plans and a minimum of a 2% slope away from the riser to shed water. Give the formed surfaces of the concrete stairs a brushed finish and the cheek wall a float finish. Erect handrails as shown on the details, straight and true to line and grade. They will be core mounted into a pipe sleeve as recommended by the manufacturer. All welds will be filed smooth to the touch. Standards for welding shall meet those requirements defined in the Standard Specification for Roadway Structures Section 1072-20. Compact any backfill around the stairs after installation to a degree comparable to the adjacent undisturbed material.

**Compensation:**

'Concrete Steps w/ Handrail' will be paid for as a lump sum once properly installed and accepted by the engineer. Such price and payment will be full compensation for all work covered by this special provision; including but not limited to, all concrete work, handrails, cheek walls, grading, and furnishing all labor, materials, equipment, and any other incidentals necessary or required to complete the work.

**Payment will be made under:**

*Concrete Steps w/ Handrail*.....LS

**4 DEMOLITION**

**General:**

Demolition consists of the removal and disposal of existing concrete sidewalks, structures, and fencing as indicated on the plans and as directed by the Engineer. Demolition will also consist of the removal and relocation of site amenities and the deconstruction and storing of brick pavers prior to concrete demolition. The specified materials to be salvaged will be handled carefully and stored for later use in a location designated by the Division Roadside Environmental Engineer to protect them from being damaged during the construction process.

**Construction:**

Remove and clean the existing brick pavers to be used later in the installation phase as specified, and neatly stack them on a pallet in a safe area designated by the engineer. Remove the existing concrete sidewalk from the areas specified on the plans. Remove and relocate all specified existing site amenities including, but not limited to, precast exposed aggregate trash/recycling receptacles, ash urns, cast iron and wood benches, signs, landscape lighting, memorials, etc. At the appropriate stage of completion and as directed by the Engineer in the field, the amenities will be re-installed and secured in their final locations on 4” concrete pads or on proposed sidewalk areas. The contractor will be responsible for replacing any of these items that are damaged during construction activities or the relocation process. Remove all black aluminum fencing as specified on the plans. NCDOT will maintain ownership of the fence once removed, so do not dispose of. All white fencing is to remain as is. All methods and operations used for the removal of paving and structures will meet prior approval of the Engineer. Make a saw cut providing a clean edge at locations where the concrete sidewalk is to be removed. All materials removed will become the property of the Contractor, unless they are to be relocated on-site, delivered to NCDOT, or otherwise noted, and will be properly disposed of by the Contractor off-site. Prevent damage to adjacent properties, structures, and vegetation to remain during the removal and demolition operations. The contractor is responsible for repairing any and all damaged areas back to their original conditions and to the satisfaction of the Engineer.

**Compensation:**

Payment will be made for the work of removing and disposing of all concrete sidewalk, structures, fencing, and any other item as indicated on the plans and as directed by the Engineer. ‘Demolition’ will be paid for at the contract lump sum price. Such price and payment will be full compensation for all work covered by this provision; including but not limited to furnishing all labor, tools and equipment, and any other incidentals necessary or required to complete the work.

**Payment will be made under:**

*Demolition*.....LS

**5**

**DEPRESSED CURB RAMP**

**General:** The depressed curb ramp will be constructed (retrofitted) at the locations shown on the plans, as indicated in the details, and as described herein. All applicable sections of ADA and the Standard Specifications Section 825, Incidental Concrete Construction - General and Section 848, Concrete Sidewalks, Driveways, and Wheelchair Ramps, will apply. Place joints as shown by the scoring pattern on the plans and as specified in Section 825 of the Standard Specifications. The sidewalk curb will transition smoothly from a 6” height to flush with the gutter. The sidewalk will be formed to meet curb height on each end of the depression with ADA compliant ramp flares. The transition from the parking lot elevation to adjacent sidewalk elevation will be a smooth and continuous slope.

**Compensation:**

The depressed curb ramps are to be paid for as a lump sum for all work completed and accepted. This will be full compensation for all work covered by this section including, but not limited to, removing the existing curb/sidewalk, furnishing and installing the concrete, furnishing and installing steel reinforcement, installing detectable warning domes, and all materials, labor, tools, and equipment necessary to complete the work.

**Payment will be made under:**

*Depressed Curb Ramps*.....LS

**6**

**IRRIGATION**

**General:**

The contractor shall provide all materials and labor to install the irrigation system utilizing spray heads and drip emitters. The department has provided a plan that shows a schematic design for the irrigation on sheets L 21-L 23. Before the installation begins, the contractor shall submit the brand/model controller and spray heads for approval by the engineer and landscape architect. Should the contractor design their own system, the plans will require final approval from the Division Roadside Environmental Engineer or the landscape architect before installation begins. If the contractor decides to provide their own design plans, they must show all locations, brands, models, and specifications for the following items: piping, spray heads and emitters, controllers, rain sensors, pop-up indicator heads, back flows, valves, and valve and controller housings. The Contractor shall be familiar with all state and local regulations and ordinances concerning irrigation systems and obtain all

permits that are necessary for the installation of the irrigation system. If the contractor chooses to use the plans provided by NCDOT, he or she shall lay out the work as accurately as possible in accordance with the plans.

The contractor shall conduct his operations in such a manner to prevent damaging existing structures and plant materials. If damages do occur, the contractor is responsible for restoring or replacing the damage property to a condition that is of equal or better condition than what previously existed at no cost to NCDOT. The contractor shall be responsible for full and complete coverage of the area needing irrigation and shall make any necessary minor adjustments as directed by the Engineer at no additional costs.

The contractor shall prepare an "as-built" drawing which shall include locations of all aspects of the irrigation system installed by the contractor. This may include, but is not limited to, all system controllers, valves (automatic and manual), pipe, bores, drip tube, wires, wire splices, and any deviation from the contract bid documents. Two (2) copies of the "as-built" drawings shall be supplied to the Department of Transportation.

**Testing:**

Upon completion of the irrigation system, the entire system shall be tested for proper operation. The contractor shall adjust the various components of the irrigation system so the overall operation of the system is most efficient. This includes synchronization of the controller, adjustments to pressure valves, and individual spray head adjustments. Lateral lines and emitters shall be inspected while a particular irrigation zone is in operation for insure there are no leaks. The Contractor shall perform a pressure and leakage test of irrigation lines. The contractor shall notify the Engineer two (2) days in advance of testing and shall be performed in the presence of the Engineer or his representative.

The contractor shall furnish a transferable certificate of warranty and a guarantee of work and materials for a one-year period from the date of final acceptance of the system. Final payment for the system shall not be made unless this certification is presented to the Engineer. Upon completion of the irrigation system installation and testing, the contractor shall schedule a final inspection with the Engineer. Final acceptance of the irrigation system shall take place upon the approval of the Engineer that satisfactory installation is complete.

**Compensation:**

"Irrigation" will be paid for as a lump sum when completed and accepted. The Contractor shall provide all labor, equipment, and materials necessary for the installation of the irrigation system including, but not limited to, layout, trenching, backfilling, providing and installing pipe, valves, filters, pressure regulators, drip tubing, controller, wiring, boring sleeves, etc.

**Payment will be made under:**

*Irrigation* .....LS

**7 LANDSCAPE GRADING**

**General:**

Landscape grading consists of grading the area in front of the building where the new walkways and fountain are to be installed in accordance with the grading plan, spot elevations, and slope percentages provided and grading specified areas along the sidewalk behind the building that is currently holding water to provide proper drainage as indicated on the plans and as directed by the Engineer. Grading should allow for positive drainage across the new walkways and turf areas to the designated storm basins.

**Compensation:**

'Landscape Grading' will be paid for at the contract lump sum price for the work detailed in this section that has been completed and approved. Such price and payment will be full compensation for furnishing all labor, equipment, and all incidentals necessary to complete the work satisfactorily.

**Payment will be made under:**

*Landscape Grading* .....LS



**8 METAL PLANT BED EDGING**

**General:**

The work covered by this provision will consist of furnishing and installing the metal landscape edging in locations as directed by the engineer. Landscape Metal edging will be Col-Met Steel Edging, Ever Edge Lawn Edging, Easy Gardener Old Town Metal Edging, or equivalent. Metal Edging will be 3/16" (4.8mm) hot rolled low carbon steel (ASTM-A-36, ASTM-A-283, ASTM-A-569) with a 6" width. Edging will include a minimum of 4 stakes per 10' length with the stakes being 16" long. Color will be a black powder coated finish that is resistant to cracking, chipping, corrosion, and UVA damage.

**Compensation:**

The work of installing the landscape metal edging will be paid for at the unit price per linear foot as "Landscape Metal Edging" when completed and accepted. Such price and payment will be full compensation for all work covered by this special provision including, but not limited to, furnishing all labor, materials, and equipment and any other incidentals necessary or required to complete the work.

**Payment will be made under:**

*Metal Plant Bed Edging*.....LF

**9 MONTHLY MAINTENANCE**

**General:**

There shall be an establishment period for this contract that includes all work associated with the upkeep and maintenance of the newly installed landscape features. The establishment period will last a minimum of 18 months from the initial acceptance of the installation and extend into the seasonal limitations for planting in order to allow replacement plantings to be installed. Tasks involved in the establishment period shall be performed on a monthly cycle unless otherwise needed or directed by the Engineer or his/her representative. Each month during the establishment period, a meeting will be held between the Engineer and the Contractor to discuss establishment work required during that period. Additional meetings may be scheduled if deemed necessary by the Engineer. All the required work will be performed in a timely manner and with utmost regard to the safety and convenience of the rest area users. Failure on the part of the contractor to complete the required work in a satisfactory manner will result in the department having the work performed by others and paid for by the Performance Bond.

The work shall include but is not limited to: irrigation repairs/maintenance, hardscape repair/maintenance, line/blade trimming, mowing, repairing of plant beds, removing and replacing plants, repairing guying or staking, pruning of trees, mulching, watering, weed removal, applications of post-emergence and pre-emergence herbicides, pesticides, fungicides and fertilizer as scheduled, as needed and as directed by the Engineer. Litter and debris pick-up and removal are also required within this period.

All plants must be in an upright healthy condition and planted at the proper depth. Mulched areas will be weed free and tidy, and any staking or guying that is utilized must be in the proper condition prior to beginning the establishment period. During the establishment period the contractor will be responsible the care of the plantings in accordance with Section 1670-14 "Establishment". All plants that do not continue to conform to the specifications and quality as approved when they were installed will be considered unacceptable. The contractor will remove all plants that are determined to be unacceptable from the site within five days of request by the Engineer. Replacements will be installed within the Seasonal Limitations.

**Compensation:**

The work of establishment period shall be paid for each month as each 'Monthly Maintenance' when satisfactorily completed and approved by the Division Roadside Environmental Engineer. Post-emergence herbicidal treatment and weed removal will be included in the monthly plant bed maintenance if it occurs throughout the establishment period.

**Payment will be made under:**

*Monthly Maintenance*..... EA

**10**

**MULCH FOR PLANTING**

Mulch for planting shall consist of double shredded hardwood mulch from a single source, unless otherwise approved by the Engineer. All mulch and the work associated with placing the mulch during the planting shall conform to article 1060-11 of the NCDOT Standard Specifications. Submit a sample for approval prior to placement. Install the mulch to a finished depth of 4 inches (unless otherwise noted), rake, and compact to create a uniform finish.

**Payment will be made under:**

*Mulch for Planting*.....CY

**11**

**PARKING STOP**

**General:**

The work covered by this section consists of furnishing and placing precast concrete parking stops (8’ in length and made of 4000 psi air-entrained concrete. Each stop shall be reinforced with a minimum of two No. 4 deformed steel reinforcing bars (rebar). The stops shall be half-octagonal in shape and have chamfered corners, drainage slots on the underside, and holes for dowel-anchoring to the substrate.

**Installation:**

Securely attach the parking stops into the concrete or asphalt pavement with no less than two 5/8” diameter by 10” in length galvanized steel dowels through the anchor holes provided in the stops. Submit shop drawings of the precast concrete parking stops that includes installation and attachment details to existing concrete and asphalt pavement for approval.

**Compensation:**

The “Parking Stops” will be paid for as each when completed and accepted. Such price will be full compensation for all labor, materials, tools, equipment, and all other incidentals necessary to complete the work.

**Payment will be made under:**

*Parking Stop*.....EA

**12**

**PLANTING**

See the NCDOT Standard Specifications Sections 1060 - Landscape Development Materials and 1670 - Planting.

**Seasonal Limitations:**

The initial planting and replacement of plants will be accomplished between October 15th and March 31st for all woody plant material (trees, shrubs and ground covers). All herbaceous plants and containerized grasses will be planted between September 1st and November 30th and March 1st and May 15th depending on requirements of each species. Exceptions to these seasonal limitations are at the discretion of the Division Roadside Environmental Engineer and will be submitted in writing. Submit the proposed schedule for plant installation for approval along with plant sources and contact information for each of them.

**Establishment Period for Planting:**

An establishment period will begin after satisfactory installation and approval of all of the planting occurs. All plants must be in an upright healthy condition and planted at the proper depth. Mulched areas will be weed free and tidy, and any staking or guying that is utilized must be in a proper condition prior to beginning the establishment period. During the establishment period, the contractor will be responsible for the proper care of the plantings in accordance with Section 1670-14: Establishment. All plants that do not continue to conform to the specifications and quality as approved when they were installed will be deemed unacceptable. The contractor will remove all plants that are unacceptable from the site within five days of request by the Engineer. **Replacements will be installed within the seasonal limitations.** Each month during the establishment period, a meeting will be held between the Engineer and the Contractor to discuss establishment work required during that period. Additional meetings may be scheduled if deemed necessary by the Engineer. All of the required work will

be performed in a timely manner and with the utmost regard to the safety and convenience of the rest area users. Failure on the part of the contractor to complete the required work in a satisfactory manner will result in NCDOT having the work performed by others and paid for by the performance bond. All requirements of Section 1670-14: Establishment will also be applicable during the Establishment Period for Planting. The Establishment Period for Planting will last a minimum of eighteen (18) months and extend into the seasonal limitations for planting in order to allow for replacement plantings to be installed. See the contract for exact time period and dates.

**Herbicides:**

Post-emergence herbicidal treatment and pre-emergent herbicidal treatment will consist of the following products and rates unless otherwise noted by the Engineer.

**Herbicide Chart:**

<b>Herbicide Brand Name</b>	<b>Common Name</b>	<b>Formulation</b>	<b>Oral LD/50 (MG/KG)</b>	<b>Amount of Formulation per Acre</b>	<b>Lbs. of Active Ingredient per Acre</b>	<b>Adjuvants</b>	<b>Remarks</b>
<b>Stump Control</b>							
<i>Garlon</i>	Triclopyr	3 S	2,574	1 gal. /1 gal. of water	3 #	1 - 2 qts. Surfactant/acre	Paint or spray, add bullseye dye.
<b>Pre-emergent</b>							
<i>Pennant + Endurance + Gallery</i>	Metolachlor + Prodiamine + Isoxaben	Liquid (5G) + 65 WDG + 75 DF	3750 + >5,000 + 5,000	2 - 3 pts. (40#) + 2# + 1#	1.95 - 2.93# (2#) + 20 lbs. + 1#	NA	Spring application; use tank agitation when mixing.
<b>Post-emergent</b>							
<i>Roundup</i>	Glyphosate	4 S	>5,000	2 - 4 qts.	2 - 4 #	2 - 4 qts. Surfactant/100 gals.	NA

13

**RETURNED CURB RAMP**

**General:** The returned curb ramp will be constructed (retrofitted) at the locations shown on the plans, as indicated in the details, and as described herein. All applicable sections of ADA and the Standard Specifications Section 825, Incidental Concrete Construction - General and Section 848, Concrete Sidewalks, Driveways, and Wheelchair Ramps, will apply. Place joints as shown by the scoring pattern on the plans and as specified in Section 825 of the Standard Specifications. The sidewalk curb height will remain level as it runs parallel to the new ramp and will meet flush with the sidewalk at the top of the ramp as shown in the details. The ramp will transition smoothly from the sidewalk to flush with the existing gutter. The transition from parking lot elevation to adjacent sidewalk elevation will be a smooth and a continuous slope.

**Compensation:** The returned curb ramps are to be paid for as a lump sum for all work completed and accepted. This will be full compensation for all work covered by this section including, but not limited to, removing the existing curb/sidewalk, furnishing and installing the concrete, furnishing and installing steel reinforcement, installing detectable warning domes, and all materials, labor, tools, and equipment necessary to complete the work.

**Payment will be made under:**

*Returned Curb Ramps*.....LS

14

**REUSED BRICK PAVERS**

**General:**

The work covered by this provision will consist of reusing the brick pavers salvaged from the previous site’s sidewalks for the new walkway layouts throughout the site.

**Materials:**

All reused pavers will be clean of stains, dirt, organic material, etc. and approved for use by the Engineer prior to being installed. Cracked and excessively chipped pavers shall not be used. The paver’s joints and surfaces will meet ADA gap and lippage requirements and will meet or exceed applicable requirements of ASTM C936 and C1782. Pavers will be a first class representation of the type specified and meet all applicable standard specifications of ADA and the concrete paver industry.

**Installation:**

All pavers are to be installed in the patterns as specified as shown in the details and on the plans. When placing the reused brick pavers, place the side with the cleanest and best appearance facing up. All pavers shall be placed flush against all new and existing hardscapes and building sills. Any revisions will be at the direction of the Engineer in the field.

**Compensation:**

The brick pavers will be paid for as ‘Reused Brick Pavers’ in square feet, measured along the surface of the completed and accepted work. Such price includes, but is not limited to, grading, an aggregate base, a sand base, cleaning the pavers, placing the pavers, joint filler, and any equipment, materials, and labor needed to complete the work.

**Payment will be made under:**

*Reused Brick Pavers*.....SF

15

**SELECTIVE TREE PRUNING & THINNING**

**General:**

The work covered by this provision consists of pruning and thinning of existing trees and the removal and disposal of pruning debris as designated on the plans and as directed by the Engineer on site. All methods and operations used for pruning/thinning will meet prior approval of the Engineer.

Conduct pruning operations in accordance with ANSI A300 guidelines for tree pruning and in a manner to prevent limb, bark, or root injuries to trees, shrubs, or other types of vegetation that are to remain and to prevent damage to adjacent property and structures which are to remain. Selectively prune damaged, diseased, broken, and crossing branches from trees specified on the plans. Selectively thin the tree(s) to reduce the density of live branches and to reduce the density at the edge

of the crown, not the interior, to increase sunlight penetration and air movement. Do not use the topping, heading, or stub cut methods of pruning to reduce the size of the tree. If the tree is growing against the building, selectively remove the necessary branches so that the tree is no longer in contact with the building and as directed by the Engineer. If damage should occur, repair the damaged area to its original condition and to the satisfaction of the Engineer. Removal and disposal of all of the debris from the site must be completely in accordance with the law.

**Compensation:**

'Selective Tree Pruning & Thinning' will be paid for by the actual number of trees that were pruned/thinned. Such price and payment will be full compensation for all work covered by this provision, including but not limited to, furnishing all labor, tools, equipment, and any other incidentals necessary or required to complete the work.

**Payment will be made under:**

*Selective Tree Pruning & Thinning*.....EA

**16 SITE STORMWATER DRAINAGE**

**General:**

This provision consists of the furnishing and installation of the stormwater site drainage and related work as indicated in the drawings and specifications. The work covered by this provision consists of excavation of all trenches and the furnishing and installation of all sleeve pipe, 12” landscape drainage drop inlets, sidewalk trench drains, 4” cleanouts, infiltration trenches, drainage pipe (corrugated and PVC), and drainage stone as shown on the plans and as directed by the Engineer. Applicable parts of the General Conditions and the Standard Specifications govern work under this provision for the proper completion of stormwater drainage.

**A - Storm Drainage Pipe**

**Materials:**

Stormwater drainage pipe will be corrugated, perforated plastic sock pipe (CPP) meeting requirements of ASTM as noted below. Specified CPP 4-10” shall be single walled corrugated pipe (unless otherwise noted on plans). Specified CPP 12” and greater shall be double walled with smooth/corrugated exterior pipe. All fittings, adapters, and connection shall be installed according to applicable ASTM, NCDOT, and manufacturer’s specifications.

For General Construction	For Highway Construction
Single Wall (3”-6”) CPP ASTM-F-405-“C” (8”-24”) CPP ASTM-F-667-“C”	Single Wall (3”-10”) CPP AASHTO-M- 252- “C” (12”-60”) CPP AASHTO-M-294- “C”
Smooth Core (3”-6”) CPP ASTM-F-2306-“S” (12”-60”) CPP ASTM-F-2306-“S”	Smooth Core (3”-10”) CPP AASHTO-M-252- “C” (12”-60”) CPP AASHTO-M-294- “C”

**B - Infiltration Trench with Catch Basins**

Landscape drainage pipe will be 4” corrugated perforated sock pipe connecting to square, 12” 2-outlet drainage catch basins with grates.

**Installation:**

Excavate the trench to a sufficient width to receive the pipe and stone and to a depth recommended by the plans or established by the Engineer. Remove and preserve existing turf that is removed from the trench location. Join the pipe sections and fittings together in accordance with the manufacturer's recommendations. Connect to the existing or proposed drainage structures as indicated on the plans. If existing systems are encountered, tie the new pipe into the existing system as directed by the Engineer. Backfill material will be carefully placed so that the pipe will not be disturbed after it has been laid. Material should consist of a 2-3" layer of washed aggregate on top of the pipe with a layer of filter fabric on top of the aggregate. Place the turf that was preserved from the excavation stage on top of the filter fabric, and roll the turf to help level out any uneven areas along the new pipe location. Maintain all drainage installations in a continuously functioning condition from the time that the pipe is installed until the project is accepted. Pipes shall have positive drainage and a minimum slope of 1%.

**C – Sidewalk Trench Drain**

The radius trench drain (curved channel drain) shall be 4" wide with a precast polymer trench body to match the radius of the concrete border that it will be placed in and have a ductile iron (black) or stainless steel grate cover. The gaps of the grate will be in a wave pattern as shown on the detail sheet, ADA compliant, and shall be no more than 1/4" wide.

**Installation:**

The trench drain shall be cast in place in the center of the concrete border as specified by the plans and details, and the location shall be approved in the concrete form prior to the concrete being poured and finished around it. The drain shall maintain positive drainage (min. 1% slope) in the directions specified on the plans, tie into PVC drain pipe, and empty into the existing stormwater catch basin near the parking area. The top of the drain (the grate) shall be flush and maintain the same grade as the concrete border in which it is cast.

**D - Sleeve Pipe**

The pipe shall be rigid, heavy walled PVC (Polyvinyl Chloride) and UL approved for underground use without concrete encasement per UL 651 "Rigid Non-Metallic Conduit or Encasement".

**Installation:**

The work shall consist of furnishing and installing the pipe as shown on the plans under sidewalks before they are poured. Excavate and place the encasement pipe and backfill so that encasement is in line with the other piping it is tying into. Backfill shall be compacted to 95% where placed beneath walks, drives, or other concrete pads. After installation, mark the location of the sleeves either by stake rebar or scored tick marks on sidewalk edges for future reference.

**E - Cleanouts**

Cleanouts will be the proper shape, length, and degree of bend, to fit the conditions. Cleanouts will be set at the locations shown on the plans. Cleanout plugs will be minimum of 4" with a finish elevation being at the proposed finish grades for the lawn, plant bed, or sidewalks. Cleanouts in the sidewalks will have a brass stem and cap mounted flush with sidewalk.

**Compensation:**

Site stormwater drainage will be paid for as a lump sum including, but not limited to, sleeve pipe, trench drain, infiltration trench, corrugated and PVC pipe, and 4" cleanouts once properly installed and accepted by the Engineer. Such price and payment will be full compensation for all work covered by this provision; including but not limited to furnishing all labor, tools, equipment, and any other incidentals necessary or required to complete the work.

**Payment will be made under:**

*Site Stormwater Drainage*.....LS

17

**STONE PAVERS**

**General:**

This provision covers the furnishing and installation of the decorative stone pavers to be used around the fountain seating area.

**Materials:**

Stone Pavers shall be Pavestone (Vintage Stone Runner), Eagle Bay Hardscape Products (Cottage Stone Antiqued-Blue Ridge), Belgard (Catalina Grana Paver-Savannah), or equivalent. The sizes of the rectangle pavers will vary as listed: 6"-9" L x 6" W x 2.5" H or similar sizing with a mix of light grey and earth tone colors. Submit a sample for approval prior to beginning installation (at least 3 paver units but enough to show color variations that will be provided in the full installation). The paver's joints and surfaces will meet ADA gap and lippage requirements and will meet or exceed applicable requirements of ASTM C936 and C1782. The pavers will be first class representation of the type specified and meet all applicable standard specifications of ADA and the concrete paver industry.

**Installation:**

All pavers are to be installed in a radial pattern around the fountain seat wall as shown in the plans and details. All pavers shall be placed flush against all new and existing hardscapes and building sills. Any revisions will be at the discretion of the Engineer in the field.

**Compensation:**

The pavers will be paid for as 'Stone Pavers' in square feet, measured along the surface of the completed and accepted work. Such price includes, but is not limited to, grading, the aggregate base, the sand base, furnishing and placing the pavers, joint filler, and any equipment, materials, and labor needed to complete the work.

**Payment will be made under:**

Stone Pavers.....SF

18

**TOPSOIL**

**General:**

The work covered by this provision shall consist of placing 4" of topsoil in the lower parking area where plant material (junipers) was removed during the demolition phase.

**Material:**

The topsoil shall consist of a sandy loam, silt loam, or clay loam that contains a reasonable amount of humus material. The topsoil shall be of good texture, loose, friable, and be representative of topsoil in the general vicinity of the project. It shall be reasonably free of sod, clay, hard lumps, large roots, rocks and gravel, noxious weeds/seeds, and other material that would be harmful to plant growth. The name of the source and a sample of the topsoil in a one pound sealed plastic bag shall be submitted to the Division Roadside Environmental Engineer and approved prior to delivery to the project site. All topsoil shall be approved by the Engineer when delivered to the job site, whether or not the source of topsoil has been previously approved.

**Construction:**

Care shall be exercised by the Contractor to minimize disturbance to the existing turf, concrete, and utilities. The topsoil shall be placed and spread evenly to the depth required, which after settlement, shall constitute the finish grade. Topsoil shall not be placed when the ground is frozen, excessively wet, or in a condition that the soil cannot be easily worked and dressed smoothly.

**Compensation:**

The topsoil will be paid for by the actual number of cubic yards of approved topsoil that has been placed and accepted. The topsoil used on this project will be measured by the truck load. Each truck shall have a legible identification mark indicating its capacity and shall be loaded to its capacity at the time that it arrives to the project site. The recorded capacity will be adjusted by making a 25% deduction to allow for shrinkage, and the adjusted capacity will be the quantity to be paid. The quantity of topsoil, measured as explained above, will be paid for at the contract unit price per cubic yard as "Topsoil". Such

price and payment will be full compensation for furnishing and placing the new topsoil, grading the new soil, and all labor, equipment, and incidentals necessary to complete the work.

Payment will be made under:

Topsoil.....CY

**19 WATER FOR PLANTING**

Water for planting will be applied in accordance with the standard specifications. Watering of plant materials and sod will occur after the site water system has been installed, connected, and is functional. The water for this project will be provided to the contractor through an onsite water source (existing well). Plant material not serviced by the new irrigation system (everything but hydrangeas and sod) shall be hand watered once installed until the maintenance period is complete. If a problem occurs with the onsite water system, the contractor will be required to furnish the water from an alternative source with no additional compensation to the contractor. All applicable sections of Section 1060, 'Landscape Development Materials' and Section 1670, 'Planting' of the Standard Specifications will apply.

**Payment will be made under:**

Water for Planting.....M/G

**20 PLANT BED REMOVAL**

The work covered by this provision consists of the removal and disposal of vegetative material to include trees, stumps (above and below ground), shrubs, and plant beds as indicated on the plans and as directed by the engineer on-site. These plants may be partially dead, diseased, invasive, or have outgrown their desired size. Salvage as much excess soil from the roots as possible to backfill any holes created by the plant removal. All turf will remain undisturbed unless otherwise specified by the plans. Do not remove plant material that is not marked for removal. After removing all plant material, grade areas smooth. All methods and operations used for plant bed removal will meet prior approval of the Engineer.

Perform all work so as to cause minimum soil erosion and comply with the requirements of Section 107-13. Conduct removal operations in a manner to prevent damage to adjacent property and structures which are to remain. If damage should occur repair the damaged area to its original condition and to the satisfaction of the Engineer. Dispose of all debris created by the plant bed removal operation off the site and out of sight of the project.

**Compensation:**

'Plant Bed Removal' will be paid by the actual square yards of bed space removed, which includes all plant material within that bed space. Such price and payment will be full compensation for all work covered by this provision; including but not limited to furnishing all labor, tools and equipment and any other incidentals necessary or required to complete the work.

**Payment will be made under:**

Plant Bed Removal.....SY



**STANDARD SPECIAL PROVISION**  
**AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS**

(5-20-08)

Z-2

*General Statute 143C-6-11. (h) Highway Appropriation* is hereby incorporated verbatim in this contract as follows:

(h) Amounts Encumbered. – Transportation project appropriations may be encumbered in the amount of allotments made to the Department of Transportation by the Director for the estimated payments for transportation project contract work to be performed in the appropriation fiscal year. The allotments shall be multiyear allotments and shall be based on estimated revenues and shall be subject to the maximum contract authority contained in *General Statute 143C-6-11(c)*. Payment for transportation project work performed pursuant to contract in any fiscal year other than the current fiscal year is subject to appropriations by the General Assembly. Transportation project contracts shall contain a schedule of estimated completion progress, and any acceleration of this progress shall be subject to the approval of the Department of Transportation provided funds are available. The State reserves the right to terminate or suspend any transportation project contract, and any transportation project contract shall be so terminated or suspended if funds will not be available for payment of the work to be performed during that fiscal year pursuant to the contract. In the event of termination of any contract, the contractor shall be given a written notice of termination at least 60 days before completion of scheduled work for which funds are available. In the event of termination, the contractor shall be paid for the work already performed in accordance with the contract specifications.

Payment will be made on any contract terminated pursuant to the special provision in accordance with Subarticle 108-13(D) of the *2018 Standard Specifications*.

**STANDARD SPECIAL PROVISION****ERRATA**

(10-16-18) (Rev.1-15-19)

Z-4

Revise the *2018 Standard Specifications* as follows:

**Division 6**

**Page 6-7, Article 609-1 DESCRIPTION, line 29,** replace article number “609-10” with “609-9”.

**Division 7**

**Page 7-27, Article 725-1 MEASUREMENT AND PAYMENT, line 4,** replace article number “725-1” with “724-4”.

**Page 7-28, Article 725-1 MEASUREMENT AND PAYMENT, line 10,** replace article number “725-1” with “725-3”.

**Division 10**

**Page 10-78, Article 1056-4 GEOTEXTILES, TABLE 1056-1, Permittivity, Type 2,** replace “Table 6<sup>D</sup>” with “Table 7<sup>D</sup>” and **Permittivity, Type 3<sup>B</sup>,** replace “Table 7<sup>D</sup>” with “Table 8<sup>D</sup>”.

**Page 10-162, Article 1080-50 PAINT FOR VERTICAL MARKERS, line 1,** replace article number “1080-50” with “1080-10”.

**Page 10-162, Article 1080-61 EPOXY RESIN FOR REINFORCING STEEL, line 5,** replace article number “1080-61” with “1080-11”.

**Page 10-162, Article 1080-72 ABRASIVE MATERIALS FOR BLAST CLEANING STEEL, line 22,** replace article number “1080-72” with “1080-12”.

**Page 10-163, Article 1080-83 FIELD PERFORMANCE AND SERVICES, line 25,** replace article number “1080-83” with “1080-13”.

**Division 17**

**Page 17-15, Article 1715-4 MEASUREMENT AND PAYMENT, lines 42-44,** replace the second sentence with the following:

An example is an installation of a single 1.25 inch HDPE conduit would be paid as:

Directional Drill (1)(1.25”) Linear Foot

**STANDARD SPECIAL PROVISION****PLANT AND PEST QUARANTINES****(Imported Fire Ant, Gypsy Moth, Witchweed, Emerald Ash Borer, And Other Noxious Weeds)**

(3-18-03) (Rev. 12-20-16)

Z-04a

**Within Quarantined Area**

This project may be within a county regulated for plant and/or pests. If the project or any part of the Contractor's operations is located within a quarantined area, thoroughly clean all equipment prior to moving out of the quarantined area. Comply with federal/state regulations by obtaining a certificate or limited permit for any regulated article moving from the quarantined area.

**Originating in a Quarantined County**

Obtain a certificate or limited permit issued by the N.C. Department of Agriculture/United States Department of Agriculture. Have the certificate or limited permit accompany the article when it arrives at the project site.

**Contact**

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-707-3730, or <http://www.ncagr.gov/plantindustry/> to determine those specific project sites located in the quarantined area or for any regulated article used on this project originating in a quarantined county.

**Regulated Articles Include**

1. Soil, sand, gravel, compost, peat, humus, muck, and decomposed manure, separately or with other articles. This includes movement of articles listed above that may be associated with cut/waste, ditch pulling, and shoulder cutting.
2. Plants with roots including grass sod.
3. Plant crowns and roots.
4. Bulbs, corms, rhizomes, and tubers of ornamental plants.
5. Hay, straw, fodder, and plant litter of any kind.
6. Clearing and grubbing debris.
7. Used agricultural cultivating and harvesting equipment.
8. Used earth-moving equipment.
9. Any other products, articles, or means of conveyance, of any character, if determined by an inspector to present a hazard of spreading imported fire ant, gypsy moth, witchweed, emerald ash borer, or other noxious weeds.

**STANDARD SPECIAL PROVISION****TITLE VI AND NONDISCRIMINATION:**

(6-28-77)(Rev 6/19/2018)

Z-6

Revise the *2018 Standard Specifications* as follows:

Replace Article 103-4(B) with the following:

The North Carolina Department of Transportation is committed to carrying out the U.S. Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts.

The provisions of this section related to United States Department of Transportation (US DOT) Order 1050.2A, Title 49 Code of Federal Regulations (CFR) part 21, 23 United States Code (U.S.C.) 140 and 23 CFR part 200 (or 49 CFR 303, 49 U.S.C. 5332 or 49 U.S.C. 47123) are applicable to all North Carolina Department of Transportation (NCDOT) contracts and to all related subcontracts, material supply, engineering, architectural and other service contracts, regardless of dollar amount. Any Federal provision that is specifically required not specifically set forth is hereby incorporated by reference.

(1) **Title VI Assurances (USDOT Order 1050.2A, Appendix A)**

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

(a) **Compliance with Regulations**

The contractor (hereinafter includes consultants) shall comply with the Acts and the Regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

(b) **Nondiscrimination**

The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.

(c) **Solicitations for Subcontractors, Including Procurements of Materials and Equipment**

In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Nondiscrimination on the grounds of race, color, or national origin.

(d) **Information and Reports**

The contractor shall provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined

by the Recipient or the FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor shall so certify to the Recipient or the FHWA, as appropriate, and shall set forth what efforts it has made to obtain the information.

(e) Sanctions for Noncompliance:

In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it and/or the FHWA may determine to be appropriate, including, but not limited to:

(i) Withholding payments to the contractor under the contract until the contractor complies; and/or

(ii) Cancelling, terminating, or suspending a contract, in whole or in part.

(f) Incorporation of Provisions

The contractor shall include the provisions of paragraphs (a) through (f) in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor shall take action with respect to any subcontract or procurement as the Recipient or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

(2) **Title VI Nondiscrimination Program (23 CFR 200.5(p))**

The North Carolina Department of Transportation (NCDOT) has assured the USDOT that, as a condition to receiving federal financial assistance, NCDOT will comply with Title VI of the Civil Rights Act of 1964 and all requirements imposed by Title 49 CFR part 21 and related nondiscrimination authorities to ensure that no person shall, on the ground of race, color, national origin, limited English proficiency, sex, age, or disability (including religion/creed or income-level, where applicable), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any programs, activities, or services conducted or funded by NCDOT. Contractors and other organizations under contract or agreement with NCDOT must also comply with Title VI and related authorities, therefore:

(a) During the performance of this contract or agreement, contractors (e.g., subcontractors, consultants, vendors, prime contractors) are responsible for complying with NCDOT's Title VI Program. Contractors are not required to prepare or submit Title VI Programs. To comply with this section, the prime contractor shall:

1. Post NCDOT's Notice of Nondiscrimination and the Contractor's own Equal Employment Opportunity (EEO) Policy in conspicuous locations accessible to all employees, applicants and subcontractors on the jobsite.
2. Physically incorporate the required Title VI clauses into all subcontracts on federally-assisted and state-funded NCDOT projects, and ensure inclusion by subcontractors into all lower-tier subcontracts.
3. Required Solicitation Language. The Contractor shall include the following notification in all solicitations for bids and requests for work or material, regardless of funding source:

“The North Carolina Department of Transportation, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award. In accordance with other related nondiscrimination authorities, bidders and contractors will also not be discriminated against on the grounds of sex, age, disability, low-income level, creed/religion, or limited English proficiency in consideration for an award.”

4. Physically incorporate the FHWA-1273, in its entirety, into all subcontracts and subsequent lower tier subcontracts on Federal-aid highway construction contracts only.
  5. Provide language assistance services (i.e., written translation and oral interpretation), free of charge, to LEP employees and applicants. Contact NCDOT OCR for further assistance, if needed.
  6. For assistance with these Title VI requirements, contact the NCDOT Title VI Nondiscrimination Program at 1-800-522-0453.
- (b) Subrecipients (e.g. cities, counties, LGAs, planning organizations) may be required to prepare and submit a Title VI Plan to NCDOT, including Title VI Assurances and/or agreements. Subrecipients must also ensure compliance by their contractors and subrecipients with Title VI. (23 CFR 200.9(b)(7))
- (c) If reviewed or investigated by NCDOT, the contractor or subrecipient agrees to take affirmative action to correct any deficiencies found within a reasonable time period, not to exceed 90 calendar days, unless additional time is granted by NCDOT. (23 CFR 200.9(b)(15))
- (d) The Contractor is responsible for notifying subcontractors of NCDOT’s External Discrimination Complaints Process.
1. **Applicability**  
Title VI and related laws protect participants and beneficiaries (e.g., members of the public and contractors) from discrimination by NCDOT employees, subrecipients and contractors, regardless of funding source.
  2. **Eligibility**  
Any person—or class of persons—who believes he/she has been subjected to discrimination based on race, color, national origin, Limited English Proficiency (LEP), sex, age, or disability (and religion in the context of employment, aviation, or transit) may file a written complaint. The law also prohibits intimidation or retaliation of any sort.
  3. **Time Limits and Filing Options**  
Complaints may be filed by the affected individual(s) or a representative and must be filed no later than 180 calendar days after the following:
    - (i) The date of the alleged act of discrimination; or
    - (ii) The date when the person(s) became aware of the alleged discrimination; or
    - (iii) Where there has been a continuing course of conduct, the date on which that conduct was discontinued or the latest instance of the conduct.Title VI and related discrimination complaints may be submitted to the following entities:

- North Carolina Department of Transportation, Office of Civil Rights, Title VI Program, 1511 Mail Service Center, Raleigh, NC 27699-1511; toll free 1-800-522-0453
  - Federal Highway Administration, North Carolina Division Office, 310 New Bern Avenue, Suite 410, Raleigh, NC 27601, 919-747-7010
  - US Department of Transportation, Departmental Office of Civil Rights, External Civil Rights Programs Division, 1200 New Jersey Avenue, SE, Washington, DC 20590; 202-366-4070
4. Format for Complaints  
Complaints must be in writing and signed by the complainant(s) or a representative, and include the complainant's name, address, and telephone number. Complaints received by fax or e-mail will be acknowledged and processed. Allegations received by telephone will be reduced to writing and provided to the complainant for confirmation or revision before processing. Complaints will be accepted in other languages, including Braille.
5. Discrimination Complaint Form  
Contact NCDOT Civil Rights to receive a full copy of the Discrimination Complaint Form and procedures.
6. Complaint Basis  
Allegations must be based on issues involving race, color, national origin (LEP), sex, age, disability, or religion (in the context of employment, aviation or transit). "Basis" refers to the complainant's membership in a protected group category.

**TABLE 103-1  
COMPLAINT BASIS**

Protected Categories	Definition	Examples	Applicable Nondiscrimination Authorities
Race and Ethnicity	An individual belonging to one of the accepted racial groups; or the perception, based usually on physical characteristics that a person is a member of a racial group	Black/African American, Hispanic/Latino, Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, White	Title VI of the Civil Rights Act of 1964; 49 CFR Part 21; 23 CFR 200; 49 U.S.C. 5332(b); 49 U.S.C. 47123. ( <i>Executive Order 13166</i> )
Color	Color of skin, including shade of skin within a racial group	Black, White, brown, yellow, etc.	
National Origin ( <i>Limited English Proficiency</i> )	Place of birth. Citizenship is not a factor. ( <i>Discrimination based on language or a person's accent is also covered</i> )	Mexican, Cuban, Japanese, Vietnamese, Chinese	
Sex	Gender. The sex of an individual. <i>Note: Sex under this program does not include sexual orientation.</i>	Women and Men	1973 Federal-Aid Highway Act; 49 U.S.C. 5332(b); 49 U.S.C. 47123.
Age	Persons of any age	21-year-old person	Age Discrimination Act of 1975 49 U.S.C. 5332(b); 49 U.S.C. 47123.

Disability	Physical or mental impairment, permanent or temporary, or perceived.	Blind, alcoholic, para-amputee, epileptic, diabetic, arthritic	Section 504 of the Rehabilitation Act of 1973; Americans with Disabilities Act of 1990
Religion (in the context of employment) <i>(Religion/ Creed in all aspects of any aviation or transit-related construction)</i>	An individual belonging to a religious group; or the perception, based on distinguishable characteristics that a person is a member of a religious group. In practice, actions taken as a result of the moral and ethical beliefs as to what is right and wrong, which are sincerely held with the strength of traditional religious views. <i>Note:</i> Does not have to be associated with a recognized religious group or church; if an individual sincerely holds to the belief, it is a protected religious practice.	Muslim, Christian, Sikh, Hindu, etc.	Title VII of the Civil Rights Act of 1964; 23 CFR 230; FHWA-1273 Required Contract Provisions. <i>(49 U.S.C. 5332(b); 49 U.S.C. 47123)</i>

### (3) Pertinent Nondiscrimination Authorities

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest agrees to comply with the following non-discrimination statutes and authorities, including, but not limited to:

- (a) Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21.
- (b) The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- (c) Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);
- (d) Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability) and 49 CFR Part 27;
- (e) The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- (f) Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- (g) The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- (h) Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.F.R. parts 37 and 38;
- (i) The Federal Aviation Administration's Nondiscrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);



- (j) Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures Nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
  - (k) Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
  - (l) Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).
  - (m) Title VII of the Civil Rights Act of 1964 (42 U.S.C. § 2000e et seq., Pub. L. 88-352), (prohibits employment discrimination on the basis of race, color, religion, sex, or national origin).
- (4) **Additional Title VI Assurances**  
*\*\*The following Title VI Assurances (Appendices B, C and D) shall apply, as applicable*
- (a) Clauses for Deeds Transferring United States Property (1050.2A, Appendix B)  
The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Assurance 4.

NOW, THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the North Carolina Department of Transportation (NCDOT) will accept title to the lands and maintain the project constructed thereon in accordance with the North Carolina General Assembly, the Regulations for the Administration of the Federal-Aid Highway Program, and the policies and procedures prescribed by the Federal Highway Administration of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the NCDOT all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit A attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto the North Carolina Department of Transportation (NCDOT) and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the NCDOT, its successors and assigns.

The NCDOT, in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]\* (2) that the NCDOT will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended [, and (3) that in the event of breach of any of the above-mentioned nondiscrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].\*

(\*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

(b) Clauses for Transfer of Real Property Acquired or Improved Under the Activity, Facility, or Program (1050.2A, Appendix C)

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(a):

1. The (grantee, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add "as a covenant running with the land"] that:
  - (i.) In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (grantee, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.
2. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued. \*
3. With respect to a deed, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. \*

(\*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

(c) Clauses for Construction/Use/Access to Real Property Acquired Under the Activity, Facility or Program (1050.2A, Appendix D)

The following clauses will be included in deeds, licenses, permits, or similar instruments/ agreements entered into by the North Carolina Department of Transportation (NCDOT) pursuant to the provisions of Assurance 7(b):

1. The (grantee, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, "as a covenant running with the land") that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (grantee, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.
2. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Non-discrimination covenants, the NCDOT will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued. \*
3. With respect to deeds, in the event of breach of any of the above Nondiscrimination covenants, the NCDOT will there upon revert to and vest in and become the absolute property of the NCDOT and its assigns. \*

(\*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

**STANDARD SPECIAL PROVISION****MINORITY AND FEMALE EMPLOYMENT REQUIREMENTS**

Z-7

**NOTICE OF REQUIREMENTS FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (*EXECUTIVE NUMBER 11246*)**

1. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, see as shown on the attached sheet entitled "Employment Goals for Minority and Female participation".

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in *41 CFR Part 60-4* shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in *41 CFR 60-4.3(a)*, and its effort to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the executive Order and the regulations in *41 CFR Part 60-4*. Compliance with the goals will be measured against the total work hours performed.

2. As used in this Notice and in the contract resulting from this solicitation, the "covered area" is the county or counties shown on the cover sheet of the proposal form and contract.

**EMPLOYMENT GOALS FOR MINORITY  
AND FEMALE PARTICIPATION**

Economic Areas

**Area 023 29.7%**

Bertie County  
Camden County  
Chowan County  
Gates County  
Hertford County  
Pasquotank County  
Perquimans County

**Area 024 31.7%**

Beaufort County  
Carteret County  
Craven County  
Dare County  
Edgecombe County  
Green County  
Halifax County  
Hyde County  
Jones County  
Lenoir County  
Martin County  
Nash County  
Northampton County  
Pamlico County  
Pitt County  
Tyrrell County  
Washington County  
Wayne County  
Wilson County

**Area 025 23.5%**

Columbus County  
Duplin County  
Onslow County  
Pender County

**Area 026 33.5%**

Bladen County  
Hoke County  
Richmond County  
Robeson County  
Sampson County  
Scotland County

**Area 027 24.7%**

Chatham County  
Franklin County  
Granville County  
Harnett County  
Johnston County  
Lee County  
Person County  
Vance County  
Warren County

**Area 028 15.5%**

Alleghany County  
Ashe County  
Caswell County  
Davie County  
Montgomery County  
Moore County  
Rockingham County  
Surry County  
Watauga County  
Wilkes County

**Area 029 15.7%**

Alexander County  
Anson County  
Burke County  
Cabarrus County  
Caldwell County  
Catawba County  
Cleveland County  
Iredell County  
Lincoln County  
Polk County  
Rowan County  
Rutherford County  
Stanly County

**Area 0480 8.5%**

Buncombe County  
Madison County

**Area 030 6.3%**

Avery County  
Cherokee County  
Clay County  
Graham County  
Haywood County  
Henderson County  
Jackson County  
McDowell County  
Macon County  
Mitchell County  
Swain County  
Transylvania County  
Yancey County

SMSA Areas

Area 5720 26.6%

Currituck County

Area 9200 20.7%

Brunswick County

New Hanover County

Area 2560 24.2%

Cumberland County

Area 6640 22.8%

Durham County

Orange County

Wake County

Area 1300 16.2%

Alamance County

Area 3120 16.4%

Davidson County

Forsyth County

Guilford County

Randolph County

Stokes County

Yadkin County

Area 1520 18.3%

Gaston County

Mecklenburg County

Union County

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Goals for Female

Participation in Each Trade

(Statewide) 6.9%

**STANDARD SPECIAL PROVISION****REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS**

FHWA - 1273 Electronic Version - May 1, 2012

Z-8

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

**ATTACHMENTS**

- A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

**I. GENERAL**

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).  
The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.  
Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.  
Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).
2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.
3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.
4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

**II. NONDISCRIMINATION**

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. **Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:
  - a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

- b. The contractor will accept as its operating policy the following statement:  
"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: 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, pre-apprenticeship, and/or on-the-job training."
2. **EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.
3. **Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:
  - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
  - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
  - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.
  - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
  - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.
  - a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.
  - b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.
  - c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.
5. **Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
  - a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
  - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
  - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
  - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.
6. **Training and Promotion:**
  - a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.
  - b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).
  - c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
  - d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.
7. **Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:
  - a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.
  - b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.



- c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.
  - d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.
8. **Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.
  9. **Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.
    - a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.
    - b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.
  10. **Assurance Required by 49 CFR 26.13(b):**
    - a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.
    - b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.
  11. **Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.
    - a. The records kept by the contractor shall document the following:
      - (1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;
      - (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and
      - (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;
    - b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

### III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

### IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

#### 1. Minimum wages

- a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's

payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
    - (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
    - (ii) The classification is utilized in the area by the construction industry; and
    - (iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.
  - (2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
  - (3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.
  - (4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.
  - c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.
  - d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.
2. **Withholding.** The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.
  3. **Payrolls and basic records**
    - a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.
    - b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee ( e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency.
    - (2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
      - (i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

- (ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
  - (iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
  - (3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.
  - (4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.
  - c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.
4. **Apprentices and trainees**
- a. Apprentices (programs of the USDOL). Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.
 

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
  - b. Trainees (programs of the USDOL). Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.
 

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
  - c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.
  - d. Apprentices and Trainees (programs of the U.S. DOT). Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.
- 5. **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.
  - 6. **Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.
  - 7. **Contract termination: debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.
  - 8. **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.
  - 9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in

29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. **Certification of eligibility.**

- a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
- c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. **CONTRACT WORK HOURS AND SAFETY STANDARDS ACT**

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
2. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.
3. **Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.
4. **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. **SUBLETTING OR ASSIGNING THE CONTRACT**

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).
  - a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees

from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

- (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
  - (2) the prime contractor remains responsible for the quality of the work of the leased employees;
  - (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
  - (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.
- b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.
2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.
  3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.
  4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.
  5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

#### **VII. SAFETY: ACCIDENT PREVENTION**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).
3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

#### **VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

#### **IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

#### **X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

**1. Instructions for Certification – First Tier Participants:**

- a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.
- d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
- f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

\* \* \* \* \*

**2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:**

- a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:
  - (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;
  - (2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
  - (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and
  - (4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

**2. Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contractor). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).
- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

\* \* \* \* \*

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

\* \* \* \* \*

**XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
  - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
  - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

**STANDARD SPECIAL PROVISION****ON-THE-JOB TRAINING**

(10-16-07) (Rev. 4-21-15)

Z-10

**Description**

The North Carolina Department of Transportation will administer a custom version of the Federal On-the-Job Training (OJT) Program, commonly referred to as the Alternate OJT Program. All contractors (existing and newcomers) will be automatically placed in the Alternate Program. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level. Instead, these requirements will be applicable on an annual basis for each contractor administered by the OJT Program Manager.

On the Job Training shall meet the requirements of 23 CFR 230.107 (b), 23 USC – Section 140, this provision and the On-the-Job Training Program Manual.

The Alternate OJT Program will allow a contractor to train employees on Federal, State and privately funded projects located in North Carolina. However, priority shall be given to training employees on NCDOT Federal-Aid funded projects.

**Minorities and Women**

Developing, training and upgrading of minorities and women toward journeyman level status is a primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority and women as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

**Assigning Training Goals**

The Department, through the OJT Program Manager, will assign training goals for a calendar year based on the contractors' past three years' activity and the contractors' anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time the Contractor shall enter into an agreement with the Department to provide a self-imposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from 1 to 15 per contractor per calendar year. The Contractor shall sign an agreement to fulfill their annual goal for the year.\



### **Training Classifications**

The Contractor shall provide on-the-job training aimed at developing full journeyman level workers in the construction craft/operator positions. Preference shall be given to providing training in the following skilled work classifications:

Equipment Operators	Office Engineers
Truck Drivers	Estimators
Carpenters	Iron / Reinforcing Steel Workers
Concrete Finishers	Mechanics
Pipe Layers	Welders

The Department has established common training classifications and their respective training requirements that may be used by the contractors. However, the classifications established are not all-inclusive. Where the training is oriented toward construction applications, training will be allowed in lower-level management positions such as office engineers and estimators. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance to FHWA the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and

The number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

The Contractor may allow trainees to be trained by a subcontractor provided that the Contractor retains primary responsibility for meeting the training and this provision is made applicable to the subcontract. However, only the Contractor will receive credit towards the annual goal for the trainee.

Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

### **Records and Reports**

The Contractor shall maintain enrollment, monthly and completion reports documenting company compliance under these contract documents. These documents and any other information as requested shall be submitted to the OJT Program Manager.

Upon completion and graduation of the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

### **Trainee Interviews**

All trainees enrolled in the program will receive an initial and Trainee/Post graduate interview conducted by the OJT program staff.

### **Trainee Wages**

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

In no instance shall a trainee be paid less than the local minimum wage. The Contractor shall adhere to the minimum hourly wage rate that will satisfy both the NC Department of Labor (NCDOL) and the Department.

### **Achieving or Failing to Meet Training Goals**

The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and who receives training for at least 50 percent of the specific program requirement. Trainees will be allowed to be transferred between projects if required by the Contractor's scheduled workload to meet training goals.

If a contractor fails to attain their training assignments for the calendar year, they may be taken off the NCDOT's Bidders List.

### **Measurement and Payment**

No compensation will be made for providing required training in accordance with these contract documents.

**STANDARD SPECIAL PROVISION**  
**MINIMUM WAGES**  
**GENERAL DECISION NC190091 01/04/2019 NC91**

Z-091

Date: January 4, 2019

General Decision Number: NC190091 01/04/2019 NC91

Superseded General Decision Numbers: NC20180104

State: North Carolina

Construction Type: HIGHWAY

**COUNTIES:**

Beaufort	Granville	Pasquotank
Bertie	Halifax	Perquimans
Bladen	Harnett	Robeson
Camden	Hertford	Sampson
Carteret	Hyde	Scotland
Chowan	Jones	Tyrrell
Columbus	Lenoir	Vance
Craven	Martin	Warren
Dare	Northampton	Washington
Duplin	Pamlico	Wilson
Gates		

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.60 for calendar year 2019 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.60 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract for calendar year 2019. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR.5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2) – (60). Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number

Publication Date

0

01/04/2019

SUNC2014-006 11/17/2014

	Rates	Fringes
BLASTER	21.85	
CARPENTER	13.72	
CEMENT MASON/CONCRETE FINISHER	14.26	
ELECTRICIAN		
Electrician	18.69	2.66
Telecommunications Technician	14.72	1.67
IRONWORKER	16.32	
LABORER		
Asphalt Raker and Spreader	12.42	
Asphalt Screed/Jackman	13.48	
Carpenter Tender	10.85	
Cement Mason/Concrete Finisher Tender	11.35	
Common or General	10.12	
Guardrail/Fence Installer	13.39	
Pipelayer	13.31	
Traffic Signal/Lighting Installer	16.88	
PAINTER		
Bridge	19.62	
POWER EQUIPMENT OPERATORS		
Asphalt Broom Tractor	13.28	
Bulldozer Fine	18.46	
Bulldozer Rough	14.09	
Concrete Grinder/Groover	24.66	
Crane Boom Trucks	17.25	
Crane Other	21.48	
Crane Rough/All-Terrain	19.00	
Drill Operator Rock	15.43	1.61
Drill Operator Structure	19.12	
Excavator Fine	17.61	
Excavator Rough	12.99	
Grader/Blade Fine	16.73	
Grader/Blade Rough	15.28	
Loader 2 Cubic Yards or Less	10.28	
Loader Greater Than 2 Cubic Yards	13.58	
Material Transfer Vehicle (Shuttle Buggy)	17.39	
Mechanic	18.63	
Milling Machine	14.38	
Off-Road Hauler/Water Tanker	9.30	
Oiler/Greaser	13.45	
Pavement Marking Equipment	11.87	
Paver Asphalt	15.53	
Roller Asphalt Breakdown	12.13	
Roller Asphalt Finish	13.65	
Roller Other	10.48	
Scraper Finish	13.98	
Scraper Rough	10.17	
Slip Form Machine	19.29	
Tack Truck/Distributor Operator	14.56	
TRUCK DRIVER		

	Rates	Fringes
GVWR of 26,000 Lbs or Less	10.35	
GVWR of 26,000 Lbs or Greater	12.04	

Welders – Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number,

007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U. S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, D.C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, D.C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

- 3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, D.C. 20210

- 4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

**LISTING OF DBE SUBCONTRACTORS**

Sheet \_\_\_\_\_ of \_\_\_\_\_

Firm Name and Address	Item No.	Item Description	* Agreed upon Unit Price	** Dollar Volume of Item
<b>Name</b>  Address				
<b>Name</b>  Address				
<b>Name</b>  Address				
<b>Name</b>  Address				
<b>Name</b>  Address				
<b>Name</b>  Address				
<b>Name</b>  Address				

\* The Dollar Volume shown in this column shall be the Actual Price Agreed Upon by the Prime Contractor and the DBE subcontractor, and these prices will be used to determine the percentage of the DBE participation in the contract.

\*\* Dollar Volume of DBE Subcontractor Percentage of Total Contract Bid Price:

*If firm is a Material Supplier Only, show Dollar Volume as 60% of Agreed Upon Amount from Letter of Intent.*

*If firm is a Manufacturer, show Dollar Volume as 100% of Agreed Upon Amount from Letter of Intent.*



**LISTING OF DBE SUBCONTRACTORS**

Sheet \_\_\_\_\_ of \_\_\_\_\_

Firm Name and Address	Item No.	Item Description	* Agreed upon Unit Price	** Dollar Volume of Item
<b>Name</b>  Address				
<b>Name</b>  Address				
<b>Name</b>  Address				
<b>Name</b>  Address				
<b>Name</b>  Address				

**\*\* Dollar Volume of DBE Subcontractor \$ \_\_\_\_\_**

**Percentage of Total Contract Bid Price \_\_\_\_\_%**

**\* The Dollar Volume shown in this column shall be the Actual Price Agreed Upon by the Prime Contractor and the DBE subcontractor, and these prices will be used to determine the percentage of the DBE participation in the contract.**

**\*\* Dollar Volume of DBE Subcontractor Percentage of Total Contract Bid Price:  
 If firm is a Material Supplier Only, show Dollar Volume as 60% of Agreed Upon Amount from Letter of Intent.  
 If firm is a Manufacturer, show Dollar Volume as 100% of Agreed Upon Amount from Letter of Intent.**

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
<b>ROADWAY ITEMS</b>						
0001	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM CONCRETE SEAT WALL & FOUNTAIN	Lump Sum	L.S.	
0002	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM CONCRETE STEPS W/ HAND RAIL	Lump Sum	L.S.	
0003	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM DEPRESSED CURB RAMPS	Lump Sum	L.S.	
0004	0000900000-N	SP	GENERIC MISCELLANEOUS ITEM RETURNED CURB RAMPS	Lump Sum	L.S.	
0005	0000915000-N	SP	GENERIC MISCELLANEOUS ITEM PARKING STOPS	8 EA		
0006	0000950000-E	SP	GENERIC MISCELLANEOUS ITEM REUSED BRICK PAVERS	2,345 SF		
0007	0000950000-E	SP	GENERIC MISCELLANEOUS ITEM STONE PAVERS	704 SF		
0008	0234000000-E	SP	GENERIC GRADING ITEM BORROW MATERIAL PER SECTION 1018	149 CY		
0009	0248000000-N	SP	GENERIC GRADING ITEM DEMOLITION	Lump Sum	L.S.	
0010	0248000000-N	SP	GENERIC GRADING ITEM LANDSCAPE GRADING	Lump Sum	L.S.	
0011	2474000000-N	SP	GENERIC DRAINAGE ITEM SITE STORMWATER DRAINAGE (INCLUDES SLEEVES)	Lump Sum	L.S.	
0012	2591000000-E	848	4" CONCRETE SIDEWALK	419 SY		
0013	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	100 SF		
0014	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	100 SF		
0015	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	100 SF		
0016	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	1 EA		
0017	4430000000-N	1130	DRUMS	150 EA		

County : Northampton

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0018	4435000000-N	1135	CONES	100	EA	
0019	4445000000-E	1145	BARRICADES (TYPE III)	64	LF	
0020	4510000000-N	1190	LAW ENFORCEMENT	20	HR	
0021	6000000000-E	1605	TEMPORARY SILT FENCE	1,000	LF	
0022	6012000000-E	1610	SEDIMENT CONTROL STONE	100	TON	
0023	6015000000-E	1615	TEMPORARY MULCHING	0.5	ACR	
0024	6029000000-E	SP	SAFETY FENCE	200	LF	
0025	6042000000-E	1632	1/4" HARDWARE CLOTH	200	LF	
0026	6071010000-E	SP	WATTLE	200	LF	
0027	6075000000-E	1651	SELECTIVE TREE REMOVAL, *** 6"	2	EA	
0028	6102000000-E	1664	SODDING ZOYSIA 'ZENITH' ZENITH ZOYSIAGRASS SOD	809	SY	
0029	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	2	EA	
0030	6640000000-N	1670	GENERIC PLANTING ITEM ACER PALMATUM 'SANGO KAKU' CORAL BARK JAPANESE MAPLE, 6-7'	1	EA	
0031	6640000000-N	1670	GENERIC PLANTING ITEM ACER PALMATUM 'SEIRYU' SEIRYU JAPANESE MAPLE, 7-8'	2	EA	
0032	6640000000-N	1670	GENERIC PLANTING ITEM BUDDLEIA 'BLUE CHIP' LO & BEHOLD BLUE CHIP BUTTERFLY BUSH	76	EA	
0033	6640000000-N	1670	GENERIC PLANTING ITEM DRYOPTERIS ERYTHROSORA AUTUMN FERN, 6-12"	28	EA	

County : Northampton

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0034	6640000000-N	1670	GENERIC PLANTING ITEM ECHINACEA PURPUREA 'MAGNUS' MAGNUS PURPLE CONEFLOWER	24 EA		
0035	6640000000-N	1670	GENERIC PLANTING ITEM ECHINACEA PURPUREA 'PAS702918' POWWOW WHITE CONEFLOWER	31 EA		
0036	6640000000-N	1670	GENERIC PLANTING ITEM HEMEROCALLIS X 'PARDON ME' PARDON ME DAYLILY, 6-12"	347 EA		
0037	6640000000-N	1670	GENERIC PLANTING ITEM HEMEROCALLIS X 'STELLA DE ORO' STELLA DE ORO DWARF DAYLILY	303 EA		
0038	6640000000-N	1670	GENERIC PLANTING ITEM HEUCHERA 'CAMEL' CAMEL CORAL BELLS, 6-12"	64 EA		
0039	6640000000-N	1670	GENERIC PLANTING ITEM HEUCHERA X 'PEACH CRISP' PEACH CRISP CORAL BELLS, 6-12"	24 EA		
0040	6640000000-N	1670	GENERIC PLANTING ITEM HEUCHERA X 'SUGAR PLUM' SUGAR PLUM CORAL BELLS, 6-12"	24 EA		
0041	6640000000-N	1670	GENERIC PLANTING ITEM HOSTA X 'GUACAMOLE' GUACAMOLE PLANTAIN LILY, 6-12"	18 EA		
0042	6640000000-N	1670	GENERIC PLANTING ITEM HYDRANGEA ARBORESCENS 'ANNABEL LE' ANNABELLE SMOOTH HYDRANGEA	17 EA		
0043	6640000000-N	1670	GENERIC PLANTING ITEM HYDRANGEA ARBORESCENS 'NCHA1' INVINCIBELLE SPIRIT SMOOTH HYD RANGEA	12 EA		
0044	6640000000-N	1670	GENERIC PLANTING ITEM ILEX VERTICILLATA 'RED SPRITE' RED SPRITE WINTERBERRY, 18-24"	12 EA		
0045	6640000000-N	1670	GENERIC PLANTING ITEM ILEX VOMITORIA 'CONDEAUX' BORDEAUX DWARF YAUPON HOLLY	107 EA		

County : Northampton

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0046	6640000000-N	1670	GENERIC PLANTING ITEM ITEA VIRGINICA 'SPRICH' LITTLE HENRY DWARF VIRGINIA SW EETSPIRE	30 EA		
0047	6640000000-N	1670	GENERIC PLANTING ITEM LAGERSTROEMIA INDICA 'SIOUX' SIOUX CRAPE MYRTLE, 6-7'	11 EA		
0048	6640000000-N	1670	GENERIC PLANTING ITEM LAGERSTROEMIA INDICA X FAURIEI 'MUSKOGEE MUSKOGEE CRAPE MYRTLE, 10-12'	7 EA		
0049	6640000000-N	1670	GENERIC PLANTING ITEM LIRIOPE MUSCARI 'BIG BLUE' BIG BLUE LILYTURF, 6-12"	954 EA		
0050	6640000000-N	1670	GENERIC PLANTING ITEM MAGNOLIA X SOULANGIANAN 'ALEXA NDRINA' ALEXANDER MAGNOLIA, 7-8'	1 EA		
0051	6640000000-N	1670	GENERIC PLANTING ITEM MUHLENBERGIA CAPILLARIS PINK MUHLY GRASS, 18-24"	134 EA		
0052	6640000000-N	1670	GENERIC PLANTING ITEM MUHLENBERGIA CAPILLARIS PINK MUHLY GRASS, 6-12"	374 EA		
0053	6640000000-N	1670	GENERIC PLANTING ITEM MUHLENBERGIA CAPILLARIS 'WHITE CLOUD' WHITE MUHLY GRASS, 6-12"	237 EA		
0054	6640000000-N	1670	GENERIC PLANTING ITEM OPHIPOGON JAPONICUS 'NANA' DWARF MONDO GRASS, 3-6"	278 EA		
0055	6640000000-N	1670	GENERIC PLANTING ITEM PHLOX SUBULATA 'EMERALD BLUE' EMERALD BLUE CREEPING PHLOX	136 EA		
0056	6640000000-N	1670	GENERIC PLANTING ITEM RHODENDRON 'CONLEF' ENCORE AUTUMN CHEER AZALEA	30 EA		
0057	6640000000-N	1670	GENERIC PLANTING ITEM RHODENDRON 'CONLEP' ENCORE AUTUMN TWIST AZALEA	14 EA		

County : Northampton

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0058	6640000000-N	1670	GENERIC PLANTING ITEM ROSMARINUS OFFICINALIS 'BARBECUE' BARBECUE ROSEMARY, 6-12"	4 EA		
0059	6640000000-N	1670	GENERIC PLANTING ITEM SCHIZACHYRIUM SCOPARIUM 'TWILIGHT ZONE' TWILIGHT ZONE LITTLE BLUESTEM	18 EA		
0060	6640000000-N	1670	GENERIC PLANTING ITEM SEDUM MEXICANUM 'LEMON BALL' LEMON BALL SEDUM, 3-6"	50 EA		
0061	6640000000-N	1670	GENERIC PLANTING ITEM SEDUM SPECTABILE 'AUTUMN JOY' AUTUMN JOY SEDUM, 12-18"	111 EA		
0062	6640000000-N	1670	GENERIC PLANTING ITEM SEDUM SPECTABILE 'LEMONJADE' SEDUM ROCK 'N' GROW 'LEMONJADE'	176 EA		
0063	6640000000-N	1670	GENERIC PLANTING ITEM SEDUM SPECTABILE 'PURE JOY' SEDUM ROCK 'N' GROW 'PURE JOY'	365 EA		
0064	6640000000-N	1670	GENERIC PLANTING ITEM SPOROBOLUS HETEROLEPIS PRAIRIE DROPSEED, 6-12"	796 EA		
0065	6640000000-N	1670	GENERIC PLANTING ITEM THUJA OCCIDENTALIS 'SMARAGD' EMERALD GREEN ARBORVITAE, 6-7"	21 EA		
0066	6645000000-N	SP	GENERIC PLANTING ITEM MONTHLY MAINTENANCE	18 EA		
0067	6645000000-N	SP	GENERIC PLANTING ITEM SELECTIVE TREE PRUNING & THINNING	1 EA		
0068	6650000000-E	1670	MULCH FOR PLANTING 4" DEPTH	321 CY		
0069	6655000000-E	1670	WATER FOR PLANTING	51 M/G		
0070	6665000000-E	1670	POSTEMERGENT HERBICIDAL TREATMENT FOR PLANT BEDS FOR PLANT BEDS	2,751 SY		

County : Northampton

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0071	6670000000-E	1670	PREEMERGENT HERBICIDAL TREATMENT FOR PLANT BEDS FOR PLANT BEDS	2,751 SY		
0072	6674000000-N	SP	GENERIC PLANTING ITEM (LS) IRRIGATION (INCLUDES SLEEVES)	Lump Sum	L.S.	
0073	6675000000-E	SP	GENERIC PLANTING ITEM EXISTING PLANT BED REMOVAL	2,676 SY		
0074	6690000000-E	SP	GENERIC PLANTING ITEM METAL PLANT BED EDGING	158 LF		
0075	6900000000-E	SP	TOPSOIL	295 CY		
0076	6975000000-N	SP	GENERIC REST AREA ITEM ELECTRICAL INSTALLATION FOR REST AREA BUILDING	Lump Sum	L.S.	
0077	6975000000-N	SP	GENERIC REST AREA ITEM GENERAL CONSTRUCTION OF REST AREA BUILDING	Lump Sum	L.S.	
0078	6975000000-N	SP	GENERIC REST AREA ITEM MECHANICAL INSTALLATION FOR REST AREA BUILDING	Lump Sum	L.S.	
0079	6975000000-N	SP	GENERIC REST AREA ITEM PLUMBING INSTALLATION FOR REST AREA BUILDING	Lump Sum	L.S.	

1444/Jan18/Q20644.5/D429528925000/E79

Total Amount Of Bid For Entire Project :

**NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN CERTIFICATION  
PARTNERSHIP**

The prequalified bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the prequalified bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the prequalified bidder intends to do the work with its own bona fide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion, debarment and gift ban certification, the Contractor is attesting his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

*N.C.G.S. § 133-32* and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

**SIGNATURE OF PREQUALIFIED BIDDER**

\_\_\_\_\_  
Full Name of  
Partnership

\_\_\_\_\_  
Address as  
Prequalified

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Signature of Partner

\_\_\_\_\_  
Print or Type Signer's Name

\_\_\_\_\_  
Print or Type Signer's Name



**NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN  
CERTIFICATION**

**LIMITED LIABILITY COMPANY**

The prequalified bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the prequalified bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the prequalified bidder intends to do the work with its own bona fide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion, debarment and gift ban certification, the Contractor is attesting his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

*N.C.G.S. § 133-32* and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

**SIGNATURE OF PREQUALIFIED BIDDER**

\_\_\_\_\_

Full Name of Firm

\_\_\_\_\_

Address as Prequalified

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Signature of Member/Manager/Authorized Agent  
(*Select appropriate Title*)

\_\_\_\_\_  
Print or Type Signer's Name

\_\_\_\_\_  
Print or Type Signer's Name

**NON-COLLUSION, DEBARMENT AND GIFT BAN CERTIFICATION**

**JOINT VENTURE (2) or (3)**

The prequalified bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the prequalified bidder has not been convicted of violating N.C.G.S. § 133-24 within the last three years, and that the prequalified bidder intends to do the work with its own bona fide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion, debarment and gift ban certification, the Contractor is attesting his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

N.C.G.S. § 133-32 and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

**SIGNATURE OF PREQUALIFIED BIDDER**

Instructions: **2 Joint Venturers** Fill in lines (1), (2) and (3) and execute. **3 Joint Venturers** Fill in lines (1), (2), (3) and (4) and execute. On Line (1), fill in the name of the Joint Venture Company. On Line (2), fill in the name of one of the joint venturers and execute below in the appropriate manner. On Line (3), print or type the name of the other joint venturer and execute below in the appropriate manner. On Line (4), fill in the name of the third joint venturer, if applicable and execute below in the appropriate manner.

(1) \_\_\_\_\_  
Name of Joint Venture

(2) \_\_\_\_\_  
Name of Contractor

\_\_\_\_\_  
Address as Prequalified

\_\_\_\_\_  
Signature of Witness or Attest

 BY 

\_\_\_\_\_  
Signature of Contractor

\_\_\_\_\_  
Print or Type Signer's Name

\_\_\_\_\_  
Print or Type Signer's Name

*If Corporation, affix Corporate Seal* AND

(3) \_\_\_\_\_  
Name of Contractor

\_\_\_\_\_  
Address as Prequalified

\_\_\_\_\_  
Signature of Witness or Attest

 BY 

\_\_\_\_\_  
Signature of Contractor

\_\_\_\_\_  
Print or Type Signer's Name

\_\_\_\_\_  
Print or Type Signer's Name

*If Corporation, affix Corporate Seal* AND

(4) \_\_\_\_\_  
Name of Contractor

\_\_\_\_\_  
Address as Prequalified

\_\_\_\_\_  
Signature of Witness or Attest

 BY 

\_\_\_\_\_  
Signature of Contractor

\_\_\_\_\_  
Print or Type Signer's Name

\_\_\_\_\_  
Print or Type Signer's Name

*If Corporation, affix Corporate Seal*

**NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN  
CERTIFICATION**

**INDIVIDUAL DOING BUSINESS UNDER A FIRM NAME**

The prequalified bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the prequalified bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the prequalified bidder intends to do the work with its own bona fide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion, debarment and gift ban certification, the Contractor is attesting his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

*N.C.G.S. § 133-32* and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

**SIGNATURE OF PREQUALIFIED BIDDER**

Name of Prequalified Bidder

\_\_\_\_\_ Individual Name

Trading and Doing Business As

\_\_\_\_\_ Full name of Firm

\_\_\_\_\_ Address as Prequalified

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Signature of Prequalified Bidder, Individual

\_\_\_\_\_  
Print or Type Signer's Name

\_\_\_\_\_  
Print or Type Signer's Name

**NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN  
CERTIFICATION**

**INDIVIDUAL DOING BUSINESS IN HIS OWN NAME**

The prequalified bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competitive bidding in connection with any bid or contract, that the prequalified bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the prequalified bidder intends to do the work with its own bona fide employees or subcontractors and will not bid for the benefit of another contractor.

By submitting this non-collusion, debarment and gift ban certification, the Contractor is attesting his status under penalty of perjury under the laws of the United States in accordance with the Debarment Certification attached, provided that the Debarment Certification also includes any required statements concerning exceptions that are applicable.

*N.C.G.S. § 133-32* and Executive Order 24 prohibit the offer to, or acceptance by, any State Employee of any gift from anyone with a contract with the State, or from any person seeking to do business with the State. By execution of any response in this procurement, you attest, for your entire organization and its employees or agents, that you are not aware that any such gift has been offered, accepted, or promised by any employees of your organization.

**SIGNATURE OF PREQUALIFIED BIDDER**

Name of Prequalified Bidder \_\_\_\_\_  
Print or Type Name

\_\_\_\_\_  
Address as Prequalified

\_\_\_\_\_  
Signature of Prequalified Bidder, Individually

\_\_\_\_\_  
Print or type Signer's Name

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Print or type Signer's name

**DEBARMENT CERTIFICATION OF PREQUALIFIED BIDDER**

Conditions for certification:

1. The prequalified bidder shall provide immediate written notice to the Department if at any time the bidder learns that his certification was erroneous when he submitted his debarment certification or explanation that is file with the Department, or has become erroneous because of changed circumstances.
2. The terms *covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded*, as used in this provision, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. A copy of the Federal Rules requiring this certification and detailing the definitions and coverages may be obtained from the Contract Officer of the Department.
3. The prequalified bidder agrees by submitting this form, that he will not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in NCDOT contracts, unless authorized by the Department.
4. For Federal Aid projects, the prequalified bidder further agrees that by submitting this form he will include the Federal-Aid Provision titled *Required Contract Provisions Federal-Aid Construction Contract (Form FHWA PR 1273)* provided by the Department, without subsequent modification, in all lower tier covered transactions.
5. The prequalified bidder may rely upon a certification of a participant in a lower tier covered transaction that he is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless he knows that the certification is erroneous. The bidder may decide the method and frequency by which he will determine the eligibility of his subcontractors.
6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this provision. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
7. Except as authorized in paragraph 6 herein, the Department may terminate any contract if the bidder knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available by the Federal Government.

**DEBARMENT CERTIFICATION**

The prequalified bidder certifies to the best of his knowledge and belief, that he and his principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- b. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records; making false statements; or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph b. of this certification; and
- d. Have not within a three-year period preceding this proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- e. Will submit a revised Debarment Certification immediately if his status changes and will show in his bid proposal an explanation for the change in status.

If the prequalified bidder cannot certify that he is not debarred, he shall provide an explanation with this submittal. An explanation will not necessarily result in denial of participation in a contract.

Failure to submit a non-collusion affidavit and debarment certification will result in the prequalified bidder's bid being considered non-responsive.

Check here if an explanation is attached to this certification.

**Execution of Contract**

**Contract No: DD00295**

**County: NORTHAMPTON COUNTY**

ACCEPTED BY THE DEPARTMENT

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**Proposals Engineer**

---

Date

EXECUTION OF CONTRACT AND BONDS  
APPROVED AS TO FORM:

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for **Division Engineer**

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Date