

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION  
HIGHWAY DIVISION 1

## PROPOSAL

**DATE AND TIME OF BID OPENING: OCTOBER 29, 2014 AT 2:00 PM**

**CONTRACT ID: 120956301**

**WBS ELEMENT NO.: 45543.3.FD1**

**COUNTY: CURRITUCK COUNTY**

**TIP NO.: F-5501**

**LOCATION: CURRITUCK FERRY TERMINAL**

**TYPE OF WORK: CONSTRUCTION OF WELCOME CENTER**

**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 DIVISION LET PROJECT.**

**BID BOND REQUIRED.**

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**NAME OF BIDDER**

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**ADDRESS OF BIDDER**

**PROPOSAL FOR THE CONSTRUCTION OF  
CONTRACT No. 120956301 IN CURRITUCK COUNTY, NORTH CAROLINA  
DATE: SEPTEMBER 22, 2014  
DEPARTMENT OF TRANSPORTATION,  
RALEIGH, NORTH CAROLINA**

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **120956301**; 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 2012 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. **120956301** in **Currituck 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 2012* 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.

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## **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, except that bids may be prepared by electronic means as described elsewhere in the proposal. Failure to comply with any requirement shall cause the bid to be considered irregular and shall be grounds for rejection of the bid.

1. The bid sheet furnished by NCDOT with the proposal shall be used and shall not be altered in any manner. **DO NOT SEPARATE THE BID SHEET FROM THE PROPOSAL!**
2. All entries on the bid sheet, including signatures, shall be written in ink.
3. The Bidder shall submit a unit price for every item on the bid form. The unit prices for the various contract items shall be written in figures. **\*\*\*Unit Prices shall be rounded off by the bidder to contain no more than FOUR decimal places.\*\*\***
4. An amount bid shall be entered on the bid sheet for every item. The amount bid for each item shall be determined by multiplying each unit bid by the quantity for that item, and shall be written in figures in the "Amount Bid" column of the sheet.
5. The total amount bid shall be written in figures in the proper place on the bid sheet. The total amount shall be determined by adding the amounts bid for each item.
6. Changes in any entry shall be made by marking through the entry in ink and making the correct entry adjacent thereto in ink. A representative of the Bidder shall initial the change in ink.
7. The bid shall be properly executed. All bids shall show the following information:
  - a. Name of individual, firm, corporation, partnership, or joint venture submitting bid.
  - b. Name and signature of individual or representative submitting bid and position or title.
  - c. Name, signature, and position or title of witness.
  - d. Federal Identification Number (or Social Security Number of Individual)
  - e. Contractor's License Number (if Applicable)
8. Bids submitted by corporations shall bear the seal of the corporation.
9. The bid shall not contain any unauthorized additions, deletions, or conditional bids.
10. The bidder shall not add any provision reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.
11. **THE PROPOSAL WITH THE BID FORM STILL ATTACHED SHALL BE PLACED IN A SEALED ENVELOPE AND SHALL HAVE BEEN DELIVERED TO AND RECEIVED IN THE NCDOT DIV. ONE OFFICE, 113 AIRPORT DRIVE, SUITE 100, EDENTON, NC 27932 LOCATED APPROXIMATELY 5 MILES SOUTHEAST OF EDENTON, JUST OFF NC 94 ON AIRPORT DRIVE IN THE NORTHEASTERN REGIONAL AIRPORT BUILDING, BY 2:00 P.M. ON, WEDNESDAY, OCTOBER 29, 2014.**
12. The sealed bid must display the following statement on the front of the sealed envelope:

### **QUOTATION FOR 120956301 – CONSTRUCTION OF CURRITUCK FERRY WELCOME CENTER, IN CURRITUCK COUNTY, TO BE OPENED AT 2:00 P.M. ON WEDNESDAY OCTOBER 29, 2014**

13. If delivered by mail, the sealed envelope shall be placed in another sealed envelope and the outer envelope shall be addressed as follows:

**N. C. DEPARTMENT OF TRANSPORTATION  
Attn: Barry Hobbs, PE  
113 Airport Drive, Suite 100  
Edenton, NC 27932**

#### **AWARD OF CONTRACT**

The award of the contract, if it be awarded, will be made to the lowest responsible Bidder in accordance with Section 102, (excluding section 102-10) of the 2012 Standard Specifications for Roads and Structures. The lowest responsible Bidder will be notified that his bid has been accepted and that he has been awarded the contract. NCDOT reserves the right to reject all bids

## PROJECT SPECIAL PROVISIONS

### **MANDATORY PRE-BID CONFERENCE AND PROPOSAL REVIEW:**

In order to bid on this contract, all prospective bidders shall attend a Mandatory Pre-Bid Conference to be held at **the Currituck County Historic Courthouse, Currituck County Board of Commissioner's Meeting Room (Second Floor), 153 Courthouse Road, Currituck, NC 27929, at 10:00 A.M. on Wednesday, October 15, 2014. Please contact Barry Hobbs - (252) 482-1862 for any further information.**

The pre-bid conference will include a thorough discussion of the plans, contract pay items, special provisions, etc.

Only bidders who have attended and properly registered at the above scheduled pre-bid conferences will be considered qualified to bid on this project. A bid received from a bidder who has not attended and properly registered at the above scheduled pre-bid conferences will not be considered for award.

This conference will be conducted by Department personnel for the purpose of providing additional information about the project and to give bidders an opportunity to ask any questions they may have.

The Engineer will explain areas of responsibility, standards of performance and expected results. This is also intended to be a time for the Contractor to raise questions.

Any changes made to the contract during the pre-bid conference will be documented and included in an addendum. The addendum must be returned with the bid package, signed and dated. Failure to do so will result in disqualification of bid. Pre-Bid Conference proceedings may be tape recorded.

Attendance at the Pre-Bid Conference will not meet the requirements of proper registration unless the individual attending has registered with the following information:

1. The individual writes his/her name on the official roster at the **beginning** of the pre-bid conference.
2. The individual writes in the name and address of the company he/she represents.
3. Only one company is shown as being represented by the individual attending.
4. The individual is an officer or permanent employee of the firm they represent.
5. The individual shall sign out when the **end** of the pre-bid conference is completed.

**Only bids received from the bidders who have attended and properly registered at the Pre-Bid Conference will be considered.**

**CONTRACT TIME AND LIQUIDATED DAMAGES:**

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

108

SP1 G10 A

**The date of availability for this contract is December 1, 2014.**

**The completion date for this contract is October 30, 2015.**

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 **One Thousand Dollars (\$ 1000.00)** per calendar day.

**PROSECUTION OF WORK:**

(7-1-95) (Rev. 8-21-12)

108

SP1 G15R

The Contractor will be required to prosecute the work in a continuous and uninterrupted manner from the time he begins the work until completion and final acceptance of the project. The Contractor will not be permitted to suspend his operations except for reasons beyond his control or except where the Engineer has authorized a suspension of the Contractor's operations in writing.

In the event that the Contractor's operations are suspended in violation of the above provisions, the sum of **\$ 500.00** will be charged the Contractor for each and every calendar day that such suspension takes place. The said amount is hereby agreed upon as liquidated damages due to extra engineering and maintenance costs and due to increased public hazard resulting from a suspension of the work. Liquidated damages chargeable due to suspension of the work will be additional to any liquidated damages that may become chargeable due to failure to complete the work on time.

**SITE WORK/CIVIL CONSTRUCTION****DESCRIPTION**

The work covered by this provision includes, but is not limited to, all elements of work covered by Sections 200, 210, 225, 230, 235, 250, 260, 260, 265, 270, 300, 310, 500, 520, 545, 605, 609, 610, 620, 645, 801, 802, 825, 846, 848, 1205, 1605, 1607, 1610, 1633, 1660, 1661, 1662 and 1665 of the *Standard Specifications*, except that the requirements of the above referenced sections pertaining to measurement and payment will not apply unless specific reference is made to such.

**CONSTRUCTION METHODS**

Perform the work in accordance with the applicable Sections of the *Standard Specifications*.

**MEASUREMENT AND PAYMENT**

With the exception of the items detailed in Section 012100 - Allowances and Section 012200 - Unit Prices, all work under this provision will incidental to the Lump Sum Base Bid Price.

**PERMANENT VEGETATION ESTABLISHMENT:**

(2-16-12) (Rev. 10-15-13)

104

SP1 G16

Establish a permanent stand of the vegetation mixture shown in the contract. During the period between initial vegetation planting and final project acceptance, perform all work necessary to establish permanent vegetation on all erodible areas within the project limits, as well as, in borrow and waste pits. This work shall include erosion control device maintenance and installation, repair seeding and mulching, supplemental seeding and mulching, mowing, and fertilizer topdressing, as directed. All work shall be performed in accordance with the applicable section of the *2012 Standard Specifications*. All work required for initial vegetation planting shall be performed as a part of the work necessary for the completion and acceptance of the Intermediate Contract Time (ICT). Between the time of ICT and Final Project acceptance, or otherwise referred to as the vegetation establishment period, the Department will be responsible for preparing the required National Pollutant Discharge Elimination System (NPDES) inspection records.

Once the Engineer has determined that the permanent vegetation establishment requirement has been achieved at an 80% vegetation density (the amount of established vegetation per given area to stabilize the soil) and no erodible areas exist within the project limits, the Contractor will be notified to remove the remaining erosion control devices that are no longer needed. The Contractor will be responsible for, and shall correct any areas disturbed by operations performed in permanent vegetation establishment and the removal of temporary erosion control measures, whether occurring prior to or after placing traffic on the project.

Payment for *Response for Erosion Control, Seeding and Mulching, Repair Seeding, Supplemental Seeding, Mowing, Fertilizer Topdressing, Silt Excavation, and Stone for Erosion Control* will be made at contract unit prices for the affected items. Work required that is not represented by contract line items will be paid in accordance with Articles 104-7 or 104-3 of the *2012 Standard Specifications*. No additional compensation will be made for maintenance and removal of temporary erosion control items.

**POSTED WEIGHT LIMITS:**

(7-1-95) (Rev. 8-21-12)

107

SP1 G24R

The Contractor's attention is directed to the fact that many Primary and Secondary Roads and bridges are posted with weight limits less than the legal limit. Do not exceed the posted weight limits in transporting materials and/or equipment to the projects, unless otherwise indicated below. Make a thorough examination of all projects and haul routes and be prepared to discuss them at the Preconstruction Conference.

**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.

**NO SPECIALTY ITEMS:**

(7-1-95)

108-6

SP1 G34

None of the items included in this contract will be specialty items (see Article 108-6 of the *2012 Standard Specifications*).

**DISADVANTAGED BUSINESS ENTERPRISE (DIVISIONS):**

(10-16-07)(Rev.12-17-13)

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.

*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.  
<http://www.ncdot.org/doh/forms/files/DBE-IS.xls>

*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 amount 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\(Federal\).doc](http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/08%20DBE%20Subcontractors%20(Federal).doc)

*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 **6.0 %**

- (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://partner.ncdot.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) *If the DBE goal is more than zero*,
  - (1) 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.
  - (2) 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.

- (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) *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 12:00 noon of the sixth calendar day following opening of bids, unless the sixth 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 12:00 noon 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 12:00 noon 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 12:00 noon 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 of this information shall be received in the office of the Engineer no later than 12:00 noon of the sixth calendar day following opening of bids, unless the sixth 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 12:00 noon 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 Development Manager in the Business Opportunity and Work Force Development Unit 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 firm (or an approved substitute DBE firm) to meet all or part of a contract goal requirement, the contractor shall not terminate the DBE 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. A DBE may only be terminated after receiving the Engineer's written approval based upon a finding of good cause for the termination.

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.

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).

### **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 on the Department's DBE-IS (*Subcontractor Payment Information*) with each invoice. Invoices will not be processed for payment until the DBE-IS is received.

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

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2012 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.

**SUBSURFACE INFORMATION:**

(7-1-95)

450

SP1 G112 D

Subsurface information is available on the roadway and structure portions of this project.

**LOCATING EXISTING UNDERGROUND UTILITIES:**

(3-20-12)

105

SP1 G115

Revise the *2012 Standard Specifications* as follows:

**Page 1-43, Article 105-8, line 28, after the first sentence,** add the following:

Identify excavation locations by means of pre-marking with white paint, flags, or stakes or provide a specific written description of the location in the locate request.

**RESOURCE CONSERVATION:**

(5-21-13)

104-13

SP1 G118

In accordance with North Carolina Executive Order 156, NCGS 130A-309.14(2), and NCGS 136-28.8, it is the policy of the Department to aid in the reduction of materials that become a part of our solid waste stream, to divert materials from landfills, and to find ways to recycle and reuse materials for the benefit of the Citizens of North Carolina.

Initiate, develop and use products and construction methods that incorporate the use of recycled or solid waste products in accordance with Article 104-13 of the *2012 Standard Specifications*. Report the quantities of reused or recycled materials either incorporated in the project or diverted from landfills on the Project Construction Reuse and Recycling Reporting Form.

A location-based tool for finding local recycling facilities and the Project Construction Reuse and Recycling Reporting Form are available at:

<http://connect.ncdot.gov/resources/Environmental/Pages/North-Carolina-Recycling-Locations.aspx>

**DOMESTIC STEEL:**

(4-16-13)

106

SPI G120

Revise the *2012 Standard Specifications* as follows:

**Page 1-49, Subarticle 106-1(B) Domestic Steel, lines 2-7**, replace the first paragraph with the following:

All steel and iron products that are permanently incorporated into this project shall be produced in the United States except minimal amounts of foreign steel and iron products may be used provided the combined material cost of the items involved does not exceed 0.1% of the total amount bid for the entire project or \$2,500, whichever is greater. If invoices showing the cost of the material are not provided, the amount of the bid item involving the foreign material will be used for calculations. This minimal amount of foreign produced steel and iron products permitted for use is not applicable to high strength fasteners. Domestically produced high strength fasteners are required.

**COOPERATION BETWEEN CONTRACTORS:**

(7-1-95)

105-7

SPI G133

The Contractor's attention is directed to Article 105-7 of the *2012 Standard Specifications*.

The Contractor on this project shall cooperate with the Contractor working within 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

SPI 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.

**GIFTS FROM VENDORS AND CONTRACTORS:**

(12-15-09)

107-1

SP1 G152

By Executive Order 24, issued by Governor Perdue, and *N.C.G.S. § 133-32*, it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, landlord, offeror, seller, subcontractor, supplier, or vendor), to make gifts or to give favors to any State employee of the Governor's Cabinet Agencies (i.e. Administration, Commerce, Correction, Crime Control and Public Safety, Cultural Resources, Environment and Natural Resources, Health and Human Services, Juvenile Justice and Delinquency Prevention, Revenue, Transportation, and the Office of the Governor). This prohibition covers those vendors and contractors who:

- (A) Have a contract with a governmental agency; or
- (B) Have performed under such a contract within the past year; or
- (C) Anticipate bidding on such a contract in the future.

For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review Executive Order 24 and *N.C.G.S. § 133-32*.

Executive Order 24 also encouraged and invited other State Agencies to implement the requirements and prohibitions of the Executive Order to their agencies. Vendors and contractors should contact other State Agencies to determine if those agencies have adopted Executive Order 24.

**LIABILITY INSURANCE:**

(5-20-14)

SP1 G160

Revise the *2012 Standard Specifications* as follows:

**Page 1-60, Article 107-15 LIABILITY INSURANCE, line 16**, add the following as the second sentence of the third paragraph:

Prior to beginning services, all contractors shall provide proof of coverage issued by a workers' compensation insurance carrier, or a certificate of compliance issued by the Department of Insurance for self-insured subcontractors, irrespective of whether having regularly in service fewer than three employees.

**EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:**

(1-16-07) (Rev 9-18-12)

105-16, 225-2, 16

SP1 G180

**General**

Schedule and conduct construction activities in a manner that will minimize soil erosion and the resulting sedimentation and turbidity of surface waters. Comply with the requirements herein regardless of whether or not a National Pollution discharge Elimination System (NPDES) permit for the work is required.

Establish a chain of responsibility for operations and subcontractors' operations to ensure that the *Erosion and Sediment Control/Stormwater Pollution Prevention Plan* is implemented and maintained over the life of the contract.

- (A) *Certified Supervisor* - Provide a certified Erosion and Sediment Control/Stormwater Supervisor to manage the Contractor and subcontractor operations, insure compliance with Federal, State and Local ordinances and regulations, and manage the Quality Control Program.
- (B) *Certified Foreman* - Provide a certified, trained foreman for each construction operation that increases the potential for soil erosion or the possible sedimentation and turbidity of surface waters.
- (C) *Certified Installer* - Provide a certified installer to install or direct the installation for erosion or sediment/stormwater control practices.
- (D) *Certified Designer* - Provide a certified designer for the design of the erosion and sediment control/stormwater component of reclamation plans and, if applicable, for the design of the project erosion and sediment control/stormwater plan.

**Roles and Responsibilities**

- (A) *Certified Erosion and Sediment Control/Stormwater Supervisor* - The Certified Supervisor shall be Level II and responsible for ensuring the erosion and sediment control/stormwater plan is adequately implemented and maintained on the project and for conducting the quality control program. The Certified Supervisor shall be on the project within 24 hours notice from initial exposure of an erodible surface to the project's final acceptance. Perform the following duties:
  - (1) **Manage Operations** - Coordinate and schedule the work of subcontractors so that erosion and sediment control/stormwater measures are fully executed for each operation and in a timely manner over the duration of the contract.
    - (a) Oversee the work of subcontractors so that appropriate erosion and sediment control/stormwater preventive measures are conformed to at each stage of the work.
    - (b) Prepare the required National Pollutant Discharge Elimination System (NPDES) Inspection Record and submit to the Engineer.
    - (c) Attend all weekly or monthly construction meetings to discuss the findings of the NPDES inspection and other related issues.
    - (d) Implement the erosion and sediment control/stormwater site plans requested.



- (e) Provide any needed erosion and sediment control/stormwater practices for the Contractor's temporary work not shown on the plans, such as, but not limited to work platforms, temporary construction, pumping operations, plant and storage yards, and cofferdams.
  - (f) Acquire applicable permits and comply with requirements for borrow pits, dewatering, and any temporary work conducted by the Contractor in jurisdictional areas.
  - (g) Conduct all erosion and sediment control/stormwater work in a timely and workmanlike manner.
  - (h) Fully perform and install erosion and sediment control/stormwater work prior to any suspension of the work.
  - (i) Coordinate with Department, Federal, State and Local Regulatory agencies on resolution of erosion and sediment control/stormwater issues due to the Contractor's operations.
  - (j) Ensure that proper cleanup occurs from vehicle tracking on paved surfaces or any location where sediment leaves the Right-of-Way.
  - (k) Have available a set of erosion and sediment control/stormwater plans that are initialed and include the installation date of Best Management Practices. These practices shall include temporary and permanent groundcover and be properly updated to reflect necessary plan and field changes for use and review by Department personnel as well as regulatory agencies.
- (2) Requirements set forth under the NPDES Permit - The Department's NPDES Stormwater permit (NCS000250) outlines certain objectives and management measures pertaining to construction activities. The permit references *NCG010000, General Permit to Discharge Stormwater* under the NPDES, and states that the Department shall incorporate the applicable requirements into its delegated Erosion and Sediment Control Program for construction activities disturbing one or more acres of land. The Department further incorporates these requirements on all contracted bridge and culvert work at jurisdictional waters, regardless of size. Some of the requirements are, but are not limited to:
- (a) Control project site waste to prevent contamination of surface or ground waters of the state, i.e. from equipment operation/maintenance, construction materials, concrete washout, chemicals, litter, fuels, lubricants, coolants, hydraulic fluids, any other petroleum products, and sanitary waste.
  - (b) Inspect erosion and sediment control/stormwater devices and stormwater discharge outfalls at least once every 7 calendar days, twice weekly for construction related *Federal Clean Water Act, Section 303(d)* impaired streams with turbidity violations, and within 24 hours after a significant rainfall event of 0.5 inch that occurs within a 24 hour period.
  - (c) Maintain an onsite rain gauge or use the Department's Multi-Sensor Precipitation Estimate website to maintain a daily record of rainfall amounts and dates.
  - (d) Maintain erosion and sediment control/stormwater inspection records for review by Department and Regulatory personnel upon request.

- (e) Implement approved reclamation plans on all borrow pits, waste sites and staging areas.
  - (f) Maintain a log of turbidity test results as outlined in the Department's Procedure for Monitoring Borrow Pit Discharge.
  - (g) Provide secondary containment for bulk storage of liquid materials.
  - (h) Provide training for employees concerning general erosion and sediment control/stormwater awareness, the Department's NPDES Stormwater Permit NCS000250 requirements, and the applicable requirements of the *General Permit, NCG010000*.
  - (i) Report violations of the NPDES permit to the Engineer immediately who will notify the Division of Water Quality Regional Office within 24 hours of becoming aware of the violation.
- (3) Quality Control Program - Maintain a quality control program to control erosion, prevent sedimentation and follow provisions/conditions of permits. The quality control program shall:
- (a) Follow permit requirements related to the Contractor and subcontractors' construction activities.
  - (b) Ensure that all operators and subcontractors on site have the proper erosion and sediment control/stormwater certification.
  - (c) Notify the Engineer when the required certified erosion and sediment control/stormwater personnel are not available on the job site when needed.
  - (d) Conduct the inspections required by the NPDES permit.
  - (e) Take corrective actions in the proper timeframe as required by the NPDES permit for problem areas identified during the NPDES inspections.
  - (f) Incorporate erosion control into the work in a timely manner and stabilize disturbed areas with mulch/seed or vegetative cover on a section-by-section basis.
  - (g) Use flocculants approved by state regulatory authorities where appropriate and where required for turbidity and sedimentation reduction.
  - (h) Ensure proper installation and maintenance of temporary erosion and sediment control devices.
  - (i) Remove temporary erosion or sediment control devices when they are no longer necessary as agreed upon by the Engineer.
  - (j) The Contractor's quality control and inspection procedures shall be subject to review by the Engineer. Maintain NPDES inspection records and make records available at all times for verification by the Engineer.
- (B) *Certified Foreman* - At least one Certified Foreman shall be onsite for each type of work listed herein during the respective construction activities to control erosion, prevent sedimentation and follow permit provisions:
- (1) Foreman in charge of grading activities
  - (2) Foreman in charge of bridge or culvert construction over jurisdictional areas
  - (3) Foreman in charge of utility activities

The Contractor may request to use the same person as the Level II Supervisor and Level II Foreman. This person shall be onsite whenever construction activities as described above are taking place. This request shall be approved by the Engineer prior to work beginning.

The Contractor may request to name a single Level II Foreman to oversee multiple construction activities on small bridge or culvert replacement projects. This request shall be approved by the Engineer prior to work beginning.

(C) *Certified Installers* - Provide at least one onsite, Level I Certified Installer for each of the following erosion and sediment control/stormwater crew:

- (1) Seeding and Mulching
- (2) Temporary Seeding
- (3) Temporary Mulching
- (4) Sodding
- (5) Silt fence or other perimeter erosion/sediment control device installations
- (6) Erosion control blanket installation
- (7) Hydraulic tackifier installation
- (8) Turbidity curtain installation
- (9) Rock ditch check/sediment dam installation
- (10) Ditch liner/matting installation
- (11) Inlet protection
- (12) Riprap placement
- (13) Stormwater BMP installations (such as but not limited to level spreaders, retention/detention devices)
- (14) Pipe installations within jurisdictional areas

If a Level I *Certified Installer* is not onsite, the Contractor may substitute a Level II Foreman for a Level I Installer, provided the Level II Foreman is not tasked to another crew requiring Level II Foreman oversight.

(D) *Certified Designer* - Include the certification number of the Level III-B Certified Designer on the erosion and sediment control/stormwater component of all reclamation plans and if applicable, the certification number of the Level III-A Certified Designer on the design of the project erosion and sediment control/stormwater plan.

### **Preconstruction Meeting**

Furnish the names of the *Certified Erosion and Sediment Control/Stormwater Supervisor*, *Certified Foremen*, *Certified Installers* and *Certified Designer* and notify the Engineer of changes in certified personnel over the life of the contract within 2 days of change.

### **Ethical Responsibility**

Any company performing work for the North Carolina Department of Transportation has the ethical responsibility to fully disclose any reprimand or dismissal of an employee resulting from improper testing or falsification of records.

**Revocation or Suspension of Certification**

Upon recommendation of the Chief Engineer to the certification entity, certification for *Supervisor*, *Certified Foremen*, *Certified Installers* and *Certified Designer* may be revoked or suspended with the issuance of an *Immediate Corrective Action (ICA)*, *Notice of Violation (NOV)*, or *Cease and Desist Order* for erosion and sediment control/stormwater related issues.

The Chief Engineer may recommend suspension or permanent revocation of certification due to the following:

- (A) Failure to adequately perform the duties as defined within this certification provision.
- (B) Issuance of an ICA, NOV, or Cease and Desist Order.
- (C) Failure to fully perform environmental commitments as detailed within the permit conditions and specifications.
- (D) Demonstration of erroneous documentation or reporting techniques.
- (E) Cheating or copying another candidate's work on an examination.
- (F) Intentional falsification of records.
- (G) Directing a subordinate under direct or indirect supervision to perform any of the above actions.
- (H) Dismissal from a company for any of the above reasons.
- (I) Suspension or revocation of one's certification by another entity.

Suspension or revocation of a certification will be sent by certified mail to the certificant and the Corporate Head of the company that employs the certificant.

A certificant has the right to appeal any adverse action which results in suspension or permanent revocation of certification by responding, in writing, to the Chief Engineer within 10 calendar days after receiving notice of the proposed adverse action.

Chief Engineer  
1536 Mail Service Center  
Raleigh, NC 27699-1536

Failure to appeal within 10 calendar days will result in the proposed adverse action becoming effective on the date specified on the certified notice. Failure to appeal within the time specified will result in a waiver of all future appeal rights regarding the adverse action taken. The certificant will not be allowed to perform duties associated with the certification during the appeal process.

The Chief Engineer will hear the appeal and make a decision within 7 days of hearing the appeal. Decision of the Chief Engineer will be final and will be made in writing to the certificant.

If a certification is temporarily suspended, the certificant shall pass any applicable written examination and any proficiency examination, at the conclusion of the specified suspension period, prior to having the certification reinstated.

**Measurement and Payment**

*Certified Erosion and Sediment Control/Stormwater Supervisor*, *Certified Foremen*, *Certified Installers* and *Certified Designer* will be incidental to the project for which no direct compensation will be made.

**PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:**

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

105-16, 230, 801

SPI 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 *2012 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 [http://www.ncdot.gov/doh/operations/dp\\_chief\\_eng/roadside/fieldops/downloads/Files/TurbidityReductionOptionSheet.pdf](http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/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.

**EMPLOYMENT:**

(11-15-11) (Rev. 1-17-12)

108, 102

SP1 G184

Revise the *2012 Standard Specifications* as follows:

**Page 1-20, Subarticle 102-15(O)**, delete and replace with the following:

**(O)** Failure to restrict a former Department employee as prohibited by Article 108-5.

**Page 1-65, Article 108-5 Character of Workmen, Methods, and Equipment, line 32**, delete all of line 32, the first sentence of the second paragraph and the first word of the second sentence of the second paragraph.

**STATE HIGHWAY ADMINISTRATOR TITLE CHANGE:**

(9-18-12)

SP1 G185

Revise the *2012 Standard Specifications* as follows:

Replace all references to "State Highway Administrator" with "Chief Engineer".

## ROADWAY SPECIAL PROVISIONS

### **CLEARING AND GRUBBING - METHOD II:**

(9-17-02) (Rev. 1-17-12)

200

SP2 R02A

Perform clearing on this project to the limits established by Method "II" shown on Standard Drawing No. 200.02 of the *2012 Roadway Standard Drawings*.

### **SELECT GRANULAR MATERIAL:**

(3-16-10) (Rev. 1-17-12)

265

SP2 R80

Revise the *2012 Standard Specifications* as follows:

**Page 2-28, Article 265-2 MATERIALS**, add the following:

Use only Class III select material for select granular material.

**Page 2-28, Article 265-4 MEASUREMENT AND PAYMENT, lines 13-30**, replace all occurrences of *Select Granular Material* with *Select Granular Material, Class III*.

**Page 2-28, Article 265-4 MEASUREMENT AND PAYMENT, after line 31**, delete the pay item and replace with the following:

Payment will be made under:

#### **Pay Item**

Select Granular Material, Class III

#### **Pay Unit**

Cubic Yard

### **PIPE INSTALLATION:**

(11-20-12)

300

SP3 R01

Revise the *2012 Standard Specifications* as follows:

**Page 3-1, Article 300-2, Materials**, line 23-24, replace sentence with:

Provide foundation conditioning geotextile in accordance with Section 1056 for Type 4 geotextile.

### **PREPARATION OF SUBGRADE AND BASE:**

(1-16-96)

610

SP5 R05

On mainline portions and ramps of this project, prepare the subgrade and base beneath the pavement structure in accordance with the applicable sections of the *2012 Standard Specifications* except use an automatically controlled fine grading machine using string lines, laser controls or other approved methods to produce final subgrade and base surfaces meeting the lines, grades and cross sections required by the plans or established by the Engineer.

No direct payment will be made for the work required by this provision as it will be considered incidental to other work being paid for by the various items in the contract.

**AGGREGATE BASE COURSE:**

(11-18-14)

520

SP5 R14

Revise the 2012 *Standard Specifications* as follows:

**Page 5-10, Article 520-5 HAULING AND PLACING AGGREGATE BASE MATERIAL**, add the following sentence to the end of the first paragraph starting on line 21:

In addition, as approved by the Engineer, place by end dumping aggregate on approved sandy subgrade soils to provide a working platform and reduce wheel rutting of the subgrade. When allowed, end dumping will be limited to a uniformly spread thickness of 2 to 3 inches prior to placing the remaining aggregate thickness with a mechanical spreader.

**ASPHALT PAVEMENTS - SUPERPAVE:**

(6-19-12) (Rev. 10-21-14)

605, 609, 610, 650, 660

SP6 R01

Revise the 2012 *Standard Specifications* as follows:

**Page 6-3, Article 605-7 APPLICATION RATES AND TEMPERATURES**, replace this article, including Table 601-1, with the following:

Apply tack coat uniformly across the existing surface at target application rates shown in Table 605-1.

<b>TABLE 605-1 APPLICATION RATES FOR TACK COAT</b>	
<b>Existing Surface</b>	<b>Target Rate (gal/sy)</b>
	<b>Emulsified Asphalt</b>
New Asphalt	0.04 ± 0.01
Oxidized or Milled Asphalt	0.06 ± 0.01
Concrete	0.08 ± 0.01

Apply tack coat at a temperature within the ranges shown in Table 605-2. Tack coat shall not be overheated during storage, transport or at application.

<b>TABLE 605-2 APPLICATION TEMPERATURE FOR TACK COAT</b>	
<b>Asphalt Material</b>	<b>Temperature Range</b>
Asphalt Binder, Grade PG 64-22	350 - 400°F
Emulsified Asphalt, Grade RS-1H	130 - 160°F
Emulsified Asphalt, Grade CRS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-1H	130 - 160°F
Emulsified Asphalt, Grade HFMS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-2	130 - 160°F



**Page 6-7, Article 609-3 FIELD VERIFICATION OF MIXTURE AND JOB MIX FORMULA ADJUSTMENTS**, lines 35-37, delete the second sentence of the second paragraph.

**Page 6-18, Article 610-1 DESCRIPTION**, lines 40-41, delete the last sentence of the last paragraph.

**Page 6-19, Subarticle 610-3(A) Mix Design-General**, line 5, add the following as the first paragraph:

Warm mix asphalt (WMA) is allowed for use at the Contractor's option in accordance with the NCDOT Approved Products List for WMA Technologies available at:

<https://connect.ncdot.gov/resources/Materials/MaterialsResources/Warm%20Mix%20Asphalt%20Approved%20List.pdf>

**Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF)**, replace Table 610-1 with the following:

<b>TABLE 610-1 DESIGN MIXING TEMPERATURE AT THE ASPHALT PLANT<sup>A</sup></b>		
<b>Binder Grade</b>	<b>HMA JMF Temperature</b>	<b>WMA JMF Temperature Range</b>
PG 64-22	300°F	225 - 275°F
PG 70-22	315°F	240 - 290°F
PG 76-22	335°F	260 - 310°F

**A.** The mix temperature, when checked in the truck at the roadway, shall be within plus 15° and minus 25° of the temperature specified on the JMF.

**Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF)**, lines 4-6, delete first sentence of the second paragraph. Line 7, in the second sentence of the second paragraph, replace “275°F” with “275°F or greater.”

**Page 6-22, Article 610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES**, lines 15-17, replace the second sentence of the first paragraph with the following:

Do not place asphalt material when the air or surface temperatures, measured at the location of the paving operation away from artificial heat, do not meet Table 610-5.

**Page 6-23, Article 610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES**, replace Table 610-5 with the following:

<b>Asphalt Concrete Mix Type</b>	<b>Minimum Surface and Air Temperature</b>
B25.0B, C	35°F
I19.0B, C, D	35°F
SF9.5A, S9.5B	40°F <sup>A</sup>
S9.5C, S12.5C	45°F <sup>A</sup>
S9.5D, S12.5D	50°F

- A. For the final layer of surface mixes containing recycled asphalt shingles (RAS), the minimum surface and air temperature shall be 50°F.

**Page 6-26, Article 610-7 HAULING OF ASPHALT MIXTURE**, lines 22-23, in the fourth sentence of the first paragraph replace “so as to overlap the top of the truck bed and” with “to”.

**Page 6-41, Subarticle 650-3(B) Mix Design Criteria**, replace Table 650-1 with the following:

<i>Sieve Size (mm)</i>	<i>Type FC-1</i>	<i>Type FC-1 Modified</i>	<i>Type FC-2 Modified</i>
19.0	-	-	100
12.5	100	100	<b>80 - 100</b>
9.50	75 - 100	75 - 100	<b>55 - 80</b>
4.75	25 - 45	25 - 45	<b>15 - 30</b>
2.36	5 - 15	5 - 15	<b>5 - 15</b>
0.075	1.0 - 3.0	1.0 - 3.0	2.0 - 4.0

**Page 6-50, Table 660-1 MATERIAL APPLICATION RATES AND TEMPERATURES**, lines 1-2, replace Note A in Table 660-1 with the following:

- A. Use No. 6M, No. 67, No. 5 and No. 78M aggregate for retreatment before an asphalt overlay on existing pavement based on the width of the cracks in the existing pavement. Choose No. 78M for sections of roadway where the average width of existing cracks is 1/4" or less in width, No. 67 for sections of roadway where the average width of existing cracks are 1/4" to 5/8" in width and choose No. 5 for sections of roadway where the existing crack widths are greater than 5/8".

**ASPHALT PAVER - FIXED AND MOBILE STRING LINE:**

(10-21-03) (Rev. 1-17-12)

610

SP6 R06B

A mobile string line consisting of a 30 to 40 foot long ski is required for the widening and resurfacing on this project. A fixed string line is required for the new pavement construction on this project.

**ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES:**

(11-21-00) (Rev. 7-17-12)

609

SP6 R15

The approximate asphalt binder content of the asphalt concrete plant mixtures used on this project will be as follows:

Asphalt Concrete Base Course	Type B 25.0__	4.4%
Asphalt Concrete Intermediate Course	Type I 19.0__	4.8%
Asphalt Concrete Surface Course	Type S 4.75A	6.8%
Asphalt Concrete Surface Course	Type SA-1	6.8%
Asphalt Concrete Surface Course	Type SF 9.5A	6.7%
Asphalt Concrete Surface Course	Type S 9.5__	6.0%
Asphalt Concrete Surface Course	Type S 12.5__	5.6%

The actual asphalt binder content will be established during construction by the Engineer within the limits established in the *2012 Standard Specifications*.

**ASPHALT PLANT MIXTURES:**

(7-1-95)

609

SP6 R20

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

**FINAL SURFACE TESTING NOT REQUIRED:**

(5-18-04) (Rev. 5-15-12)

610

SP6 R45

Final surface testing is not required on this project.

**ASPHALT CONCRETE SURFACE COURSE COMPACTION:**

(7-1-95) (Rev. 8-21-12)

SP6 R49R

Compact the asphalt surface course on this project in accordance with Subarticle 610-9 of the *2012 Standard Specifications* and the following provision:

Perform the first rolling with a steel wheel roller followed by rolling with a self-propelled pneumatic tired roller with the final rolling by a steel wheel roller.

**MATERIALS:**

(2-21-12) (Rev. 5-20-14)

1000, 1002, 1005, 1024, 1050, 1056, 1074, 1078, 1080, 1081, 1086, 1084, 1087, 1092

SP10 R01

Revise the *2012 Standard Specifications* as follows:

**Page 10-1, Article 1000-1, DESCRIPTION, lines 9-10,** replace the last sentence of the first paragraph with the following:

Type IL, IP, IS or IT blended cement may be used instead of Portland cement.

**Page 10-1, Article 1000-1, DESCRIPTION, line 14,** add the following:

Use materials which do not produce a mottled appearance through rusting or other staining of the finished concrete surface.

**Page 10-5, Table 1000-1, REQUIREMENTS FOR CONCRETE,** replace with the following:

Class of Concrete	Min. Comp. Strength at 28 days	Maximum Water-Cement Ratio				Consistency Max. Slump		Cement Content			
		Air-Entrained Concrete		Non Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non-Vibrated	
		Rounded Aggregate	Angular Aggregate	Rounded Aggregate	Angular Aggregate			Min.	Max.	Min.	Max.
Units	psi					inch	inch	lb/cy	lb/cy	lb/cy	lb/cy
AA	4,500	0.381	0.426	-	-	3.5	-	639	715	-	-
AA Slip Form	4,500	0.381	0.426	-	-	1.5	-	639	715	-	-
Drilled Pier	4,500	-	-	0.450	0.450	-	5-7 dry 7-9 wet	-	-	640	800
A	3,000	0.488	0.532	0.550	0.594	3.5	4	564	-	602	-
B	2,500	0.488	0.567	0.559	0.630	2.5	4	508	-	545	-
B Slip Formed	2,500	0.488	0.567	-	-	1.5	-	508	-	-	-
Sand Light-weight	4,500	-	0.420	-	-	4	-	715	-	-	-
Latex Modified	3,000 7 day	0.400	0.400	-	-	6	-	658	-	-	-
Flowable Fill excavatable	150 max. at 56 days	as needed	as needed	as needed	as needed	-	Flowable	-	-	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	-	Flowable	-	-	100	as needed
Pavement	4,500 design, field 650 flexural, design only	0.559	0.559	-	-	1.5 slip form 3.0 hand place	-	526	-	-	-
Precast	See Table 1077-1	as needed	as needed	-	-	6	as needed	as needed	as needed	as needed	as needed
Prestress	per contract	See Table 1078-1	See Table 1078-1	-	-	8	-	564	as needed	-	-

**Page 10-1, Article 1000-2, MATERIALS, line 16; Page 10-8, Subarticle 1000-7(A), MATERIALS, line 8; and Page 10-18, Article 1002-2, MATERIALS, line 9,** add the following to the table of item references:

**Item****Section**

Type IL Blended Cement

1024-1

Page 10-23, Table 1005-1, AGGREGATE GRADATION-COARSE AGGREGATE, replace with the following:

TABLE 1005-1 AGGREGATE GRADATION - COARSE AGGREGATE													
Percentage of Total by Weight Passing													
Std. Size #	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#40	#200	Remarks
4	100	90-100	20-55	0-15	-	0-5	-	-	-	-	-	-	Asphalt Plant Mix
467M	100	95-100	-	35-70	-	0-30	0-5	-	-	-	-	-	Asphalt Plant Mix
5	-	100	90-100	20-55	0-10	0-5	-	-	-	-	-	-	AST, Sediment Control Stone
57	-	100	95-100	-	25-60	-	0-10	0-5	-	-	-	-	AST, Str. Concrete, Shoulder Drain, Sediment Control Stone
57M	-	100	95-100	-	25-45	-	0-10	0-5	-	-	-	-	AST, Concrete Pavement
6M	-	-	100	90-100	20-55	0-20	0-8	-	-	-	-	-	AST
67	-	-	100	90-100	-	20-55	0-10	0-5	-	-	-	-	AST, Str. Concrete, Asphalt Plant Mix
78M	-	-	-	100	98-100	75-100	20-45	0-15	-	-	-	-	Asphalt Plant Mix, AST, Str. Conc, Weep Hole Drains
14M	-	-	-	-	-	100	35-70	5-20	-	0-8	-	-	Asphalt Plant Mix, AST, Weep Hole Drains, Str. Concrete
9	-	-	-	-	-	100	85-100	10-40	-	0-10	-	-	AST
ABC	-	100	75-97	-	55-80	-	35-55	-	25-45	-	14-30	4-12 <sup>B</sup>	Aggregate Base Course, Aggregate Stabilization
ABC (M)	-	100	75-100	-	45-79	-	20-40	-	0-25	-	-	0-12 <sup>B</sup>	Maintenance Stabilization
Light-weight C	-	-	-	-	100	80-100	5-40	0-20	-	0-10	-	0-2.5	AST

- A. See Subarticle 1005-4(A).
- B. See Subarticle 1005-4(B).
- C. For Lightweight Aggregate used in Structural Concrete, see Subarticle 1014-2(E)(6).

Page 10-46, Article 1024-1, PORTLAND CEMENT, line 33, add the following as the ninth paragraph:

Use Type IL blended cement that meets AASHTO M 240, except that the limestone content is limited to between 5 and 12% by weight and the constituents shall be interground. Class F fly ash can replace a portion of Type IL blended cement and shall be replaced as outlined in Subarticle 1000-4(I) for Portland cement. For mixes that contain cement with alkali content between 0.6% and 1.0% and for mixes that contain a reactive aggregate documented by the Department, use a pozzolan in the amount shown in Table 1024-1.

**Page 10-65, Article 1050-1, GENERAL, line 41**, replace the first sentence with the following:

All fencing material and accessories shall meet Section 106.

**Page 10-73, Article 1056-1 DESCRIPTION, lines 7-8**, delete the first sentence of the second paragraph and replace with the following:

Use geotextile fabrics that are on the NCDOT Approved Products List.

**Page 10-73, Article 1056-2 HANDLING AND STORING, line 17**, replace “mechanically stabilized earth (MSE) wall faces” with “temporary wall faces”.

**Page 10-74, TABLE 1056-1 GEOTEXTILE REQUIREMENTS**, replace table with the following:

TABLE 1056-1 GEOTEXTILE REQUIREMENTS						
Property	Requirement (MARV <sup>A</sup> )					Test Method
	Type 1	Type 2	Type 3 <sup>B</sup>	Type 4	Type 5 <sup>C</sup>	
Typical Application	Shoulder Drains	Under Rip Rap	Temporary Silt Fence	Soil Stabilization	Temporary Walls	
Elongation (MD & CD)	≥ 50%	≥ 50%	≤ 25%	< 50%	< 50%	ASTM D4632
Grab Strength (MD & CD)	Table 1 <sup>D</sup> , Class 3	Table 1 <sup>D</sup> , Class 1	100 lb	Table 1 <sup>D</sup> , Class 3	-	ASTM D4632
Tear Strength (MD & CD)			-		-	ASTM D4533
Puncture Strength			-		-	ASTM D6241
Ultimate Tensile Strength (MD & CD)	-	-	-	-	2,400 lb/ft (unless required otherwise in the contract)	ASTM D4595
Permittivity	Table 2 <sup>D</sup> , 15% to 50% in Situ Soil Passing No. 200 <sup>E</sup>		Table 7 <sup>D</sup>	Table 5 <sup>D</sup>	0.20 sec <sup>-1</sup>	ASTM D4491
Apparent Opening Size					No. 30 <sup>E</sup>	ASTM D4751
UV Stability (Retained Strength)					70%	ASTM D4355

- A. MARV does not apply to elongation
- B. Minimum roll width of 36" required
- C. Minimum roll width of 13 ft required
- D. AASHTO M 288
- E. US Sieve No. per AASHTO M 92

**Page 10-115, Subarticle 1074-7(B), Gray Iron Castings, lines 10-11**, replace with the first two sentences with the following:

Supply gray iron castings meeting all facets of AASHTO M 306 excluding proof load. Proof load testing will only be required for new casting designs during the design process, and conformance to M306 loading (40,000 lbs.) will be required only when noted on the design documents.

Page 10-126, Table 1078-1, REQUIREMENTS FOR CONCRETE, replace with the following:

<b>TABLE 1078-1 REQUIREMENTS FOR CONCRETE</b>		
<b>Property</b>	<b>28 Day Design Compressive Strength 6,000 psi or less</b>	<b>28 Day Design Compressive Strength greater than 6,000 psi</b>
Maximum Water/Cementitious Material Ratio	0.45	0.40
Maximum Slump without HRWR	3.5"	3.5"
Maximum Slump with HRWR	8"	8"
Air Content (upon discharge into forms)	5 + 2%	5 + 2%

Page 10-151, Article 1080-4 Inspection and Sampling, lines 18-22, replace (B), (C) and (D) with the following:

- (B) At least 3 panels prepared as specified in 5.5.10 of AASHTO M 300, Bullet Hole Immersion Test.
- (C) At least 3 panels of 4"x6"x1/4" for the Elcometer Adhesion Pull Off Test, ASTM D4541.
- (D) A certified test report from an approved independent testing laboratory for the Salt Fog Resistance Test, Cyclic Weathering Resistance Test, and Bullet Hole Immersion Test as specified in AASHTO M 300.
- (E) A certified test report from an approved independent testing laboratory that the product has been tested for slip coefficient and meets AASHTO M253, Class B.

Page 10-161, Subarticle 1081-1(A) Classifications, lines 29-33, delete first 3 sentences of the description for Type 2 and replace with the following:

**Type 2** - A low-modulus, general-purpose adhesive used in epoxy mortar repairs. It may be used to patch spalled, cracked or broken concrete where vibration, shock or expansion and contraction are expected.

Page 10-162, Subarticle 1081-1(A) Classifications, lines 4-7, delete the second and third sentences of the description for Type 3A. Lines 16-22, delete Types 6A, 6B and 6C.

Page 10-162, Subarticle 1081-1(B) Requirements, lines 26-30, replace the second paragraph with the following:

For epoxy resin systems used for embedding dowel bars, threaded rods, rebar, anchor bolts and other fixtures in hardened concrete, the manufacturer shall submit test results showing that the bonding system will obtain 125% of the specified required yield strength of the fixture. Furnish certification that, for the particular bolt grade, diameter and embedment depth required, the anchor system will not fail by adhesive failure and that there is no movement of the anchor bolt. For certification and anchorage, use 3,000 psi as the minimum Portland cement concrete compressive strength used in this test. Use adhesives that meet Section 1081.

List the properties of the adhesive on the container and include density, minimum and maximum temperature application, setting time, shelf life, pot life, shear strength and compressive strength.

Page 10-163, Table 1081-1 Properties of Mixed Epoxy Resin Systems, replace table with the following:

TABLE 1081-1 PROPERTIES OF MIXED EPOXY RESIN SYSTEMS							
Property	Type 1	Type 2	Type 3	Type 3A	Type 4A	Type 4B	Type 5
Viscosity-Poises at 77°F ± 2°F	Gel	10-30	25-75	Gel	40-150	40-150	1-6
Spindle No.	-	3	4	--	4	4	2
Speed (RPM)	-	20	20	--	10	10	50
Pot Life (Minutes)	20-50	30-60	20-50	5-50	40-80	40-80	20-60
Minimum Tensile Strength at 7 days (psi)	1,500	2,000	4,000	4,000	1,500	1,500	4,000
Tensile Elongation at 7 days (%)	30 min.	30 min.	2-5	2-5	5-15	5-15	2-5
Min. Compressive Strength of 2" mortar cubes at 24 hours	3,000 (Neat)	4,000-	6,000-	6,000 (Neat)	3,000	3,000	6,000
Min. Compressive Strength of 2" mortar cubes at 7 days	5,000 (Neat)	-	-	-	-	5,000	-
Maximum Water Absorption (%)	1.5	1.0	1.0	1.5	1.0	1.0	1.0
Min. Bond Strength Slant Shear Test at 14 days (psi)	1,500	1,500	2,000	2,000	1,500	1,500	1,500

Page 10-164, Subarticle 1081-1(E) Prequalification, lines 31-33, replace the second sentence of the first paragraph with the following:

Manufacturers choosing to supply material for Department jobs must submit an application through the Value Management Unit with the following information for each type and brand name:

Page 10-164, Subarticle 1081-1(E)(3), line 37, replace this subarticle with the following:

(3) Type of the material in accordance with Articles 1081-1 and 1081-4,



**Page 10-165, Subarticle 1081-1(E)(6), line 1**, in the first sentence of the first paragraph replace “AASHTO M 237” with “the specifications”.

**Page 10-165, Subarticle 1081-1(E) Prequalification, line 9-10**, delete the second sentence of the last paragraph.

**Page 10-165, Subarticle 1081-1(F) Acceptance, line 14**, in the first sentence of the first paragraph replace “Type 1” with “Type 3”.

**Page 10-169, Subarticle 1081-3(G) Anchor Bolt Adhesives**, delete this subarticle.

**Page 10-170, Article 1081-3 Hot Bitumen, line 9**, add the following at the end of Section 1081:

#### **1081-4 EPOXY RESIN ADHESIVE FOR BONDING TRAFFIC MARKINGS**

##### **(A) General**

This section covers epoxy resin adhesive for bonding traffic markers to pavement surfaces.

##### **(B) Classification**

The types of epoxies and their uses are as shown below:

**Type I** – Rapid Setting, High Viscosity, Epoxy Adhesive. This type of adhesive provides rapid adherence to traffic markers to the surface of pavement.

**Type II** – Standard Setting, High Viscosity, Epoxy Adhesive. This type of adhesive is recommended for adherence of traffic markers to pavement surfaces when rapid set is not required.

**Type III** – Rapid Setting, Low Viscosity, Water Resistant, Epoxy Adhesive. This type of rapid setting adhesive, due to its low viscosity, is appropriate only for use with embedded traffic markers.

**Type IV** – Standard Set Epoxy for Blade Deflecting-Type Plowable Markers.

##### **(C) Requirements**

Epoxies shall conform to the requirements set forth in AASHTO M 237.

##### **(D) Prequalification**

Refer to Subarticle 1081-1(E).

##### **(E) Acceptance**

Refer to Subarticle 1081-1(F).

**Page 10-173, Article 1084-2 STEEL SHEET PILES, lines 37-38**, replace first paragraph with the following:

Steel sheet piles detailed for permanent applications shall be hot rolled and meet ASTM A572 or ASTM A690 unless otherwise required by the plans. Steel sheet piles shall be coated as required by the plans. Galvanized sheet piles shall be coated in accordance with Section 1076.

Metallized sheet piles shall be metallized in accordance to the Project Special Provision “Thermal Sprayed Coatings (Metallization)” with an 8 mil, 99.9% aluminum alloy coating and a 0.5 mil seal coating. Any portion of the metallized sheet piling encased in concrete shall

receive a barrier coat. The barrier coat shall be an approved waterborne coating with a low-viscosity which readily absorbs into the pores of the aluminum thermal sprayed coating. The waterborne coating shall be applied at a spreading rate that results in a theoretical 1.5 mil dry film thickness. The manufacturer shall issue a letter of certification that the resin chemistry of the waterborne coating is compatible with the 99.9% aluminum thermal sprayed alloy and suitable for tidal water applications.

**Page 10-174, Subarticle 1086-1(B)(1) Epoxy, lines 18-24**, replace this subarticle with the following:

The epoxy shall meet Article 1081-4.

The 2 types of epoxy adhesive which may be used are Type I, Rapid Setting, and Type II, Standard Setting. Use Type II when the pavement temperature is above 60°F or per the manufacturer's recommendations whichever is more stringent. Use Type I when the pavement temperature is between 50°F and 60°F or per the manufacturer's recommendations whichever is more stringent. Epoxy adhesive Type I, Cold Set, may be used to attach temporary pavement markers to the pavement surface when the pavement temperature is between 32°F and 50°F or per the manufacturer's recommendations whichever is more stringent.

**Page 10-175, Subarticle 1086-2(E) Epoxy Adhesives, line 27**, replace "Section 1081" with "Article 1081-4".

**Page 10-177, Subarticle 1086-3(E) Epoxy Adhesives, line 22**, replace "Section 1081" with "Article 1081-4".

**Page 10-179, Subarticle 1087-4(A) Composition, lines 39-41**, replace the third paragraph with the following:

All intermixed and drop-on glass beads shall not contain more than 75 ppm arsenic or 200 ppm lead.

**Page 10-180, Subarticle 1087-4(B) Physical Characteristics, line 8**, replace the second paragraph with the following:

All intermixed and drop-on glass beads shall comply with NCGS § 136-30.2 and 23 USC § 109(r).

**Page 10-181, Subarticle 1087-7(A) Intermixed and Drop-on Glass Beads, line 24**, add the following after the first paragraph:

Use X-ray Fluorescence for the normal sampling procedure for intermixed and drop-on beads, without crushing, to check for any levels of arsenic and lead. If any arsenic or lead is detected, the sample shall be crushed and repeat the test using X-ray Fluorescence. If the X-ray Fluorescence test shows more than a LOD of 5 ppm, test the beads using United States Environmental Protection Agency Method 6010B, 6010C or 3052 for no more than 75 ppm arsenic or 200 ppm lead.

**Page 10-204, Subarticle 1092-2(A) Performance and Test Requirements**, replace **Table 1092-3 Minimum Coefficient of Retroreflection for NC Grade A** with the following:

TABLE 1092-3 MINIMUM COEFFICIENT OF RETROREFLECTION FOR NC GRADE A (Candelas Per Lux Per Square Meter)								
Observation Angle, degrees	Entrance Angle, degrees	White	Yellow	Green	Red	Blue	Fluorescent Yellow Green	Fluorescent Yellow
0.2	-4.0	525	395	52	95	30	420	315
0.2	30.0	215	162	22	43	10	170	130
0.5	-4.0	310	230	31	56	18	245	185
0.5	30.0	135	100	14	27	6	110	81
1.0	-4.0	<b>120</b>	60	8	16	3.6	64	48
1.0	30.0	45	34	4.5	9	2	36	27

### **EROSION AND STORMWATER CONTROL FOR SHOULDER CONSTRUCTION AND RECONSTRUCTION:**

(11-16-10) (Rev. 8-21-12)

105-16, 225-2, Division 16

SP16 R03R

Land disturbing operations associated with shoulder construction/reconstruction may require erosion and sediment control/stormwater measure installation. National Pollutant Discharge Elimination System (NPDES) inspection and reporting may be required.

Erosion control measures shall be installed per the erosion control detail in any area where the vegetated buffer between the disturbed area and surface waters (streams, wetlands, or open waters) or drainage inlet is less than 10 feet. The Engineer may reduce the vegetated buffer threshold for this requirement to a value between 5 and 10 feet. Erosion control measures shall be spot checked every 14 days until permanent vegetative establishment.

In areas where shoulder construction/reconstruction includes disturbance or grading on the front slope or to the toe of fill, relocating ditch line or backslope, or removing vegetation from the ditch line or swale, NPDES inspection and monitoring are required every 14 days or within 24 hours of a rainfall event of 0.5" or greater. Maintain daily rainfall records. Install erosion control measures per detail.

In areas where the vegetated buffer is less than 10 feet between the disturbed area and waters of the State classified as High Quality Water (HQW), Outstanding Resource Water (ORW), Critical Areas, or Unique Wetlands, NPDES inspection and monitoring are required every 14 days or within 24 hours of a rainfall event of 0.5" or greater. The Engineer may reduce the vegetated buffer threshold for this requirement to a value between 5 and 10 feet. The plans or provisions will indicate the presence of these water classifications. Maintain daily rainfall records. Install erosion control measures per detail.

Land disturbances hardened with aggregate materials receiving sheet flow are considered non-erodible.

Sites that require lengthy sections of silt fence may substitute with rapid permanent seeding and mulching as directed by the Engineer.

NPDES documentation shall be performed by a Level II Erosion and Sediment Control/Stormwater certificate holder.

Materials used for erosion control will be measured and paid as stated in the contract.

## STANDARD SPECIAL PROVISIONS

### 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(E) of the *2012 Standard Specifications*.

### CONTRACT PAYMENT AND PERFORMANCE BOND – GENERAL:

REVISED 5/27/14

A performance bond in the amount of one hundred percent (100%) of the contract amount, conditioned upon the faithful performance of the contract in accordance with specifications and conditions of the contract is required on this project if the contract amount exceeds \$500,000. Such bond shall be solely for the protection of the North Carolina Department of Transportation and the State of North Carolina.

A payment bond in the amount of one hundred percent (100%) of the contract amount, conditioned upon the prompt payment for all labor or materials for which the Contractor, or subcontractor, is liable is required on this project if the contract amount exceeds \$500,000. The payment bond shall be solely for the protection of persons or firms furnishing materials or performing labor for this contract for which the Contractor is liable.

The successful bidder, within **fourteen (14) days** after notice of award, shall provide the Department with a contract payment bond and a contract performance bond each in an amount equal to one hundred percent (100%) of the amount of the contract.

### BIDS:

In accordance with GS 136-28.1(b), if the total bid amount of the contract exceeds \$2.5 million, the bid will not be considered for award.

**DIVISION LET CONTRACT PREQUALIFICATION:**

(07-01-14)

SPD 01-410

Any firm that wishes to bid as a prime contractor shall be prequalified as a Bidder or PO Prime Contractor prior to submitting a bid. Information regarding prequalification can be found at: <https://connect.ncdot.gov/business/Prequal/Pages/default.aspx>.

**SAFETY VESTS:**

*All Contractors' personnel, all subcontractors and their personnel, and any material suppliers and their personnel must wear an OSHA approved reflective vest or outer garment at all times while on the project.*

**CONTRACTOR CLAIM SUBMITTAL FORM:**

If the Contractor elects to file a written claim or requests an extension of contract time, it shall be submitted on the *Contractor Claim Submittal Form (CCSF)* available through the Construction Unit or [http://ncdot.org/doh/operations/dp\\_chief\\_eng/constructionunit/formsmanuals/](http://ncdot.org/doh/operations/dp_chief_eng/constructionunit/formsmanuals/)

**DRIVEWAYS AND PRIVATE PROPERTY**

The Contractor shall maintain access to driveways for all residents and property owners throughout the life of the project.

The Contractor shall not perform work for private citizens or agencies in conjunction with this project or within the project limits of this contract. Any driveway paved by a Contractor which ties into a NCDOT system road being paved by the Contractor must be paved either prior to the road paving project or after its completion.

**NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY:**

(5-17-11)

Z-3

Seed shall be sampled and tested by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory. When said samples are collected, the vendor shall supply an independent laboratory report for each lot to be tested. Results from seed so sampled shall be final. Seed not meeting the specifications shall be rejected by the Department of Transportation and shall not be delivered to North Carolina Department of Transportation warehouses. If seed has been delivered it shall be available for pickup and replacement at the supplier's expense.

Any re-labeling required by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory, that would cause the label to reflect as otherwise specified herein shall be rejected by the North Carolina Department of Transportation.

Seed shall be free from seeds of the noxious weeds Johnsongrass, Balloonvine, Jimsonweed, Witchweed, Itchgrass, Serrated Tussock, Showy Crotalaria, Smooth Crotalaria, Sicklepod, Sandbur, Wild Onion, and Wild Garlic. Seed shall not be labeled with the above weed species on the seed analysis label. Tolerances as applied by the Association of Official Seed Analysts will NOT be allowed for the above noxious weeds except for Wild Onion and Wild Garlic.

Tolerances established by the Association of Official Seed Analysts will generally be recognized. However, for the purpose of figuring pure live seed, the found pure seed and found germination percentages as reported by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory will be used. Allowances, as established by the NCDOT, will be recognized for minimum pure live seed as listed on the following pages.

The specifications for restricted noxious weed seed refers to the number per pound as follows:

<u>Restricted Noxious Weed</u>	<u>Limitations per Lb. Of Seed</u>	<u>Restricted Noxious Weed</u>	<u>Limitations per Lb. of Seed</u>
Blessed Thistle	4 seeds	Cornflower (Ragged Robin)	27 seeds
Cocklebur	4 seeds	Texas Panicum	27 seeds
Spurred Anoda	4 seeds	Bracted Plantain	54 seeds
Velvetleaf	4 seeds	Buckhorn Plantain	54 seeds
Morning-glory	8 seeds	Broadleaf Dock	54 seeds
Corn Cockle	10 seeds	Curly Dock	54 seeds
Wild Radish	12 seeds	Dodder	54 seeds
Purple Nutsedge	27 seeds	Giant Foxtail	54 seeds
Yellow Nutsedge	27 seeds	Horsenettle	54 seeds
Canada Thistle	27 seeds	Quackgrass	54 seeds
Field Bindweed	27 seeds	Wild Mustard	54 seeds
Hedge Bindweed	27 seeds		

Seed of Pensacola Bahiagrass shall not contain more than 7% inert matter, Kentucky Bluegrass, Centipede and Fine or Hard Fescue shall not contain more than 5% inert matter whereas a maximum of 2% inert matter will be allowed on all other kinds of seed. In addition, all seed shall not contain more than 2% other crop seed nor more than 1% total weed seed. The germination rate as tested by the North Carolina Department of Agriculture shall not fall below 70%, which includes both dormant and hard seed. Seed shall be labeled with not more than 7%, 5% or 2% inert matter (according to above specifications), 2% other crop seed and 1% total weed seed.

Exceptions may be made for minimum pure live seed allowances when cases of seed variety shortages are verified. Pure live seed percentages will be applied in a verified shortage situation. Those purchase orders of deficient seed lots will be credited with the percentage that the seed is deficient.

#### FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

Minimum 85% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 83% pure live seed will not be approved.

Sericea Lespedeza  
Oats (seeds)

Minimum 80% pure live seed; maximum 1% total weed seed; maximum 2% total other crop; maximum 144 restricted noxious weed seed per pound. Seed less than 78% pure live seed will not be approved.

Tall Fescue (all approved varieties)  
Kobe Lespedeza  
Korean Lespedeza  
Weeping Lovegrass  
Carpetgrass

Bermudagrass  
Browntop Millet  
German Millet – Strain R  
Clover – Red/White/Crimson

Minimum 78% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 76% pure live seed will not be approved.

Common or Sweet Sundangrass

Minimum 76% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 74% pure live seed will not be approved.

Rye (grain; all varieties)  
Kentucky Bluegrass (all approved varieties)  
Hard Fescue (all approved varieties)  
Shrub (bicolor) Lespedeza

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 noxious weed seed per pound. Seed less than 70% pure live seed will not be approved.

Centipedegrass  
Crownvetch  
Pensacola Bahiagrass  
Creeping Red Fescue

Japanese Millet  
Reed Canary Grass  
Zoysia

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 5% inert matter; maximum 144 restricted noxious weed seed per pound.

Barnyard Grass  
Big Bluestem  
Little Bluestem  
Bristly Locust  
Birdsfoot Trefoil  
Indiangrass  
Orchardgrass  
Switchgrass  
Yellow Blossom Sweet Clover

**ERRATA:**

(1-17-12) (Rev. 11-18-14)

Z-4

Revise the *2012 Standard Specifications* as follows:

**Division 2**

**Page 2-7, line 31, Article 215-2 Construction Methods**, replace “Article 107-26” with “Article 107-25”.

**Page 2-17, Article 226-3, Measurement and Payment, line 2**, delete “pipe culverts.”.

**Page 2-20, Subarticle 230-4(B), Contractor Furnished Sources, change references as follows:** **Line 1**, replace “(4) Buffer Zone” with “(c) Buffer Zone”; **Line 12**, replace “(5) Evaluation for Potential Wetlands and Endangered Species” with “(d) Evaluation for Potential Wetlands and Endangered Species”; and **Line 33**, replace “(6) Approval” with “(4) Approval”.

**Division 3**

**Page 3-1, after line 15, Article 300-2 Materials**, replace “1032-9(F)” with “1032-6(F)”.

**Division 4**

**Page 4-77, line 27, Subarticle 452-3(C) Concrete Coping**, replace “sheet pile” with “reinforcement”.

**Division 6**

**Page 6-7, line 31, Article 609-3 Field Verification of Mixture and Job Mix Formula Adjustments**, replace “30” with “45”.

**Page 6-10, line 42, Subarticle 609-6(C)(2)**, replace “Subarticle 609-6(E)” with “Subarticle 609-6(D)”.

**Page 6-11, Table 609-1 Control Limits**, replace “Max. Spec. Limit” for the Target Source of  $P_{0.075}/P_{be}$  Ratio with “1.0”.

**Page 6-40, Article 650-2 Materials**, replace “Subarticle 1012-1(F)” with “Subarticle 1012-1(E)”

**Division 8**

**Page 8-23, line 10, Article 838-2 Materials**, replace “Portland Cement Concrete, Class B” with “Portland Cement Concrete, Class A”.

**Division 10**

**Page 10-166, Article 1081-3 Hot Bitumen**, replace “Table 1081-16” with “Table 1081-2”, replace “Table 1081-17” with “Table 1081-3”, and replace “Table 1081-18” with “Table 1081-4”.

**Division 12**

**Page 12-7, Table 1205-3**, add “FOR THERMOPLASTIC” to the end of the title.

**Page 12-8, Subarticle 1205-5(B), line 13**, replace “Table 1205-2” with “Table 1205-4”.

**Page 12-8, Table 1205-4 and 1205-5**, replace “THERMOPLASTIC” in the title of these tables with “POLYUREA”.

**Page 12-9, Subarticle 1205-6(B), line 21**, replace “Table 1205-4” with “Table 1205-6”.

**Page 12-11, Subarticle 1205-8(C), line 25**, replace “Table 1205-5” with “Table 1205-7”.



**Division 15**

**Page 15-4, Subarticle 1505-3(F) Backfilling, line 26**, replace “Subarticle 235-4(C)” with “Subarticle 235-3(C)”.

**Page 15-6, Subarticle 1510-3(B), after line 21**, replace the allowable leakage formula with the following:  $W = LD\sqrt{P} \div 148,000$

**Page 15-6, Subarticle 1510-3(B), line 32**, delete “may be performed concurrently or” and replace with “shall be performed”.

**Page 15-17, Subarticle 1540-3(E), line 27**, delete “Type 1”.

**Division 17**

**Page 17-26, line 42, Subarticle 1731-3(D) Termination and Splicing within Interconnect Center**, delete this subarticle.

Revise the *2012 Roadway Standard Drawings* as follows:

**1633.01 Sheet 1 of 1, English Standard Drawing for Matting Installation**, replace “1633.01” with “1631.01”.

**PLANT AND PEST QUARANTINES:**

**(Imported Fire Ant, Gypsy Moth, Witchweed, And Other Noxious Weeds)**

(3-18-03) (Rev. 10-15-13)

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, 919-733-6932, or <http://www.ncagr.gov/plantind/> 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 or other noxious weeds.

**AWARD OF CONTRACT:**

(6-28-77)

Z-6

“The North Carolina Department of Transportation, in accordance with the provisions of *Title VI of the Civil Rights Act of 1964* (78 Stat. 252) and the Regulations of the Department of Transportation (*49 C.F.R., Part 21*), issued pursuant to such act, hereby notifies all bidders that it will affirmatively insure that the contract entered into pursuant to this advertisement will be awarded to the lowest responsible bidder without discrimination on the ground of race, color, or national origin”.

**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 or 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 AreasArea 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

Goals for FemaleParticipation in Each Trade

(Statewide) 6.9%

REQUIRED CONTRACT PROVISIONS FEDERAL - AID CONSTRUCTION CONTRACTS

FHWA - 1273 Electronic Version - May 1, 2012

Z-8

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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 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).
- 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.

### **ON-THE-JOB TRAINING:**

(10-16-07) (Rev. 5-21-13)

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. A sample agreement is available at [www.ncbowd.com/section/on-the-job-training](http://www.ncbowd.com/section/on-the-job-training).

### 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.

## **GENERAL DECISION NUMBER: NC140026 01/03/2014 NC26**

Date: January 3, 2014

Superseded General Decision Number: NC20130026

State: North Carolina

Construction Type: BUILDING

**COUNTIES:**

Currituck

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Modification Number  
0

Publication Date  
01/03/2014

\* IRON0079-011 05/01/2013

	Rates	Fringes
IRONWORKER, STRUCTURAL	24.04	10%+11.25
PLUM0421-003 07/01/2013		
PIPEFITTER	24.85	9.65
SUNC2011-007 08/24/2011		
BRICKLAYER	19.00	
CARPENTER (Drywall Hanging Only)	13.83	
CARPENTER (Form Work Only)	13.38	1.80
CARPENTER, Excludes Drywall Hanging, and Form Work	16.39	4.26
CEMENT MASON/CONCRETE FINISHER	15.80	
ELECTRICIAN	20.64	6.68
HVAC MECHANIC (HVAC Duct Installation Only)	17.37	1.82
LABORER: Common or General	10.46	0.77
Landscape	9.13	0.28
Pipelayer	13.35	2.80
Mason Tender-Brick/Cement/Concrete	12.00	
OPERATOR: Backhoe/Excavator/Trackhoe	18.47	2.41
Bulldozer	16.00	1.87
Crane	19.77	4.48
Forklift	13.86	
Grader/Blade	15.72	1.49
Loader	16.17	0.25
PAINTER: Brush, Roller and Spray	12.35	
PLUMBER	18.48	3.93
ROOFER	11.75	1.06



	Rates	Fringes
SHEET METAL WORKER, Excludes HVAC Duct Installation	15.81	1.40
TRUCK DRIVER	13.38	1.48

Welders – Receive rate prescribed for craft performing operation to which welding is incidental.

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 union or non-union.

#### Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters, PLUM, indicate the international union and the four-digit number, 0198, that follows 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. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

#### Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

#### 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

PROJECT TECHNICAL MANUAL

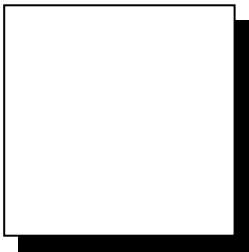
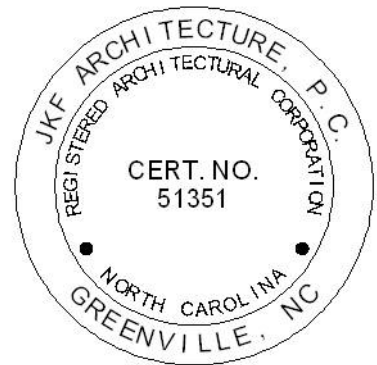
# NC DEPARTMENT OF TRANSPORTATION CURRITUCK WELCOME CENTER

Currituck, NC

SCO ID #120956301 ;CODE; 84210 ;ITEM; 7826

JKF Project No. 2013-04

June 26, 2013



P.O. Box 20662  
Greenville, NC 27858  
252-355-1068 Phone  
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jkf@jkf-arch.com

# Geotechnical Engineering Report

Proposed Currituck County Welcome Center

Courthouse Road

Currituck, North Carolina

May 8, 2013

Project No. 72135013

**Prepared for:**

NC Department of Transportation  
Raleigh, North Carolina

**Prepared by:**

Terracon Consultants, Inc.  
Winterville, North Carolina

Offices Nationwide  
Employee-Owned

Established in 1965  
[terracon.com](http://terracon.com)

**Terracon**

May 8, 2013



NC Department of Transportation  
Facilities Management Division  
1525 Mail Service Center  
Raleigh, North Carolina 27699-1525

Attn: Ms. Priscilla Tyree Williams, PE  
Director – Facilities Management Division

RE: Geotechnical Engineering Report  
Proposed Currituck Welcome Center  
Courthouse Road  
Currituck, North Carolina  
Terracon Project No. 72135013

Dear Ms. Williams:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal 72130099, dated April 2, 2013. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design of foundations and pavements for the proposed retail facility.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,

**Terracon Consultants, Inc.**

Carl F. Bonner, PE  
Principal / Office Manager  
Registered, NC 16252

Barney C. Hale, PE  
Senior Geotechnical Engineer

Enclosures

Terracon Consultants, Inc. 314 Beacon Drive Winterville, North Carolina 28590  
P [252] 353 1600 F [252] 353 0002 Terracon.com NC Registration Number F-0869



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### APPENDIX A – FIELD EXPLORATION

Exhibit A-1	Site Location Plan
Exhibit A-2	Boring Location Plan
Exhibit A-3	Field Exploration Description
Exhibits A-4 thru A-9	Boring Logs

### APPENDIX B – LABORATORY TESTING

Exhibit B-1	Laboratory Testing Explanation
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### APPENDIX C – SUPPORTING DOCUMENTS

Exhibit C-1	General Notes
Exhibit C-2	Unified Soil Classification
Exhibit C-3	Report of a Soil Evaluation for Stormwater Treatment

## EXECUTIVE SUMMARY

The following items represent a brief summary of the findings of our subsurface exploration, our conclusions and recommendations for the proposed welcome center to be located on Courthouse Road in Currituck, North Carolina.

- The proposed welcome center will consist of an approximately 4,000 square foot, single-story building. The proposed structure will be metal or wood framed with isolated steel interior columns on shallow foundations and a concrete slab-on-grade. An asphalt parking lot is associated with the project.
- At the time of our site exploration, the site for the proposed building and parking lot was partially a gravel parking lot and partially grassed. A shallow swale extended through the proposed building footprint.
- Native deposits of silty sand, poorly graded sand and clayey sand were encountered in the borings.
- The primary geotechnical considerations at the site are the areas of very loose to loose sand encountered within 6 feet of the ground surface. After the site is stripped, the subgrade soils in the building and parking lot footprints should be compacted using a vibratory roller. After the vibratory rolling, a thorough proofrolling should be performed to detect areas of unsuitable soil that may need to be overexcavated and replaced.
- Performing earthwork operations during warmer periods of the year (May through October) will reduce the potential for problems associated with unstable subgrades. Site drying conditions are typically enhanced when it is warm. The moisture sensitivity of the on-site soils does not preclude performing earthwork at other times of the year, but does lead to an increased potential for having to perform overexcavation and replacement or some other form of remedial work.
- Support of the proposed structure on conventional shallow foundations is recommended after vibratory compaction. We recommend that the building be designed as a monolithic slab with thickened sections for columns and load bearing walls. The use of isolated column and wall footings without raising site grades could require undercutting and replacement of footing soils. Foundations are expected to bear on approved native soils or the new engineered fill compacted to the recommendations given herein. Foundations bearing on these suitable materials could be designed using a maximum net allowable soil bearing pressure of 1,500 psf.
- Existing subgrade soils should be observed and tested by proofrolling to evaluate the suitability of this material for support of the floor slab and pavements and be corrected as necessary, as described in the following report. Unsuitable soils should be removed if they cannot be satisfactorily recompacted. We recommend Terracon be retained to observe and test the foundation bearing materials and as well as other construction materials at the site.

This summary should be used in conjunction with the entire report for design purposes. Details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of report limitations.

**Responsive ■ Resourceful ■ Reliable**

**GEOTECHNICAL ENGINEERING REPORT  
PROPOSED WELCOME CENTER  
CURRITUCK, NORTH CAROLINA**

Terracon Project No. 72135013

May 8, 2013

## 1.0 INTRODUCTION

We have completed the geotechnical engineering report for the proposed welcome center to be located on Courthouse Road in Currituck, North Carolina. Six borings were performed to depths of approximately 5 to 20 feet below the existing ground surface at the requested locations. Logs of the borings along with a site location plan and a boring location plan are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- earthwork
- pavements
- foundation design and construction
- seismic considerations
- floor slab design and construction

## 2.0 PROJECT INFORMATION

### 2.1 Project Description

ITEM	DESCRIPTION
<b>Site Location</b>	See Appendix A, Exhibit A-1, Site Location Plan
<b>Site layout</b>	See Appendix A, Exhibit A-2, Boring Location Plan
<b>Structure</b>	Single-story, approximately 4,000 square foot, welcome center with associated parking lots and driveways.
<b>Building Construction</b>	Wood or metal framed with isolated interior columns supported on shallow foundations with a concrete slab-on-grade floor.
<b>Maximum loads</b>	Columns: 20 kips (assumed) Walls: 2klf (assumed) Slabs: 100 psf max (assumed)
<b>Finished floor elevation</b>	6.0 feet.
<b>Grading</b>	Up to 2 feet of fill.
<b>Retaining walls</b>	None anticipated.



ITEM	DESCRIPTION
Below grade levels	None anticipated.

## 2.2 Site Location and Description

ITEM	DESCRIPTION
Location	The proposed welcome center is to be located on Courthouse Road in Currituck, North Carolina.
Existing improvements	A portion of the site is a gravel parking lot, the remainder undeveloped.
Current ground cover	Gravel and grass.
Existing topography	Relatively level, slopes towards the east. A shallow swale crosses the site.

## 3.0 SUBSURFACE CONDITIONS

### 3.1 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Description	Approximate Depth to Bottom of Stratum (feet)	Material Encountered	Consistency/Density
Surface	0.5	Gravel or Grassed/Topsoil/Rootmat	N/A
Stratum 1	20	Poorly Graded Sand (SP), Silty Sand (SM), Clayey Sand (SC)	Very Loose to Medium Dense

Laboratory tests for water content, Atterberg limits, and grain size were conducted on selected soil samples and the test results are presented in the appendix of this report and in the following table:

Boring Number	Sample Depth (feet)	Liquid Limit (%)	Plasticity Index (%)	#200 Wash (%)	Natural Moisture (%)	Organic Content (%)
B-1	3.5 – 5	34	5	38	29	6
B-2	3.5 – 5	--	--	27	17	--
B-3	3.5 – 5	--	--	16	22	--

Conditions encountered at the boring locations are indicated on the boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. For a comprehensive description of the conditions encountered in the borings, refer to the boring logs in Appendix A of this report.

### **3.2 Groundwater**

Mud rotary drilling techniques were used to advance the borings. The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater was observed at a depth of approximately 2 to 3 feet in the borings while drilling. The moisture condition of the soil samples supported this groundwater level.

The groundwater level can rise due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Terracon subcontracted a soil scientist to perform a soil evaluation for stormwater treatment for this project. Based on this testing, the seasonal high groundwater level was determined to be at or near the surface at the first test location, at a depth of around 32 inches at the second test location and at a depth of approximately 17 inches in the third test location. Saturated soils were encountered at a depth of approximately 20 inches at the first test location at the time of the investigation. Note that the site gently slopes towards the road and sound and the depth to groundwater and seasonal high water table is reflected in the surface elevation changes.

A tested infiltration rate of 0.55 inches per hour was documented at the second test location. An estimated infiltration rate of at least 1 inch per hour was noted for the third test location. The soil evaluation for stormwater treatment report is attached with this report. These values are based on the existing condition of the existing soils.

### **3.3 Site Geology**

The subject site is located in the Coastal Plain Physiographic Province. The Coastal Plain soils consist mainly of marine sediments that were deposited during successive periods of fluctuating sea level and moving shoreline. The soils include sands, silts, and clays with irregular deposits of shells, which are typical of those lain down in a shallow sloping sea bottom. Recent alluvial sands, silts, and clays are typically present near rivers and creeks. According to the *1985 Geologic Map of North Carolina*, the site is mapped within the Surficial Deposits Formation.

## 4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

### 4.1 Geotechnical Considerations

The primary geotechnical considerations at the site are the areas of very loose to loose sand encountered within 6 feet of the ground surface. After the site is stripped, the subgrade soils in the building and parking lot footprints should be compacted using a vibratory roller. After the vibratory rolling, a thorough proofrolling should be performed to detect areas of unsuitable soil that may need to be overexcavated and replaced.

Performing earthwork operations during warmer periods of the year (May through October) will reduce the potential for problems associated with unstable subgrades. Site drying conditions are typically enhanced when it is warm. The moisture sensitivity of the on-site soils does not preclude performing earthwork at other times of the year, but does lead to an increased potential for having to perform overexcavation and replacement or some other form of remedial work.

Support of the proposed structure on conventional shallow foundations is recommended after vibratory compaction. We recommend that the building be designed as a monolithic slab with thickened sections for columns and load bearing walls. The use of isolated column and wall footings without raising site grades could require undercutting and replacement of footing soils. Foundations are expected to bear on approved native soils or the new engineered fill compacted to the recommendations given herein. Foundations bearing on these suitable materials could be designed using a maximum net allowable soil bearing pressure of 1,500 psf.

Protecting the exposed subgrade soils from infiltration of surface water by keeping the site grades sloped to promote runoff in advance of rain events will also reduce the potential for needing to perform remedial work on wet subgrades. Should unstable subgrade conditions develop, stabilization measures should be employed.

A more complete discussion of these points and additional information is included in the following sections.

### 4.2 Earthwork

Site preparation should begin with the complete removal of the surface vegetation and topsoil. The gravel in the parking lot can remain if it does not interfere with site grades.

Based on the boring information, topsoil and rootmat at the ground surface should be stripped to a depth of approximately 6 inches. However, surface stripping depths may vary between borings and a Terracon representative should field verify the stripping depth during construction. Topsoil may be re-used in areas of the site to be landscaped. Topsoil should not be used as structural fill or backfill.

After stripping, the exposed subgrade soils in the building and parking lot footprints will be disturbed and should be densified in place using a medium weight vibratory roller. The purpose of the vibratory rolling is to improve the exposed subgrade soils for floor slab and pavement support and to potentially improve the foundation bearing soils. The roller should make at least 6 passes across the site, with the second set of 3 passes perpendicular to the first set of 3 passes. If water is brought to the surface by the vibratory rolling, the operation should be discontinued until the water subsides and the rolling should be continued in the static mode.

After the vibratory rolling, pore pressures should be allowed to dissipate for a minimum of four hours. After the waiting period, proofrolling should be performed on the exposed subgrade soils in areas to receive fill or at the subgrade elevation in cut areas with a moderately loaded, tandem-axle dump truck or similar rubber-tired construction equipment. Proofrolling is recommended as a means of detecting areas of soft or unstable subgrade soils. The proofrolling should be performed during a period of dry weather to avoid degrading an otherwise suitable subgrade. The proofrolling operations should be observed by a representative of the geotechnical engineer. Subgrade soils that exhibit excessive rutting or deflection during proofrolling should be overexcavated as directed by the representative and replaced with properly compacted fill.

Engineered fill should meet the following material property requirements:

Fill Type <sup>1</sup>	USCS Classification	Acceptable Location for Placement
Imported Granular Soil	SP, SM or SC	All locations and elevations

1. Controlled, compacted fill should consist of approved materials that are free of organic matter and debris. A sample of each material type should be submitted to the geotechnical engineer for evaluation.

#### 4.2.1 Compaction Requirements

We recommend that the fill be placed as recommended in the following table.

ITEM	DESCRIPTION
<b>Fill Lift Thickness</b>	9-inches or less in loose thickness (4" to 6" lifts when hand-operated equipment is used)
<b>Compaction Requirements</b> <sup>1</sup>	Compact to a minimum of 95% of the materials standard Proctor maximum dry density (ASTM D 698)
<b>Moisture Content – Structural Fill</b>	Within the range of -2% to +2% of optimum moisture content as determined by the standard Proctor test at the time of placement and compaction

1. Engineered fill should be tested for moisture content and compaction during placement. If in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the tests should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

#### 4.2.2 Grading and Drainage

During construction, grades should be sloped to promote runoff away from the construction area. Final surrounding grades should be sloped away from the structures on all sides to prevent ponding of water. If gutters / downspouts do not discharge directly onto pavement, they should not discharge directly adjacent to the building. This can be accomplished through the use of splash-blocks, downspout extensions, and flexible pipes that are designed to attach to the end of the downspout. Flexible pipe should only be used if it is daylighted in such a manner that it gravity-drains collected water. Splash-blocks should also be considered below hose bibs and water spigots.

#### 4.2.3 Construction Considerations

Performing earthwork operations during warmer periods of the year (May through October) will reduce the potential for problems associated with unstable subgrades. Site drying conditions are typically enhanced when it is warm. The moisture sensitivity of the on-site soils does not preclude performing earthwork at other times of the year, but does lead to an increased potential for having to perform overexcavation and replacement or some other form of remedial work. Protecting the exposed subgrade soils from infiltration of surface water by keeping the site grades sloped to promote runoff in advance of rain events will also reduce the potential for needing to perform remedial work on wet subgrades. Should unstable subgrade conditions develop, stabilization measures should be employed.

The site should be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted.

As a minimum, all temporary excavations should be sloped or braced as required by Occupational Safety and Health Administration (OSHA) regulations to provide stability and safe

working conditions. Temporary excavations will most likely be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required, to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; proof-rolling; placement and compaction of controlled compacted fills; and backfilling of excavations.

### 4.3 Foundation Recommendations

#### 4.3.1 Shallow Foundations

Support of the proposed structure on conventional shallow foundations is recommended after vibratory compaction. We recommend that the building be designed as a monolithic slab with thickened sections for columns and load bearing walls. The use of isolated column and wall footings without raising site grades could require undercutting and replacement of footing soils. Design recommendations for a shallow foundation system are presented in the following table and paragraphs.

<b>DESCRIPTION</b>	<b>VALUE</b>
<b>Maximum Net allowable bearing pressure <sup>1</sup></b>	1,500 psf
<b>Minimum embedment below lowest adjacent finished grade for frost protection and protective embedment <sup>2</sup></b>	16 inches
<b>Minimum width for continuous wall footings</b>	16 inches
<b>Minimum width for isolated column footings</b>	24 inches
<b>Approximate total settlement <sup>3</sup></b>	Up to 1 inch
<b>Estimated differential settlement <sup>3</sup></b>	Up to 1/2 inch along 40 feet of wall
<b>Ultimate coefficient of sliding friction <sup>4</sup></b>	0.35

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
2. For perimeter footings and footings beneath unheated areas.
3. The actual magnitude of settlement that will occur beneath the foundations will depend upon the variations within the subsurface soil profile, the structural loading conditions and the quality of the foundation excavation. The estimated total and differential settlements listed assume that the foundation related earthwork and the foundation design are completed in accordance with our recommendations.

- 
4. For uplift resistance, use the weight of the foundation concrete plus the weight of the soil over the plan area of the footings. 105 pounds per cubic foot should be used for the density of the soil.
- 

### 4.3.2 Construction Considerations

The foundation bearing materials should be evaluated at the time of the foundation excavation. This is an essential part of the construction process due to the presence of loose native soils. A representative of the geotechnical engineer should use a combination of hand auger borings and dynamic cone penetrometer (DCP) testing to determine the suitability of the bearing materials for the design bearing pressure. DCP testing should be performed to a depth of 3 to 5 feet below the bottom of footing excavation. Excessively soft, loose or wet bearing soils should be overexcavated to a depth recommended by the geotechnical engineer. The footings could then bear directly on these soils at the lower level or the excavated soils could be replaced with compacted soil fill or washed, crushed stone (NCDOT No. 57) wrapped in a geotextile fabric. Overexcavation and replacement should be anticipated.

The base of all foundation excavations should be free of water and loose soil prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively disturbed or saturated, the affected soil should be removed prior to placing concrete.

## 4.4 Seismic Considerations

Code Used	Site Classification
2012 North Carolina Building Code	D

Based on our exploration of the upper 20 feet of the soil profile and our experience in the area, it is our opinion that the subsurface characteristics reflect those of Site Class D as described in the 2012 North Carolina State Building Code.

## 4.5 Floor Slabs

### 4.5.1 Design Recommendations

ITEM	DESCRIPTION
Floor slab support	Approved existing soils or new engineered fill
Modulus of subgrade reaction	100 pounds per square inch per inch (psi/in) for point loading conditions
Sub-base layer	4 inches of free draining granular material (NCDOT No. 57)

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual.

The use of a vapor retarder should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings. The slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

#### **4.5.2 Construction Considerations**

On most project sites, the site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. If such disturbance occurs, the floor slab subgrade may not be suitable for placement of the capillary break layer and concrete and corrective action will be required.

We recommend the area underlying the structure footprint be rough graded and then thoroughly proofrolled with a moderately loaded tandem axle dump truck prior to final grading and placement of the sub-base layer. Particular attention should be paid to high traffic areas that were rutted and disturbed by construction activities and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted fill. Floor slab subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the aggregate base course and concrete.

#### **4.6 Pavements**

The pavement subgrade should be thoroughly proofrolled as outlined in section **4.2 Earthwork** of this report. Loose soils delineated by the proofrolling operations should be undercut and backfilled as directed by the geotechnical engineer. The use of a geotechnical fabric and crushed stone is also a potential option for subgrade improvement. Upon completion of any necessary remediation, the subgrade should be adequate for support of the pavement sections recommended below.

Pavement thickness design is dependent upon:

- the anticipated traffic conditions during the life of the pavement;
- subgrade and paving material characteristics; and
- climatic conditions of the region.

We have assumed that traffic loads at the site will be produced primarily by delivery and garbage trucks in the heavy duty areas and by passenger cars and light delivery vehicles for the light duty areas. Two pavement section alternatives have been provided. The light-duty pavement sections are for car parking areas only. Heavy-duty pavement sections should be



**Geotechnical Engineering Report**

Proposed Welcome Center ■ Currituck, North Carolina

May 8, 2013 ■ Terracon Project No. 72135013



used for concentrated car traffic (drive lanes / entrance drives) and garbage/delivery truck traffic areas.

Recommended pavement sections are listed in the table below. For areas subject to concentrated and repetitive loading conditions, i.e. dumpster pads and ingress/egress aprons, or in areas where vehicles will turn at low speeds, we recommend using a Portland cement concrete pavement with a thickness of at least 7 inches underlain by at least 4 inches of crushed stone. For dumpster pads, the concrete pavement area should be large enough to support the container and tipping axle of the refuse truck.

Recommended Pavement Sections			
Pavement Type	Material	Layer Thickness (inches)	
		Light Duty	Heavy Duty
Rigid	Portland Cement Concrete (4,000 psi)	5	6
	Crushed Aggregate Base Course (NCDOT CABC Type 1 or Type 2)	4	6
Flexible (Superpave)	Asphalt Surface (NCDOT S-9.5A)	3.0 <sup>1</sup>	3.0 <sup>1</sup>
	Crushed Aggregate Base Course (NCDOT CABC Type 1 or Type 2)	6	8

1. Placed in two 1.5 inch lifts

The placement of a partial pavement thickness for use during construction is not suggested without a detailed pavement analysis incorporating construction traffic. In addition, we should be contacted to confirm the traffic assumptions outlined above. If the actual traffic varies from the assumptions outlined above, modification of the pavement section thickness will be required.

Recommendations for pavement construction presented depend upon compliance with recommended material specifications. To assess compliance, observation and testing should be performed under the direction of the geotechnical engineer.

Asphalt concrete aggregates and base course materials should conform to the North Carolina Department of Transportation (NCDOT) "Standard Specifications for Roads and Structures." Concrete pavement should be air-entrained and have a minimum compressive strength of 4,000 psi after 28 days of laboratory curing per ASTM C-31. We recommend 4,000 psi concrete, rather than 3,000 psi concrete, for better durability.

The performance of all pavements can be enhanced by minimizing excess moisture which can reach the subgrade soils. The following recommendations should be considered a minimum:

- site grading at a minimum 2 percent grade away from the pavements;
- subgrade and pavement surface with a minimum 1/4 inch per foot slope to promote proper surface drainage; and
- installation of joint sealant to seal cracks immediately.

Preventative maintenance should be planned and provided for through an ongoing pavement management program to enhance future pavement performance. Preventative maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Preventative maintenance, which consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing), is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

## **5.0 GENERAL COMMENTS**

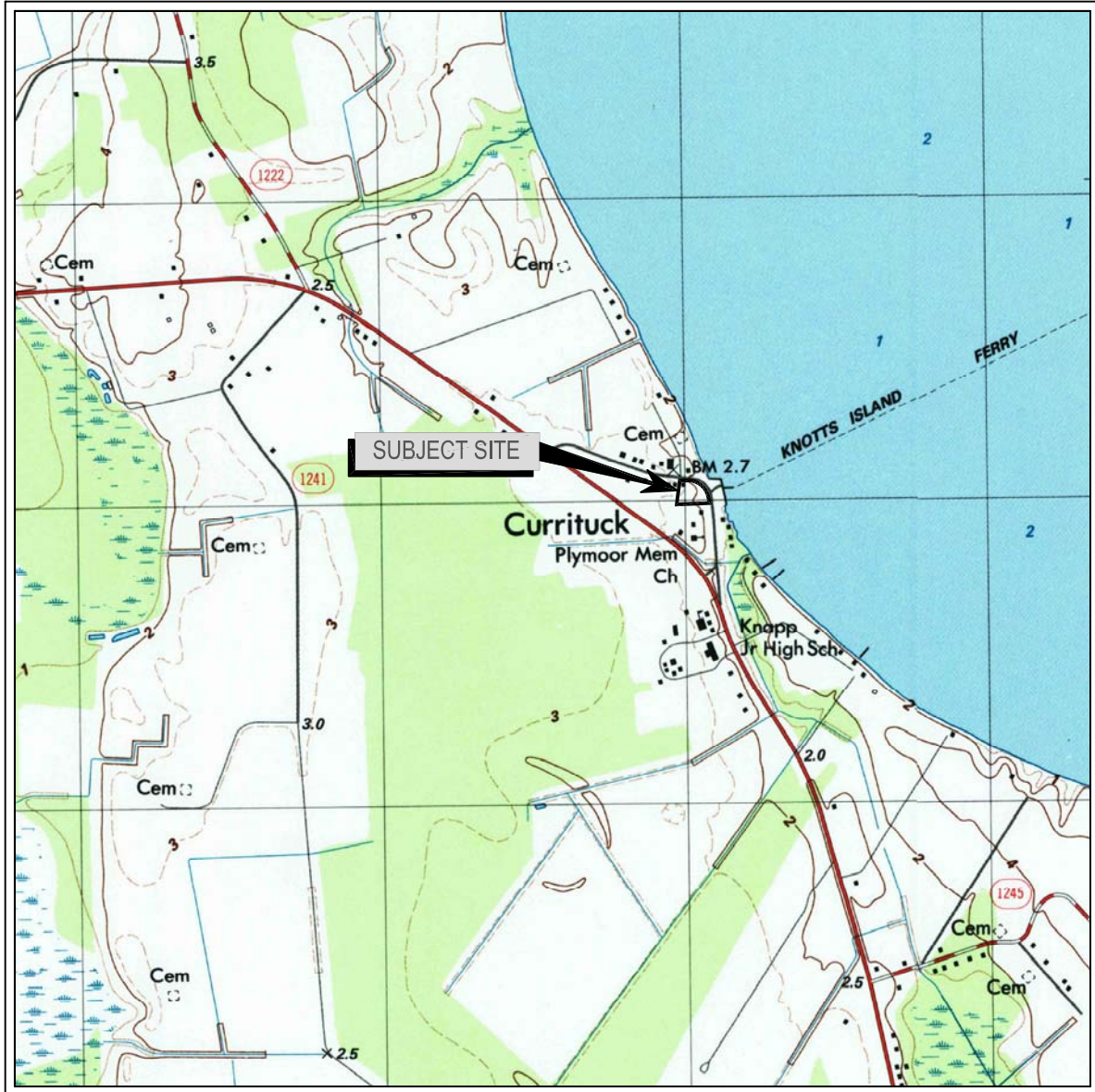
Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

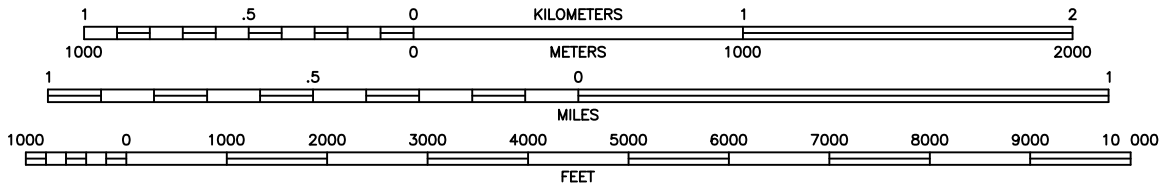
The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

**APPENDIX A**  
**FIELD EXPLORATION**



SCALE 1:24 000



CONTOUR INTERVAL 2 METERS  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE  
CURRITUCK, NC  
1999

7.5 MINUTE SERIES (TOPOGRAPHIC)



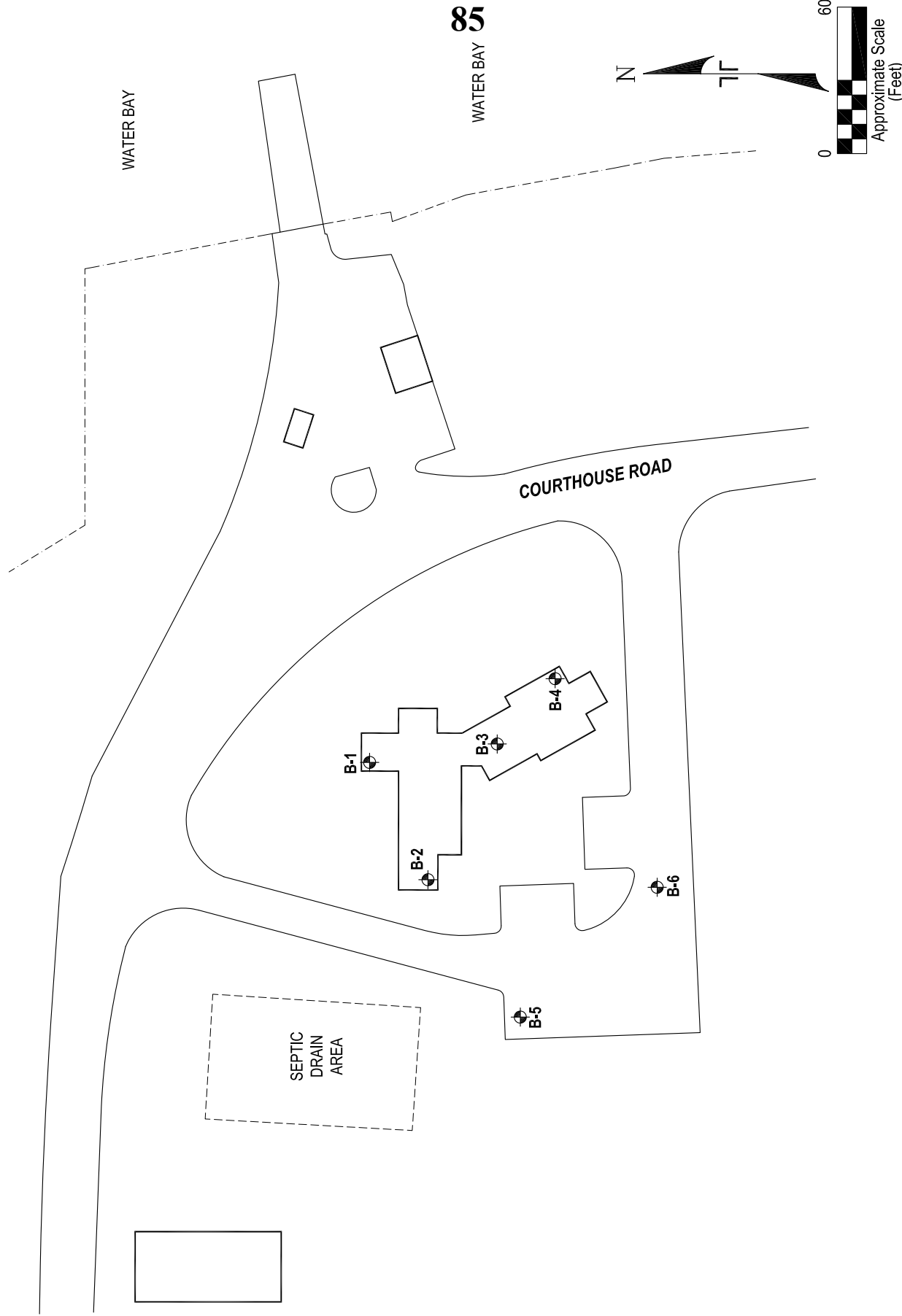
Project Mng:	CB	Project No.	72135013
Drawn By:	DWD	Scale:	AS SHOWN
Checked By:	CB/MRF	File No.	GEO72135013-1
Approved By:	CB	Date:	MAY 2013

**Terracon**  
Consulting Engineers and Scientists

314 Beacon Drive Winterville, NC 28590  
(252) 353-1600 (252) 353-0002

SITE LOCATION PLAN  
GEOTECHNICAL ENGINEERING REPORT  
CURRITUCK NCDOT WELCOME CENTER  
COURTHOUSE ROAD  
CURRITUCK, NC

EXHIBIT  
A-1



**LEGEND**



APPROXIMATE BORING LOCATION

THIS DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES.

Project Mgr:	CB
Drawn By:	DWD
Checked By:	CB/MRF
Approved By:	CB

Project No.:	72135013
Scale:	AS SHOWN
File No.:	GE072135013-2
Date:	MAY 2013

**Terracon**  
 Consulting Engineers and Scientists  
 314 Beacon Drive  
 (252) 353-1600  
 Winterville, NC 28590  
 (252) 353-0002

**BORING LOCATION PLAN**  
 GEOTECHNICAL ENGINEERING REPORT  
 CURRITUCK NCDOT WELCOME CENTER  
 COURTHOUSE ROAD  
 CURRITUCK, NC

## **Field Exploration Description**

The boring locations were marked by representatives of Terracon using a measuring wheel and referencing existing site features using the site plan provided to us. Boring elevation information was provided on a Site Plan. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The soil test borings were performed by a trailer-mounted power drilling rig utilizing mud rotary drilling procedures to advance the boreholes. The drilling tools were removed from the borehole and representative soil samples were obtained at 2.5 to 5 foot intervals using split-barrel sampling procedures. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground with a 140-pound hammer falling a distance of 30 inches. A cathead and rope assembly was used to lift the 140 pound hammer. After seating the sampler 6 inches at the bottom of the borehole to penetrate any loose cuttings, the sampler is driven an additional 12 inches. The number of blows required to advance the sampling spoon the last 12 inches is recorded as the standard penetration resistance value (N-value). These N-values are indicated on the boring logs at the depths of occurrence.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples. Additional information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions

**BORING LOG NO. B-1**

**PROJECT: Currituck County NCDOT Welcome Center**

**CLIENT: NC Dept of Transportation Raleigh, NC**

**SITE: Courthouse Road Currituck, NC**

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE 72135013 CURRITUCK COUNTY NCDOT WELCOME CENTER. CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
	Surface Elev.: 4.5 (Ft.) ELEVATION (Ft.)									
	0.5 <b>Stone Base</b>	4								
	<b>POORLY GRADED SAND (SP)</b> , dark gray brown, loose	1								
		2	▽		3-3-4 N=7	1				
	3.0 <b>SILTY SAND (SM)</b> , with organics, dark brown, very loose	1.5								
		4			1-1-1 N=2	2	29	34-29-5	38	
	6.0 <b>POORLY GRADED SAND (SP)</b> , gray and light tan, medium dense	-1.5								
		6			5-5-7 N=12	3				
		7								
		8								
		9			6-6-7 N=13	4				
		10								
		11								
		12								
		13								
		14			7-7-7 N=14	5				
		15								
		16								
		17								
	18.0 <b>SILTY SAND (SM)</b> , gray, medium dense	-13.5								
		18								
		19			6-4-6 N=10	6				
		20								
	<b>Boring Terminated at 20 Feet</b>	-15.5								
		20								
		21								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Manual

Advancement Method:  
Mud Rotary

See Exhibit A-3 for description of field procedures  
See Appendix B for description of laboratory procedures and additional data (if any).

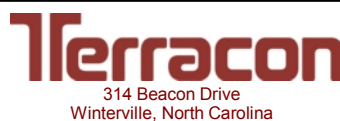
Notes:

Abandonment Method:  
Cuttings

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

▽ While Drilling



Boring Started: 4/24/2013

Boring Completed: 4/24/2013

Drill Rig: 45-08

Driller: Carolina Drilling, Inc.

Project No.: 72135013

Exhibit: A-4

**BORING LOG NO. B-2**

**PROJECT: Currituck County NCDOT Welcome Center**

**CLIENT: NC Dept of Transportation  
Raleigh, NC**

**SITE: Courthouse Road  
Currituck, NC**

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE 72135013 CURRITUCK COUNTY WELCOME CENTER; CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
		0.5	4.5									
	<b>Grass/Topsoil/Rootmat</b>			1								
	<b>SILTY SAND (SM)</b> , dark gray, dark brown, tan brown and light gray, very loose			2			1-1-1 N=2	1	28			
				3	▽							
				4			2-1-1 N=2	2	17	NP	27	
				5								
	<b>POORLY GRADED SAND (SP)</b> , light tan and gray, medium dense	6.0	-1	6								
				7			6-6-7 N=13	3	32			
				8								
				9			5-6-4 N=10	4	31			
				10								
				11								
				12								
				13								
				14			6-5-7 N=12	5	37			
				15								
				16								
				17								
	<b>SILTY SAND (SM)</b> , gray, medium dense	18.0	-13	18								
				19			6-7-4 N=11	6	37			
		20.0	-15	20								
	<b>Boring Terminated at 20 Feet</b>											
				21								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Manual

Advancement Method:  
Mud Rotary

See Exhibit A-3 for description of field procedures  
See Appendix B for description of laboratory procedures and additional data (if any).

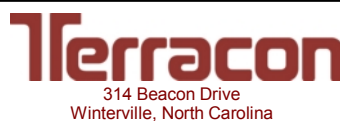
Notes:

Abandonment Method:  
Cuttings

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

▽ While Drilling



Boring Started: 4/24/2013

Boring Completed: 4/24/2013

Drill Rig: 45-08

Driller: Carolina Drilling, Inc.

Project No.: 72135013

Exhibit: A-5



# BORING LOG NO. B-3

**PROJECT:** Currituck County NCDOT Welcome Center

**CLIENT:** NC Dept of Transportation  
Raleigh, NC

**SITE:** Courthouse Road  
Currituck, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE 72135013 CURRITUCK COUNTY WELCOME CENTER. CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
		0.5	3									
	<b>Grass/Topsoil/Rootmat</b>			1								
	<b>POORLY GRADED SAND (SP)</b> , dark brown and gray, medium dense			2	▽		2-6-6 N=12	1				
		3.0	0.5	3								
	<b>SILTY SAND (SM)</b> , tan brown, very loose			4			1-1-2 N=3	2	22	NP	16	
		6.0	-2.5	5								
	<b>POORLY GRADED SAND (SP)</b> , gray, medium dense			6			6-7-6 N=13	3				
				7								
				8								
				9			4-5-5 N=10	4				
				10								
				11								
				12								
				13								
				14			5-6-5 N=11	5				
				15								
				16								
				17								
		18.0	-14.5	18								
	<b>SILTY SAND (SM)</b> , gray, loose			19			6-4-4 N=8	6				
		20.0	-16.5	20								
	<b>Boring Terminated at 20 Feet</b>											
				21								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Manual

Advancement Method:  
Mud Rotary

See Exhibit A-3 for description of field procedures  
See Appendix B for description of laboratory procedures and additional data (if any).

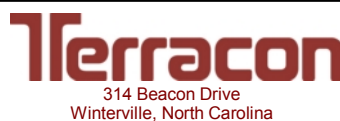
Notes:

Abandonment Method:  
Cuttings

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

▽ While Drilling



Boring Started: 4/24/2013

Boring Completed: 4/24/2013

Drill Rig: 45-08

Driller: Carolina Drilling, Inc.

Project No.: 72135013

Exhibit: A-6

# BORING LOG NO. B-4

**PROJECT:** Currituck County NCDOT Welcome Center

**CLIENT:** NC Dept of Transportation  
Raleigh, NC

**SITE:** Courthouse Road  
Currituck, NC

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE 72135013 CURRITUCK COUNTY WELCOME CENTER; CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
		0.5	3.5									
	<b>Grass/Topsoil/Rootmat</b>			1								
	<b>SILTY SAND (SM)</b> , gray brown and tan orange, loose			2			3-4-1 N=5	1				
				3	▽							
				4			2-2-4 N=6	2				
				5								
	6.0		-2	6								
	<b>POORLY GRADED SAND (SP)</b> , tan brown and gray, loose to medium dense			7			6-5-5 N=10	3				
				8								
				9			5-4-5 N=9	4				
				10								
				11								
				12								
				13								
	13.0		-9	14			6-6-4 N=10	5				
	<b>SILTY SAND (SM)</b> , gray, loose to medium dense			15								
				16								
				17								
				18								
				19			5-3-5 N=8	6				
	20.0		-16	20								
	<b>Boring Terminated at 20 Feet</b>			21								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Manual

Advancement Method:  
Mud Rotary

See Exhibit A-3 for description of field procedures  
See Appendix B for description of laboratory procedures and additional data (if any).

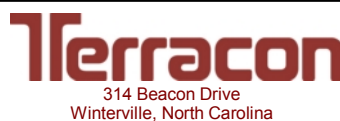
Notes:

Abandonment Method:  
Cuttings

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**

▽ While Drilling



Boring Started: 4/24/2013

Boring Completed: 4/24/2013

Drill Rig: 45-08

Driller: Carolina Drilling, Inc.

Project No.: 72135013

Exhibit: A-7

# BORING LOG NO. B-5

**PROJECT: Currituck County NCDOT Welcome Center**

**CLIENT: NC Dept of Transportation  
Raleigh, NC**

**SITE: Courthouse Road  
Currituck, NC**

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE 72135013 CURRITUCK COUNTY NCDOT WELCOME CENTER. CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
	Surface Elev.: 5 (Ft.)	0.5	4.5	1								
	<b>Grass/Topsoil/Rootmat</b> <b>SILTY SAND (SM)</b> , dark gray brown and tan brown, very loose to loose			2			1-2-2 N=4	1				
				3								
				4			1-1-2 N=3	2				
	<b>Boring Terminated at 5 Feet</b>	5.0	0	5								
				6								
				7								
				8								
				9								
				10								
				11								
				12								
				13								
				14								
				15								
				16								
				17								
				18								
				19								
				20								
				21								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Manual

Advancement Method:  
Mud Rotary

See Exhibit A-3 for description of field procedures  
See Appendix B for description of laboratory procedures and additional data (if any).

Notes:

Abandonment Method:  
Cuttings

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**



Boring Started: 4/24/2013

Boring Completed: 4/24/2013

Drill Rig: 45-08

Driller: Carolina Drilling, Inc.

Project No.: 72135013

Exhibit: A-8


# BORING LOG NO. B-6

**PROJECT: Currituck County NCDOT Welcome Center**

**CLIENT: NC Dept of Transportation Raleigh, NC**

**SITE: Courthouse Road Currituck, NC**

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO LOG-DEPTH TO BOTTOM OF PAGE 72135013 CURRITUCK COUNTY NCDOT WELCOME CENTER. CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

GRAPHIC LOG	LOCATION See Exhibit A-2	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
										LL-PL-PI		
		0.5	4.5	1								
	<b>Grass/Topsoil/Rootmat</b> <b>CLAYEY SAND (SC)</b> , orange brown and gray, loose			2			4-2-2 N=4	1				
				3								
				4			2-3-2 N=5	2				
	<b>Boring Terminated at 5 Feet</b>	5.0	0	5								
				6								
				7								
				8								
				9								
				10								
				11								
				12								
				13								
				14								
				15								
				16								
				17								
				18								
				19								
				20								
				21								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Manual

Advancement Method:  
Mud Rotary

See Exhibit A-3 for description of field procedures  
See Appendix B for description of laboratory procedures and additional data (if any).

Notes:

Abandonment Method:  
Cuttings

See Appendix C for explanation of symbols and abbreviations.

**WATER LEVEL OBSERVATIONS**



Boring Started: 4/24/2013

Boring Completed: 4/24/2013

Drill Rig: 45-08

Driller: Carolina Drilling, Inc.

Project No.: 72135013

Exhibit: A-9

**APPENDIX B**  
**LABORATORY TESTING**

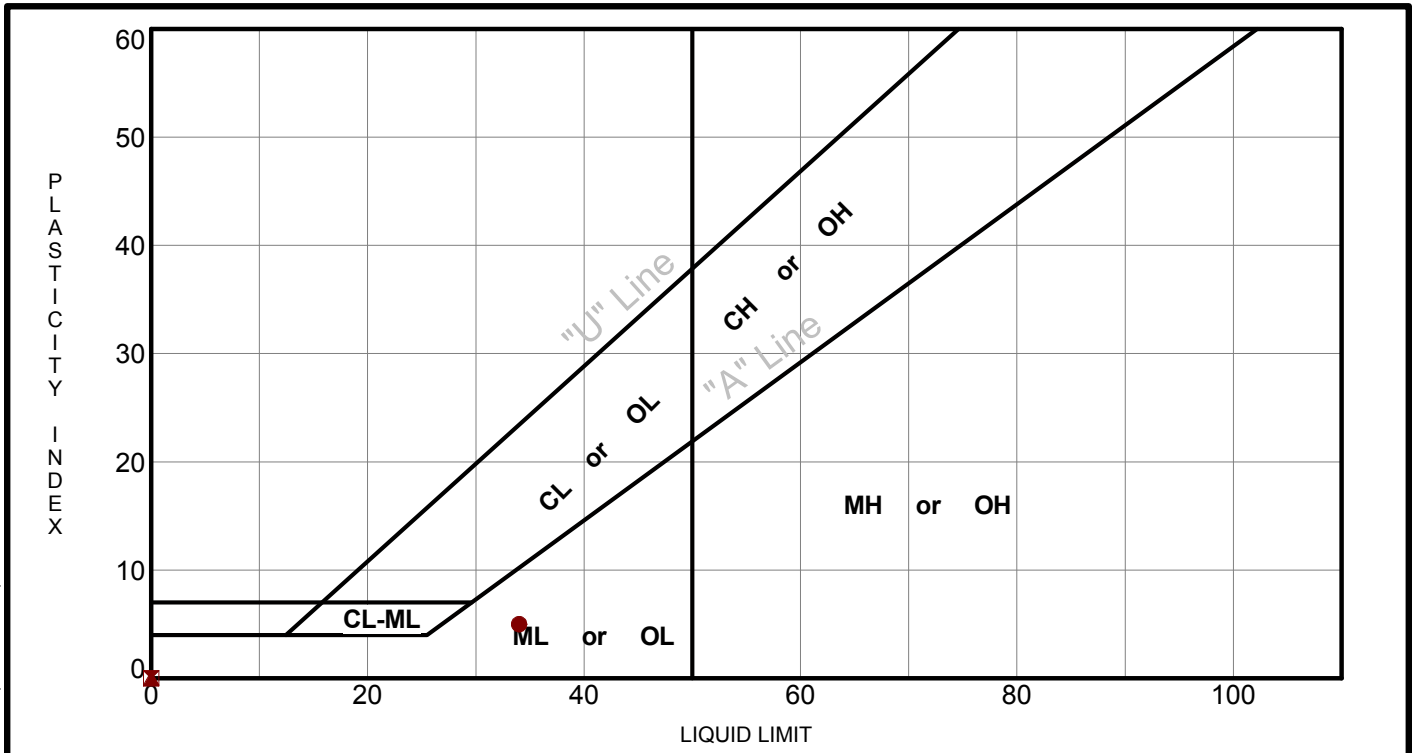
## **Laboratory Testing**

Descriptive classifications of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Also shown are estimated Unified Soil Classification Symbols. A brief description of this classification system is attached to this report. Soils laboratory testing was performed under the direction of a geotechnical engineer and included visual classification, moisture content, grain size analysis and Atterberg limits, as appropriate. The results of the laboratory testing are shown on the borings logs and in Appendix B.

# ATTERBERG LIMITS RESULTS

ASTM D4318

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS 72135013 CURRITUCK COUNTY NCDOT WELCOME CENTER: CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

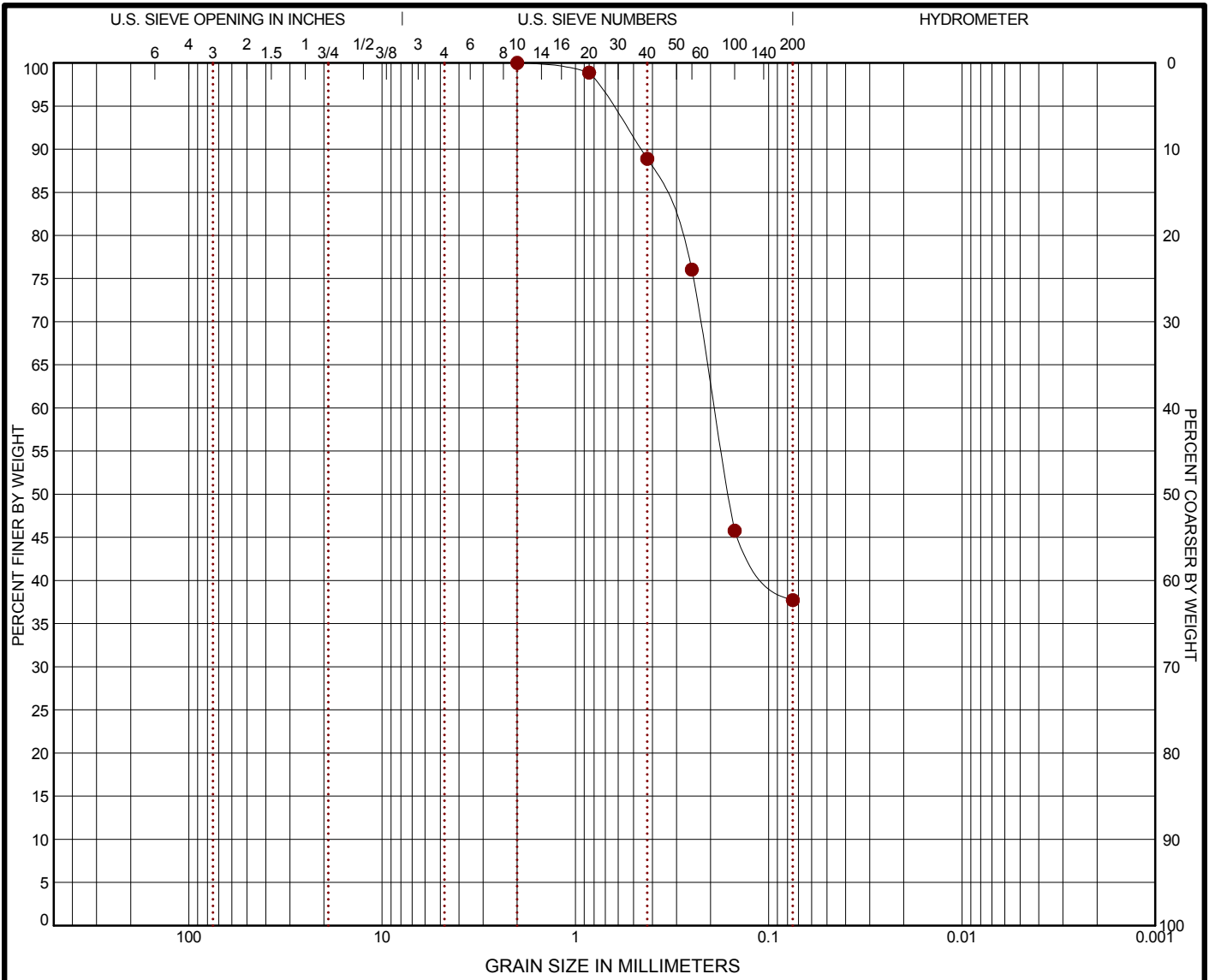


Boring ID	Depth (ft)	LL	PL	PI	Fines	USCS	Description
● B-1	3.5 - 5.0	34	29	5	37.7	SM	DARK BROWN SILTY SAND
✕ B-2	3.5 - 5.0	NP	NP	NP	26.7	SM	LIGHT GRAY & TAN BROWN SILTY SAND
▲ B-3	3.5 - 5.0	NP	NP	NP	15.9	SM	TAN BROWN SILTY SAND

PROJECT: Currituck County NCDOT Welcome Center	314 Beacon Drive Winterville, North Carolina	PROJECT NUMBER: 72135013
SITE: Courthouse Road Currituck, NC		CLIENT: NC Dept of Transportation Raleigh, NC
		EXHIBIT: B-2

# GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
<b>B-1</b>	<b>3.5 - 5</b>	<b>0.0</b>	<b>0.0</b>	<b>62.3</b>		<b>37.7</b>		<b>SM</b>

	<b>GRAIN SIZE</b> 	<b>SIEVE (size)</b> 1 1/2" 1" 3/4" 1/2" 3/8" #4 #10 #20 #40 #60 #100 #200	<b>PERCENT FINER</b> 	<b>SOIL DESCRIPTION</b> ● DARK BROWN SILTY SAND
<b>COEFFICIENTS</b> C <sub>c</sub> C <sub>u</sub>				<b>REMARKS</b> ●

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 72135013 CURRITUCK COUNTY NCDOT WELCOME CENTER, CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

PROJECT: Currituck County NCDOT  
Welcome Center

SITE: Courthouse Road  
Currituck, NC



PROJECT NUMBER: 72135013

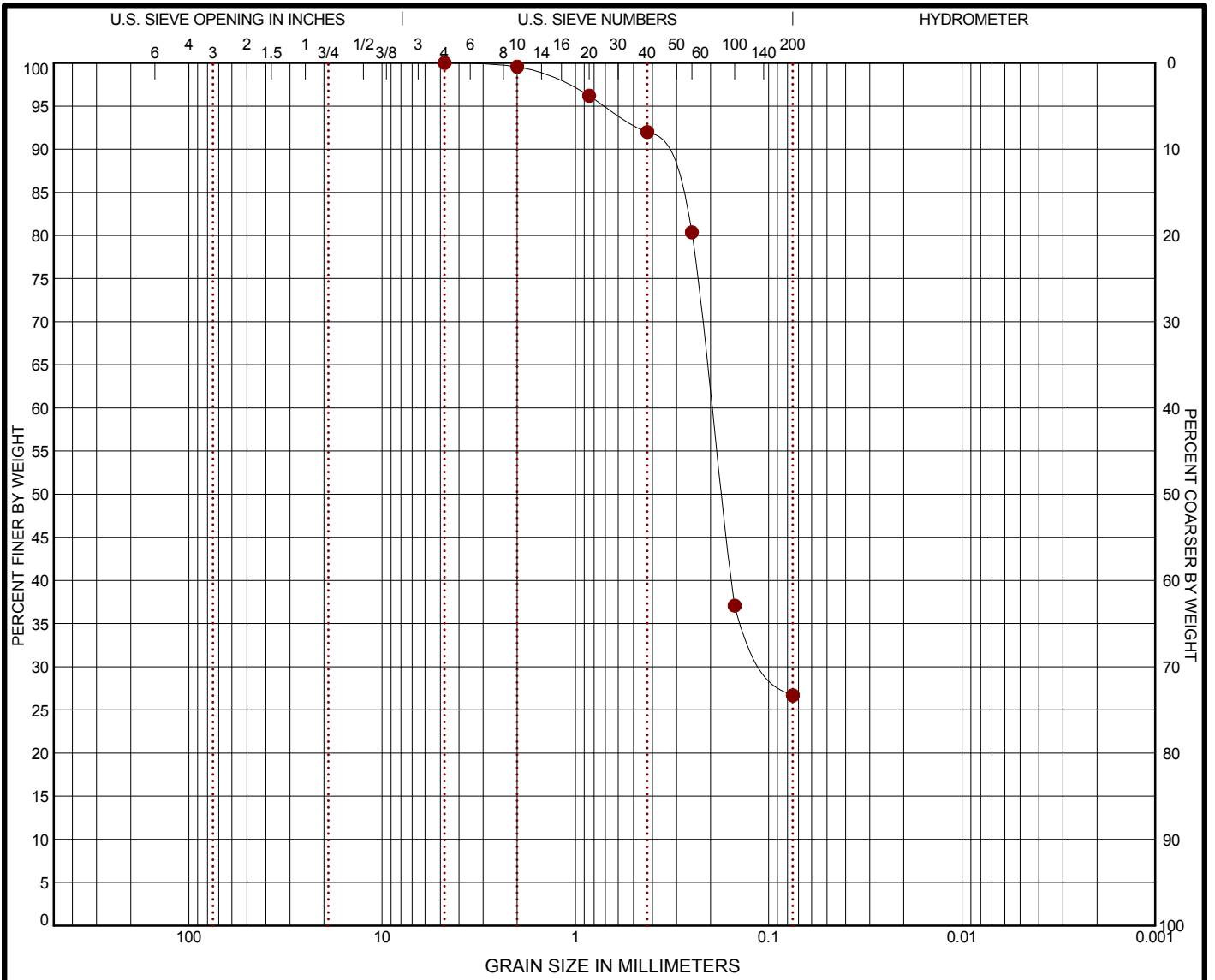
CLIENT: NC Dept of Transportation  
Raleigh, NC

EXHIBIT: B-3



# GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
B-2	3.5 - 5	0.0	0.0	73.3		26.7		SM

GRAIN SIZE	
D <sub>60</sub>	0.197
D <sub>30</sub>	0.094
D <sub>10</sub>	
COEFFICIENTS	
C <sub>c</sub>	
C <sub>u</sub>	

SIEVE (size)	PERCENT FINER
1 1/2"	
1"	
3/4"	
1/2"	
3/8"	
#4	100.0
#10	99.56
#20	96.19
#40	91.99
#60	80.37
#100	37.09
#200	26.69

**SOIL DESCRIPTION**  
 ● LIGHT GRAY & TAN BROWN SILTY SAND

**REMARKS**  
 ●

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 72135013 CURRITUCK COUNTY NCDOT WELCOME CENTER; CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

PROJECT: Currituck County NCDOT  
Welcome Center

SITE: Courthouse Road  
Currituck, NC

**Terracon**  
 314 Beacon Drive  
 Winterville, North Carolina

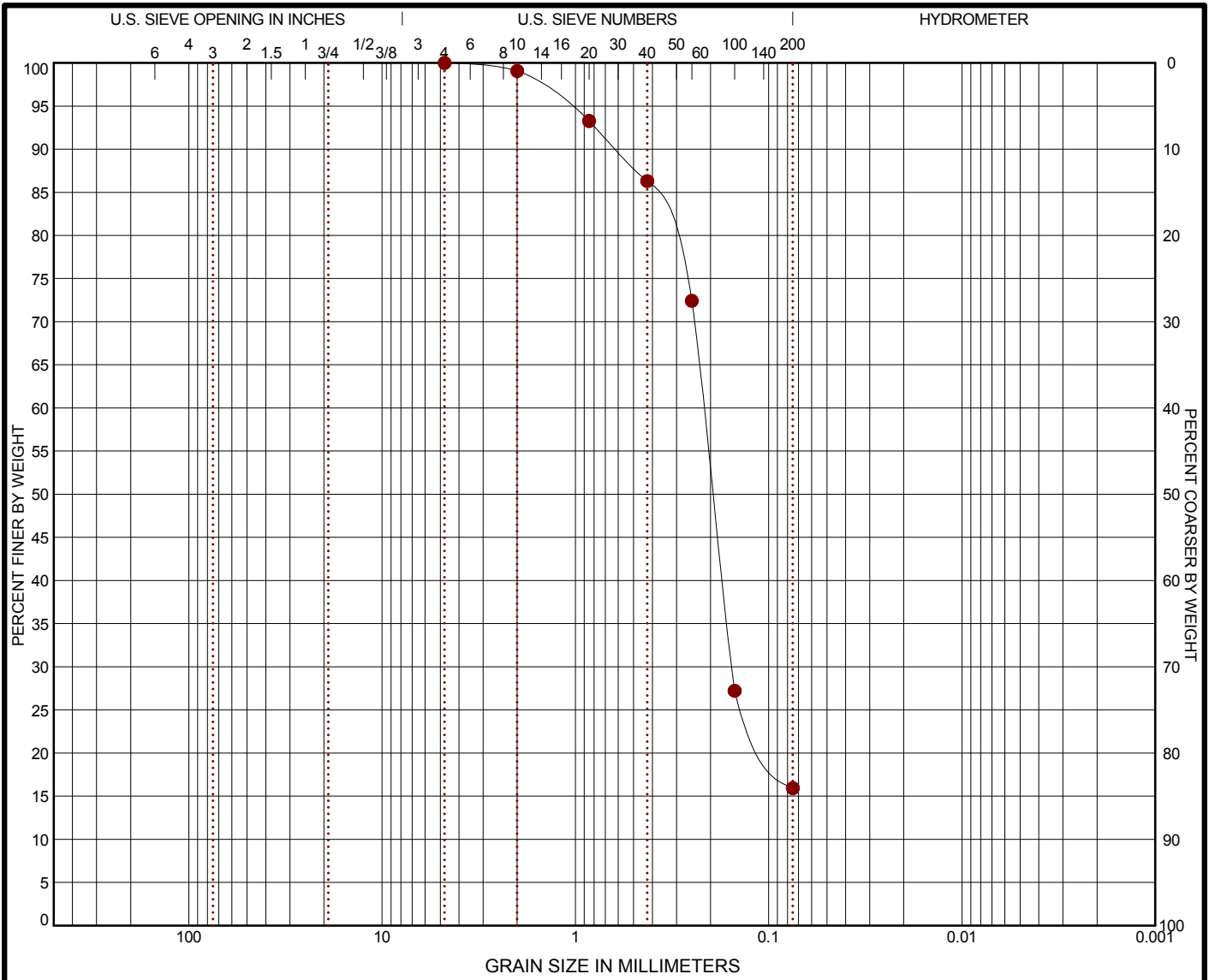
PROJECT NUMBER: 72135013

CLIENT: NC Dept of Transportation  
Raleigh, NC

EXHIBIT: B-4

# GRAIN SIZE DISTRIBUTION

ASTM D422



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
● B-3	3.5 - 5	0.0	0.0	84.1		15.9		SM

	<b>GRAIN SIZE</b> ● D <sub>60</sub> <b>0.217</b> D <sub>30</sub> <b>0.155</b> D <sub>10</sub>	<b>SIEVE (size)</b> 1 1/2" 1" 3/4" 1/2" 3/8" #4 #10 #20 #40 #60 #100 #200	<b>PERCENT FINER</b> ● 100.0 99.07 93.27 86.3 72.42 27.22 15.93	<b>SOIL DESCRIPTION</b> ● TAN BROWN SILTY SAND  <b>REMARKS</b> ●
<b>COEFFICIENTS</b> C <sub>c</sub> C <sub>u</sub>				












LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 72135013 CURRITUCK COUNTY NCDOT WELCOME CENTER; CURRITUCK, NC.GPJ TERRACON2012.GDT 5/3/13

PROJECT: Currituck County NCDOT Welcome Center	<p style="color: red; font-weight: bold;">314 Beacon Drive Winterville, North Carolina</p>	PROJECT NUMBER: 72135013 CLIENT: NC Dept of Transportation Raleigh, NC EXHIBIT: B-5
SITE: Courthouse Road Currituck, NC		

**APPENDIX C**  
**SUPPORTING DOCUMENTS**

# GENERAL NOTES

## DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

<b>SAMPLING</b>			<b>WATER LEVEL</b>		Water Initially Encountered	<b>FIELD TESTS</b>	(HP) Hand Penetrometer	
	<b>Auger</b>	<b>Split Spoon</b>			Water Level After a Specified Period of Time		(T) Torvane	
					Water Level After a Specified Period of Time		(b/f) Standard Penetration Test (blows per foot)	
	<b>Shelby Tube</b>	<b>Macro Core</b>		Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.			(PID) Photo-Ionization Detector	
							(OVA) Organic Vapor Analyzer	
<b>Ring Sampler</b>	<b>Rock Core</b>							
								
<b>Grab Sample</b>	<b>No Recovery</b>							

## DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

## LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

<b>STRENGTH TERMS</b>	<b>RELATIVE DENSITY OF COARSE-GRAINED SOILS</b> (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			<b>CONSISTENCY OF FINE-GRAINED SOILS</b> (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
	Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Ring Sampler Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

## RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 15
With	15 - 29
Modifier	> 30

## RELATIVE PROPORTIONS OF FINES

<u>Descriptive Term(s) of other constituents</u>	<u>Percent of Dry Weight</u>
Trace	< 5
With	5 - 12
Modifier	> 12

## GRAIN SIZE TERMINOLOGY

<u>Major Component of Sample</u>	<u>Particle Size</u>
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

## PLASTICITY DESCRIPTION

<u>Term</u>	<u>Plasticity Index</u>
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>				Soil Classification		
				Group Symbol	Group Name <sup>B</sup>	
<b>Coarse Grained Soils:</b> More than 50% retained on No. 200 sieve	<b>Gravels:</b> More than 50% of coarse fraction retained on No. 4 sieve	<b>Clean Gravels:</b> Less than 5% fines <sup>C</sup>	$Cu \geq 4$ and $1 \leq Cc \leq 3$ <sup>E</sup>	GW	Well-graded gravel <sup>F</sup>	
		<b>Gravels with Fines:</b> More than 12% fines <sup>C</sup>	Fines classify as ML or MH	GP	Poorly graded gravel <sup>F</sup>	
			Fines classify as CL or CH	GM	Silty gravel <sup>F,G,H</sup>	
		<b>Sands:</b> 50% or more of coarse fraction passes No. 4 sieve	<b>Clean Sands:</b> Less than 5% fines <sup>D</sup>	$Cu \geq 6$ and $1 \leq Cc \leq 3$ <sup>E</sup>	GC	Clayey gravel <sup>F,G,H</sup>
	<b>Sands with Fines:</b> More than 12% fines <sup>D</sup>		Fines classify as ML or MH	SW	Well-graded sand <sup>I</sup>	
			Fines classify as CL or CH	SP	Poorly graded sand <sup>I</sup>	
	<b>Fine-Grained Soils:</b> 50% or more passes the No. 200 sieve		<b>Silts and Clays:</b> Liquid limit less than 50	<b>Inorganic:</b>	$PI > 7$ and plots on or above "A" line <sup>J</sup>	CL
		$PI < 4$ or plots below "A" line <sup>J</sup>			ML	Silt <sup>K,L,M</sup>
<b>Organic:</b>		Liquid limit - oven dried		< 0.75	OL	Organic clay <sup>K,L,M,N</sup>
		Liquid limit - not dried				Organic silt <sup>K,L,M,O</sup>
<b>Silts and Clays:</b> Liquid limit 50 or more		<b>Inorganic:</b>	PI plots on or above "A" line	CH	Fat clay <sup>K,L,M</sup>	
			PI plots below "A" line	MH	Elastic Silt <sup>K,L,M</sup>	
		<b>Organic:</b>	Liquid limit - oven dried	< 0.75	OH	Organic clay <sup>K,L,M,P</sup>
			Liquid limit - not dried			Organic silt <sup>K,L,M,Q</sup>
<b>Highly organic soils:</b>	Primarily organic matter, dark in color, and organic odor			PT	Peat	

<sup>A</sup> Based on the material passing the 3-inch (75-mm) sieve

<sup>B</sup> If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

<sup>C</sup> Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

<sup>D</sup> Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

$$E \quad Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

<sup>F</sup> If soil contains  $\geq 15\%$  sand, add "with sand" to group name.

<sup>G</sup> If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

<sup>H</sup> If fines are organic, add "with organic fines" to group name.

<sup>I</sup> If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.

<sup>J</sup> If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

<sup>K</sup> If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

<sup>L</sup> If soil contains  $\geq 30\%$  plus No. 200 predominantly sand, add "sandy" to group name.

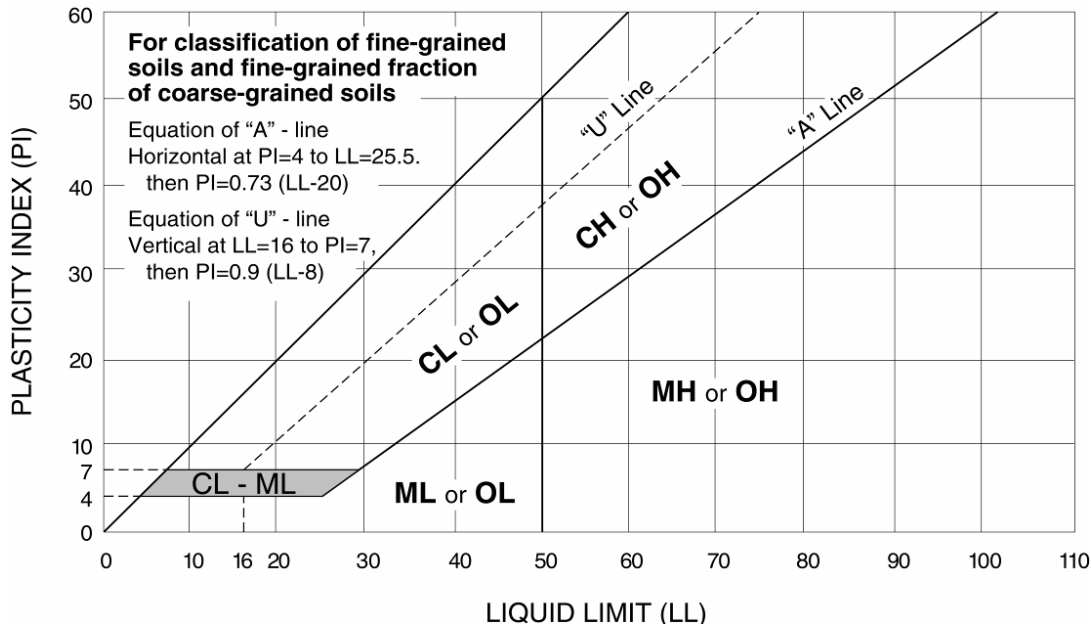
<sup>M</sup> If soil contains  $\geq 30\%$  plus No. 200, predominantly gravel, add "gravelly" to group name.

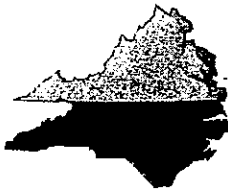
<sup>N</sup>  $PI \geq 4$  and plots on or above "A" line.

<sup>O</sup>  $PI < 4$  or plots below "A" line.

<sup>P</sup> PI plots on or above "A" line.

<sup>Q</sup> PI plots below "A" line.



**FRED D. SMITH SOIL CONSULTING, INC.**

May 6, 2013

Mr. Carl Bonner  
Terracon Consulting Engineers and Scientists  
314 Beacon Dr  
Winterville, NC 28590

Subject: Report of a Soil Evaluation for Stormwater Treatment  
NCDOT Currituck Welcome Center  
Currituck, NC

Dear Mr. Bonner,

This letter concerns the soil evaluation I performed at the above mentioned site. You authorized me to perform a soil evaluation of the surface soils on the site, to determine the depth to the 'seasonal high water table', and to perform in-situ soil permeability testing at the site. The work was done in general accordance with the rules for stormwater disposal {15A NCAC 02H .1008 (d)}.

You provided me with an aerial photograph and a site plan showing the three areas for stormwater evaluation. You marked areas in the field for stormwater evaluation and geotechnical borings. The site plan with the permeability test and hand auger locations is attached.

**Soil and Site Evaluation**

The site of HA 1 is a footslope near the road ditch. The soil has black loamy sand topsoil over gray sand and sandy clay loam. Water entered the boring at about 20 inches beneath the surface. The seasonal high water table is at the surface at this location.

Site of HA 2 is in a landscape position of a shoulder slope near a ridge and appears to be near the highest elevation at the site. The soil at this location has about 12 inches of dark brown loamy sand topsoil over about 10 inches of brown loamy sand. At about 22 inches is a reddish yellow and brown sandy clay loam. At about 32 inches beneath the surface gray mottling patterns indicate the depth of the seasonal high water table at this location.

The site of HA 3 is located in the existing gravel parking area. This area has about 17 inches of crush and run fill over a clean sand fill. At 17 inches beneath the surface is original soil that is gray sand to 33 inches beneath the surface. Below 33 inches is a gray massive sandy clay loam. This layer overlies old marsh topsoil that is black silt loam (42 inches). The seasonal high water table in this area is at about 17 inches below the existing surface where the sand is gray.

The seasonal high water table (SHWT) was determined by evaluating soil color and redoximorphic characteristics observed in the borings.

At higher elevations of the site, the SHWT is about 30 to 34 inches beneath the surface. As the surface slopes toward the road and the sound, the SHWT becomes shallower and is at the surface in HA 1. The parking area has been filled and the SHWT is just below the depth of the fill, or about 17 inches beneath the existing surface.

### Permeability

The soil permeability at HA-2 was measured using an Aardvark Soil Permeability. The Aardvark Permeameter maintains a constant head of water in a bore hole. The rate of water movement is measured over time. The results are entered into an Excel spreadsheet program that computes the permeability value in inches per hour.

The saturated hydraulic conductivity (Ksat) of the sand was measured at a depth of 28 inches beneath the surface. The texture of the horizon is described as a sandy clay loam. The Ksat measurements and results are attached.

The saturated hydraulic conductivity of the layer was measured to be 0.55 inches per hour. The value is slower than anticipated because of weak soil structure and expansive or mixed clay mineralogy at that depth. The expansive mineralogy increases with depth.

The permeability of the loamy sand layers above this permeability test will be quite faster than 0.55 inches per hour. I estimate the permeability of the loamy sand at a depth of 8 inches (2 feet above the SHWT) to be at least 1.0 inches per hour.

A permeability test should not be performed shallower than 14 inches with an Aardvark according to the manufacturer.

Permeability testing was not performed at the other locations due to seasonal high water tables present at shallow depths.

I appreciate the opportunity to work with you on this project. Please contact me if you have questions or need additional information.

Sincerely,



Fred D. Smith  
Licensed Soil Scientist



Table 1  
Hand Auger Boring Descriptions  
Currituck Ferry  
Currituck, NC

## HA 1

Horizon/Depth (inches)	Texture	Color and description
A / 0-12	Loamy sand	Black (10R 2.5/2) and dark reddish brown (5YR 2.5/2); Crumb structure; very friable.
E / 12-20	Sand	Dark reddish gray (5YR 4/2); single grain structure.
B / 20-36+	Sandy loam/ sandy clay loam	Gray (5YR 5/1, 4/2) with few fine reddish yellow (5YR 4/8) mottles. Massive. Water in boring.

## HA 2- PERMEABILITY TEST

Horizon/Depth (inches)	Texture	Color and description
A / 0-12	Loamy sand	Dark reddish brown (2.5YR 2.5/4). Crumb structure; very friable.
E / 12-22	Loamy sand	Brown (10YR 4/3) with moderate medium reddish yellow mottles (7.5YR 7/8); crumb structure.
B / 22-32	Sandy loam lenses in sandy clay loam	Mixed matrix of (7.5YR 5/8 and 5/4); weak subangular blocky; sticky, friable, slightly plastic.
B1/ 32-36+	Sandy clay loam	Brown and gray (7.5YR 5/8 with 6/2 mottles); massive; very sticky expansive clay mineralogy. Water in boring.

## HA 3- PARKING AREA

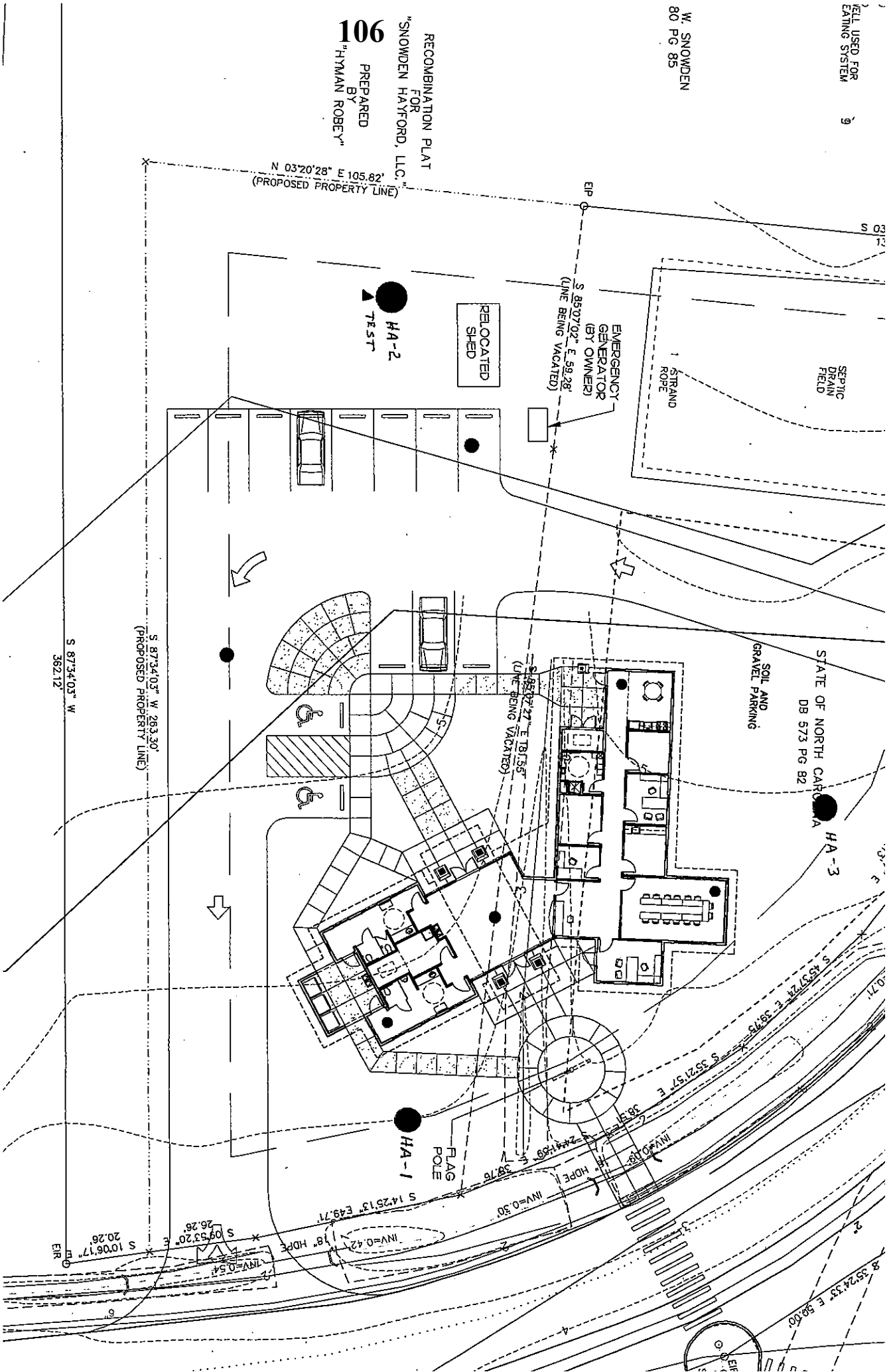
Horizon/Depth (inches)	Texture	Color and description
Fill 0-9	Crush and Run gravel	
Fill 9-17	Sand fill	Yellowish brown(10YR 5/6); single grain; loose.
E / 17-33	Sand	Gray (7.5YR 3/2 and 5/2)
B / 33-42	Sandy clay loam	Dark reddish gray (5YR 4/2); massive; expansive clay mineralogy.
A` / 42+ ( old topsoil layer)	Silt loam	Black (10R 2.5/2); massive.



Percolation or Ksat Rates using Aardvark Soil Permeameter							Perc Rate:	min/in	Ksat: 0.5 in/hr	LR:	gdsf	
Site: CURRITUCK FERRY												
Date: 4/24/2013 Operator: FDS												
Soil Series: Soil Horizon:												
Diameter of Hole(in): 3							Water Column Height (in):					
Boring Conversion Factor (BCF): 2.25							Design Loading Rate = $K_{sat} \cdot 1.496 \cdot \text{safety factor}$ of 0.05 to 0.5 system dependent					
Boring Conversion Factor (BCF) = (rad) squared / 5.06 for Aardvark Reservoir							F Value (Radcliffe and West, 2000)					
Borehole diameter												
Texture												
Sands												
Structured loams and clays												
Unstructured loams and clay												
F Value												
BCF												
HCF												
Percolation Rate												
Rate (min/in)												
dt/dh												
P												
min/in												
Ksat												
F(1/P)												
Safety Factor of Ksat												
Design Loading Rate												
Rate gdsf with a 0.10												
Ksat												
in/hr												
gdsf												
11:50 12:00												
12:00 12:10												
12:10 12:20												
12:20 12:30												
12:30 12:40												
12:40 12:50												
12:50 1:00												
1:00 1:10												
1:10 1:20												
2.25							0.5	3	0.068	1.47	4.39	
2.25							0.5	4	0.068	0.92	2.75	
2.25							0.5	6	0.068	0.73	2.20	
2.25							0.5	11	0.068	0.37	1.10	
2.25							0.5	4	0.068	1.10	3.30	
2.25							0.5	6	0.068	0.73	2.20	
2.25							0.5	7	0.068	0.55	1.65	
2.25							0.5	7	0.068	0.55	1.65	
2.25							0.5	7	0.068	0.55	1.65	
8												
1												
3												
STEADY STATE ARITHMETIC AVERAGE of last 3 readings												
Pedon Description												
Depth												
Horizon												
Color												
Texture												
Structure												
Horizon Notes												
0.55 in/hr												
Site Notes:												

W. SNOWDEN  
80 PG 85

RECOMBINATION PLAT  
FOR  
"SNOWDEN HAYFORD, LLC."  
106  
PREPARED  
BY  
"HYMAN ROBEY"



**SECTION 011000 - SUMMARY**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Project information.
  - 2. Work covered by Contract Documents.
  - 3. Phased construction.
  - 4. Work by Owner.
  - 5. Access to site.
  - 6. Work restrictions.
  - 7. Specification and drawing conventions.
  - 8. Miscellaneous provisions.

1.3 PROJECT INFORMATION

- A. Project Identification: NCDOT Currituck Welcome Center.
  - 1. Project Location: Courthouse Road, SR 1242, Currituck, NC.
- B. Owner/ Owner's Representative:  
Priscilla Tyree Williams, PE  
Director, Facilities Management Division  
North Carolina Department of Transportation  
1525 Mail Service Center  
1526 Raleigh, NC 27699-1525.
- C. Architect:  
  
JKF Architecture PC  
John K. Farkas, AIA LEED-AP  
P.O. Box 20662  
625 Lynndale Court, Suite F  
Greenville, NC 27858  
[jkf@j kf-arch.com](mailto:jkf@j kf-arch.com)  
252-355-1068
- D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
  - 1. Rivers & Associates, Greenville, NC; Civil Engineering

2. Nesar & Roomsburg; Virginia Beach, VA; Structural Engineering
3. Progressive Design Collaborative, Raleigh, NC; PME Engineering.

#### 1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents prepared by JKF Architecture dated 6-26-2013, and consists of, of but not limited to, the following:
  1. Construction of a new 1-story, approximately 3,406 GSF, exterior metal stud building with brick and cement board siding exterior. Roof is a standing seam metal roof on plywood roof deck over metal stud framing with blanket insulation. Project includes exterior aluminum storefront, curtain wall, and vinyl clad wood windows, aluminum entrance doors, AMP doors, louvers, and cast stone. Building is Type IIB Construction. Project includes site work, and PME systems.
  2. Project also includes building demolition, minor site work and demolition at the adjacent site, and construction of a wood framed toll booth.
- B. Type of Contract:
  1. Project will be constructed under a single prime contract.

#### 1.5 PHASED CONSTRUCTION

- A. The Work shall be conducted in a single phase.

#### 1.6 WORK BY OWNER

- A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

#### 1.7 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of Project site to **areas within the Contract limits** indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  1. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to **40 feet** beyond building perimeter; **10 feet** beyond surface walkways, patios, surface parking, and utilities less than **12 inches** in diameter; **15 feet** beyond primary roadway curbs and main utility branch trenches; and **25 feet** beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.
  2. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

- b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

#### 1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
- C. Nonsmoking Building: Smoking is not permitted.
- D. Controlled Substances: Use of tobacco products and other controlled substances on site is not permitted.

#### 1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

#### **PART 2 - PRODUCTS (Not Used)**

#### **PART 3 - EXECUTION (Not Used)**

**END OF SECTION 011000**

**SECTION 012100 - ALLOWANCES****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
  - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
- C. Related Sections include the following:
  - 1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
  - 2. Division 1 Section "Unit Prices" for procedures for using unit prices.

## 1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

## 1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

## 1.5 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

## 1.6 LUMP-SUM AND QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight, and delivery to Project site.
- B. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.

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

## 3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

## 3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

## 3.3 SCHEDULE OF ALLOWANCES

A. **Allowance No. 1: Remove Unsuitable Soils:**

1. Description: Remove and replace unsuitable soils in building pad or parking areas, excluding that required for footings, foundations, and utility trenches, as directed by the architect. Suitable fill material includes compacted sand fill. Labor to remove and install, fill materials, supervision, overhead and profit, delivery charges, etc., are to be included in the Base Bid. Final quantities necessary for the project will be based on actual quantities determined by the Owner's testing agency and confirm by Designers. Adjustments made based on the final quantities shall be per Unit Price #1.
2. Base Bid Quantity to be included in Base Bid: 200 CY.
3. On Bid Form indicated Lump Sum amount for Base Bid Quantity.
4. No changes in the Contract duration for the first 200 CY that require removal and replacement. If quantities exceed 200 CY, adjustments to duration will be made by Unit Price #1.

B. **Allowance No. 2: Remove Unsuitable Soils (#57 Stone):**

1. Description: Remove and replace unsuitable soils in building pad or parking areas, excluding that required for footings, foundations, and utility trenches, as directed by the architect. Suitable fill material includes #57. Labor to remove and install, fill materials, supervision, overhead and profit, delivery charges, etc., are to be included in the Base Bid. Final quantities necessary for the project will be based on actual quantities determined by the Owner's testing agency and confirm by Designers. Adjustments made based on the final quantities shall be per Unit Price #2.
2. Base Bid Quantity to be included in Base Bid: 200 CY.
3. On Bid Form indicated Lump Sum amount for Base Bid Quantity.
4. No changes in the Contract duration for the first 200 CY that require removal and replacement. If quantities exceed 200 CY, adjustments to duration will be made by Unit Price #2.
- 5.

END OF SECTION 012100



**SECTION 012200 - UNIT PRICES****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
  - 1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

## 1.3 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

## 1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

**PART 2 - PRODUCTS (Not Used)****PART 3 - EXECUTION****3.1 LIST OF UNIT PRICES**

- A. **Unit Price No. 1** - Remove and replace unsuitable soils in building pad or parking areas.

1. Description: Remove and replace unsuitable soils in building pad or parking areas, excluding that required for footings, foundations, and utility trenches, as directed by the architect. Suitable fill material includes compacted sand fill above that required by the Contract Documents including Allowances, as directed by the Architect.
  2. Unit of Measurement: Per cubic yard in place.
  3. Add 1 calendar day to the Contract duration for every part of 200 CY of unsuitable soils removed. No extended overhead recovery will be permitted as part of this Unit Price.
- B. Unit Price No. 2 - Remove and replace unsuitable soils in building pad or parking areas.**
1. Description: Remove and replace unsuitable soils in building pad or parking areas, excluding that required for footings, foundations, and utility trenches, as directed by the architect. Suitable fill material includes #57 stone above that required by the Contract Documents including, as directed by the Architect.
  2. Unit of Measurement: Per cubic yard in place.
  3. Add 1 calendar day to the Contract duration for every part of 200 CY of unsuitable soils removed. No extended overhead recovery will be permitted as part of this Unit Price.
- C. Unit Price No. 3 - Remove and replacement unsuitable soils in footings, foundations, and utility trenches.**
1. Description: Remove and replacement unsuitable soils in footings, foundations, and utility trenches, as directed by the architect. Suitable fill material may include compacted sand fill or #57 stone directed by the Architect, but use of either shall not alter the unit price.
  2. Unit of Measurement: Per cubic yard in place.
  3. Add 1 calendar day to the Contract duration for every part of 200 CY of unsuitable soils removed. No extended overhead recovery will be permitted as part of this Unit Price.
- D. Unit Price No. 4 - Provide geotechnical fabric, geogrid, or other suitable stabilization material.**
1. Description: Upon approval of the Architect, utilized geotechnical fabric to stabilized areas of unsuitable soils including building pad and parking area preparation. Building pad includes entire building area including excavations for footings, foundations, and utility trenches.
  2. Unit of Measurement: Per square yard in place.
  3. Add 1 calendar day to the Contract duration for every part of 500 SY of fabric installed. No extended overhead recovery will be permitted as part of this Unit Price.

**END OF SECTION 012200**

## SECTION 012900 - PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

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

#### 1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

#### 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with Continuation Sheets.
    - b. Submittals Schedule.
    - c. Contractor's Construction Schedule.
  - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than 21 days after notice to proceed. Provide separate schedule for each Armory.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
  - 1. Submit draft of **AIA Document G703 Continuation Sheets**.
  - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
  - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
  - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  - 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

## 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  - 1. Initial Application for Payment, Application for Payment at time of final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use **AIA Document G702 and AIA Document G703 Continuation Sheets** as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. **Architect** will return incomplete applications without action.
  - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  - 2. Include amounts of Approved Change Orders issued before last day of construction period covered by application.
- E. Transmittal: Submit 6 signed and notarized original copies of each Application for Payment to **Architect** by a method ensuring receipt **within 24 hours**. One copy shall include waivers of lien and similar attachments if required.
  - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  - 1. Evidence of completion of Project closeout requirements.
  - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  - 3. Updated final statement, accounting for final changes to the Contract Sum.
  - 4. NC State Construction Forms "Contractor's Affidavit of Payment of Debts and Claims."
  - 5. NC State Construction Forms "Contractor's Affidavit of Release of Liens."
  - 6. NC State Construction Forms "Consent of Surety to Final Payment."
  - 7. Summary of all MBE's paid for project. Use Appendix E to Summarize.

**PART 2 - PRODUCTS (Not Used)****PART 3 - EXECUTION (Not Used)****PART 4 - END OF SECTION 012900**

**SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

## 1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
  - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

## 1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
  - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate required installation sequences.

- c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
    - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
    - 3. Number of Copies: Submit 4 opaque copies of each submittal. Architect will return 2 copies.
    - 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
  - B. Key Personnel Names: Within 21 days after notice to proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
    - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.
- 1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL
- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
    - 1. Include special personnel required for coordination of operations with other contractors.
- 1.6 PROJECT MEETINGS
- A. General: Architect will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
    - 1. Attendees: Architect will inform participants and others involved, and individuals whose presence is required, of date and time of each meeting.
    - 2. Agenda: Architect will prepare the meeting agenda.
    - 3. Minutes: Architect will record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, within 10 days of the meeting.
  - B. Preconstruction Conference: Architect will schedule a preconstruction conference before starting construction.
    - 1. Attendees: Authorized representatives of Owner, State Construction, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
    - 2. Agenda: Discuss items of significance that could affect progress, including the following:
      - a. Tentative construction schedule.
      - b. Phasing.
      - c. Critical work sequencing and long-lead items.
      - d. Designation of key personnel and their duties.
      - e. Procedures for processing field decisions and Change Orders.
      - f. Procedures for requests for interpretations (RFIs).

- g. Procedures for testing and inspecting.
  - h. Procedures for processing Applications for Payment.
  - i. Distribution of the Contract Documents.
  - j. Submittal procedures.
  - k. Preparation of Record Documents.
  - l. Use of the premises **and existing building**.
  - m. Work restrictions.
  - n. Owner's occupancy requirements.
  - o. Responsibility for temporary facilities and controls.
  - p. Construction waste management and recycling.
  - q. Parking availability.
  - r. Office, work, and storage areas.
  - s. Equipment deliveries and priorities.
  - t. First aid.
  - u. Security.
  - v. Progress cleaning.
  - w. Working hours.
3. Minutes: **Architect will record** and distribute meeting minutes.
- C. Progress Meetings: Architect will conduct progress meetings at **monthly** intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of Owner, State Construction, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Contractor shall provide a written summary of the project status in the following format at each meeting:
    - a. Review outstanding items from previous minutes.
    - b. Contractors current status complete with written summary.
    - c. Contractors work to be performed next period, written summary.
    - d. Change Order status
    - e. Shop Drawing status.
    - f. Project Schedule.
    - g. Other.
  - 3. Minutes: **Architect will record** and distribute to Contractor the meeting minutes.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 013100**

**SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Contractor's Construction Schedule.
  - 2. Submittals Schedule.
  - 3. Daily construction reports.

## 1.3 SUBMITTALS

- A. Submittals Schedule: Submit **three** copies of schedule. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.
  - 2. Specification Section number and title.
  - 3. Submittal category (action or informational).
  - 4. Name of subcontractor.
  - 5. Description of the Work covered.
  - 6. Scheduled date for Architect's final release or approval.
  - 7. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- B. Contractor's Construction Schedule: Submit **two** opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
- C. Daily Construction Reports: Submit **two weekly** intervals.

## 1.4 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:



## 1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

**PART 2 - PRODUCTS**

## 2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
  - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

## 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for **the Notice to Proceed** to date of **Final Completion**.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
  - 1. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  - 2. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, and Final Completion:
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

## 2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within **21** days of date established for **the Notice to Proceed**. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
  - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in **1** percent increments within time bar.

## 2.4 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  - 1. List of subcontractors at Project site.
  - 2. List of separate contractors at Project site.
  - 3. Approximate count of personnel at Project site.
  - 4. Equipment at Project site.
  - 5. Material deliveries.
  - 6. High and low temperatures and general weather conditions.
  - 7. Accidents.
  - 8. Meetings and significant decisions.
  - 9. Unusual events (refer to special reports).
  - 10. Stoppages, delays, shortages, and losses.
  - 11. Meter readings and similar recordings.
  - 12. Emergency procedures.
  - 13. Orders and requests of authorities having jurisdiction.
  - 14. Change Orders received and implemented.
  - 15. **Construction** Change Directives received and implemented.
  - 16. Services connected and disconnected.
  - 17. Equipment or system tests and startups.

**PART 3 - EXECUTION**

## 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At **monthly** intervals, update schedule to reflect actual construction progress and activities. Issue schedule **one week** before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate Actual Completion percentage for each activity.

- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

**END OF SECTION 013200**

**SECTION 013300 - SUBMITTAL PROCEDURES****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
  - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
  - 2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
  - 3. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

## 1.3 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will **not** be provided by Architect or consultants for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. **Architect reserves** the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on **Architect's** receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 20 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. **Architect** will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Resubmittal Review: Allow **20** days for review of each resubmittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Number and title of appropriate Specification Section.
    - i. Drawing number and detail references, as appropriate.
    - j. Location(s) where product is to be installed, as appropriate.
    - k. Other necessary identification.
- E. Deviations: **Highlight** or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will **discard submittals** received from sources other than Contractor.
1. Transmittal Form: Use Contractor's Standard Form
  2. Transmittal Form: Provide locations on form for the following information:
    - a. Project name.
    - b. Date.
    - c. Names of subcontractor, manufacturer, and supplier.
    - d. Category and type of submittal.
    - e. Submittal purpose and description.
    - f. Specification Section number and title.
    - g. Drawing number and detail references, as appropriate.
    - h. Submittal and transmittal distribution record.
    - i. Remarks.
    - j. Signature of transmitter.
  3. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals with mark indicating a Review or Reviewed as Noted by Architect.

**PART 2 - PRODUCTS**

## 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.
    - f. Wiring diagrams showing factory-installed wiring.
    - g. Printed performance curves.
    - h. Operational range diagrams.
    - i. Mill reports.
    - j. Standard product operation and maintenance manuals.
    - k. Compliance with specified referenced standards.
    - l. Testing by recognized testing agency.
    - m. Application of testing agency labels and seals.
    - n. Notation of coordination requirements.
  - 4. Submit Product Data before or concurrent with Samples.
  - 5. Number of Copies: Submit 6 copies of Product Data, unless otherwise indicated. Architect[, will return 3copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - l. Notation of dimensions established by field measurement.
    - m. Relationship to adjoining construction clearly indicated.
    - n. Seal and signature of professional engineer if specified.

- o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
  - 3. Number of Copies: Submit 6 opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Architect will retain 3 copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of appropriate Specification Section.
  - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit 6 full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return 3 submittals with options selected.
  - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- E. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.
- F. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

## 2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit 3 copies of each submittal, unless otherwise indicated. Architect will not return copies.
  2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

## 2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. Reviewed: Information submitted is in compliance with Contract Documents.
  2. Reviewed as Noted: Information submitted is in compliance with Contract Documents except as noted.
  3. Revise and Resubmit: Submittal does not meet Contract Documents or is incomplete, and must be resubmitted.



- 4. Not Reviewed: Incomplete submittal, was not required or does not require review.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

**END OF SECTION 013300**

**SECTION 014000 - QUALITY REQUIREMENTS****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

## 1.3 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

## 1.4 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.

3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.5 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, **and the Contract Sum will be adjusted by Change Order.**

B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

C. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- D. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- E. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents including Statement of Special Inspections. Submit schedule within 20 days of date established for **the Notice to Proceed**.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- F. Quality Assurance Plan for Wind Resistance: The building and building components shall resist the indicated wind loading. The main lateral (wind and seismic) force resisting system shall be moment resistant steel frames. Contractor shall submit a "Contractor's Statement of Responsibility" included in this Manual within 14 days of Notice to Proceed.

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION**

### **3.1 REPAIR AND PROTECTION**

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
  2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

## **END OF SECTION 014000**

# Statement of Special Inspections

Project: Currituck Welcome Center  
 Location: Currituck, NC  
 Owner: NC Department of Transportation

Design Professional in Responsible Charge: *Kevin M. Roomsburg, P.E.*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

- Structural       Mechanical/Electrical/Plumbing  
 Architectural       Other: \_\_\_\_\_

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: *Monthly* or  per attached schedule.

Prepared by:

Kevin M. Roomsburg, P.E.  
 \_\_\_\_\_  
 (type or print name)

*Kevin Roomsburg*  
 \_\_\_\_\_  
 Signature

8/17/13  
 \_\_\_\_\_  
 Date



Owner's Authorization:

SCO Acceptance:

Signature \_\_\_\_\_ Date \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

# Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Soils and Foundations     | <input type="checkbox"/> Spray Fire Resistant Material         |
| <input checked="" type="checkbox"/> Cast-in-Place Concrete    | <input type="checkbox"/> Wood Construction                     |
| <input type="checkbox"/> Precast Concrete                     | <input type="checkbox"/> Exterior Insulation and Finish System |
| <input type="checkbox"/> Masonry                              | <input type="checkbox"/> Mechanical & Electrical Systems       |
| <input checked="" type="checkbox"/> Structural Steel          | <input type="checkbox"/> Architectural Systems                 |
| <input checked="" type="checkbox"/> Cold-Formed Steel Framing | <input type="checkbox"/> Special Cases                         |

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. <b>Special Inspection Coordinator – Kevin M. Roomsburg, P.E.</b>	<i>NRW Engineering, P.C.</i>	<i>748 Lord Dunmore Drive Suite 101 Virginia Beach, VA 23464 (757) 474-0612 kmr@nrwengineering.com</i>
2. Structural Engineer of Record Kevin M. Roomsburg, PE	<i>NRW Engineering, P.C.</i>	<i>748 Lord Dunmore Drive Suite 101 Virginia Beach, VA 23464 (757) 474-0612 kmr@nrwengineering.com</i>
3. Inspector		
4. <b>Testing Agency</b>	<i>Terracon</i>	<i>314 Beacon Drive Winterville, NC 28590 (252) 353-1600 cfbonner@terracon.com</i>
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

## Quality Assurance Plan

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### Quality Assurance for Seismic Resistance

Seismic Design Category	B
Quality Assurance Plan Required (Y/N)	N

Description of seismic force resisting system and designated seismic systems:  
*Seismic loading shall be resisted via moment resistant steel frames.*

### Quality Assurance for Wind Requirements

Basic Wind Speed (3 second gust)	115
Wind Exposure Category	C
Quality Assurance Plan Required (Y/N)	Y

Description of wind force resisting system and designated wind resisting components:  
*Wind loading shall be resisted via plywood shear walls and moment resistant steel frames.*

### Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated above must submit a Statement of Responsibility, refer to specification section 014000.

## Qualifications of Inspectors and Testing Technicians

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The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

### Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

### American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

### American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

### American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.
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### International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

### National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

### Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector
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### Other

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Item	Agency #	Scope	
1. Shallow Foundations	4  PE/GE	<p><i>Inspect soils below building foot print for adequate bearing capacity and consistency with geotechnical report.</i></p> <p><i>Inspect proof rolling operation.</i></p> <p><i>Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill</i></p> <p><i>Verify excavations for footings are at proper depth and have reached suitable materials</i></p>	
2. Controlled Structural Fill	4  PE/GE	<p><i>Perform sieve tests (ASTM D422 &amp; D1140) and modified Proctor tests (ASTM D1557) of each source of fill material.</i></p> <p><i>Inspect placement, lift thickness and compaction of controlled fill.</i></p> <p><i>Test density of each lift of fill by nuclear methods (ASTM D2922)</i></p> <p><i>Verify extent and density of fill placement.</i></p>	
3. Deep Foundations	N/A		
4. Load Testing	N/A		
4. Other:			

## Cast-in-Place Concrete

Item	Agency #	Scope	
1. Mix Design	1 ACI-CCI ICC- RCSI	Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.	
2. Material Certification	1	Review certificates of compliance for concrete materials, reinforcing, admixtures, and accessories.	
3. Reinforcement Installation	1/4 ACI-CCI ICC- RCSI	Periodic inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters	
4. Post-Tensioning Operations	N/A  ICC- PCSI	Inspect placement, stressing, grouting and protection of post-tensioning tendons. Verify that tendons are correctly positioned, supported, tied and wrapped. Record tendon elongations.	
5. Welding of Reinforcing	N/A  AWS- CWI	Visually inspect all reinforcing steel welds. Verify weldability of reinforcing steel. Inspect preheating of steel when required.	
6. Anchor Bolts	4	Continuous inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.	
7. Concrete Placement	4 ACI-CCI ICC- RCSI	Continuous inspect of placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.	
8. Sampling and Testing of Concrete	4 ACI- CFTT ACI-STT	Continuous test of concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064).	
9. Curing and Protection	4 ACI-CCI ICC- RCSI	Periodic inspect curing, cold weather protection and hot weather protection procedures.	
10. Other:			

Item	Agency # (Qualif.)	Scope	
1. Fabricator Certification/ Quality Control Procedures <input type="checkbox"/> Fabricator Exempt	1  AWS/AISC- SSI ICC-SWSI	<i>Review shop fabrication and quality control procedures. Collect certificate of compliance from fabricator at completion of fabrication.</i>	
2. Material Certification	1  AWS/AISC- SSI ICC-SWSI	<i>Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes</i>	
3. Open Web Steel Joists	N/A	<i>Inspect installation, field welding and bridging of joists.</i>	
4. Bolting	4  AWS/AISC- SSI ICC-SWSI	<i>Periodic inspect installation and tightening of high-strength bolts. Verify that splines have separated from tension control bolts. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections.</i>	
5. Welding	4  AWS-CWI  ASNT	<i>Visually inspect all welds. Inspect pre-heat, post-heat and surface preparation between passes. Verify size and length of fillet welds. Continuous Ultrasonic testing of all full-penetration welds.</i>	
6. Shear Connectors	N/A  AWS/AISC- SSI ICC-SWSI	<i>Inspect size, number, positioning and welding of shear connectors. Inspect suds for full 360 degree flash. Ring test all shear connectors with a 3 lb hammer. Bend test all questionable studs to 15 degrees.</i>	
7. Structural Details	1  PE/SE	<i>Periodic inspect steel frame for compliance with structural drawings, including bracing, member configuration and connection details.</i>	
8. Metal Deck	N/A  AWS-CWI	<i>Inspect welding and side-lap fastening of metal roof and floor deck.</i>	
9. Other:			

## Cold-Formed Steel Framing

Item	Agency # (Qualif.)	Scope	
1. Member Sizes	1	<i>Review of material sizes.</i>	
2. Material Thickness	1	<i>Review of material thicknesses.</i>	
3. Material Properties	1	<i>Review of material properties.</i>	
4. Mechanical Connections	4	<i>Periodic inspection of all mechanical field connections.</i>	
5. Welding	4	<i>Periodic inspection of all welded field connections.</i>	
6. Framing Details	1	<i>Periodic Inspection of framing and details.</i>	
7. Trusses	N/A		
8. Permanent Truss Bracing	N/A		
9. Other:	N/A		

**Wind-Resisting Components**

Item	Agency #	Scope	
1. Contractor Statement of Responsibility	1	Prior to any work taking place, each contractor responsible for the construction of a wind-resisting material, system, or component shall submit a written statement of responsibility to the Special Inspector for distribution to the Building Official and Owner	
2. Wind-resisting components	1	Inspect the wind-resisting materials, systems, components, and connections listed below ensuring all items are installed in conformance with the project documents	

**Main Wind-Force Resisting System(s):**

Structural moment resistant steel frames along column grids B & C, and plywood shear walls located throughout the building structure as indicated.

**Wind-Resisting Components Subject to Continuous Special Inspections:**

Moment resistant frame welded connections, shear wall connection of plywood to metal studs, and hold down anchor installation.

**Wind-Resisting Components Subject to Periodic Special Inspections:**

Exterior light gage wall and roof framing details and connection of plywood diaphragm roof deck.

CONTRACTOR'S STATEMENT OF RESPONSIBILITY

PROJECT: Currituck Welcome Center

LOCATION: Currituck, NC

SCO ID#: 120956301

BUDGET CODE: 84210 ITEM: 7826 DATE:

OWNER: NC Department of Transportation

DESIGNER: JKF Architecture

PRIME CONTRACTOR:

CONTRACTOR RESPONSIBLE:

SYSTEM/COMPONENT: Wind-Resisting Components

I (we) acknowledge the special requirements outlined in the quality assurance plan. I (we) also acknowledge that control will be exercised to obtain conformance with the construction documents as approved by the Office of State Construction.

The following procedures will be established and strictly followed to maintain control within our organization:

Four horizontal lines for listing procedures.

The following reporting will be submitted to the Special Inspector, Owner and Office of State Construction at the following frequency:

Reporting method:

Frequency:

The following individuals(s) will be responsible for monitoring the procedures as set forth above:

Name:

Title:

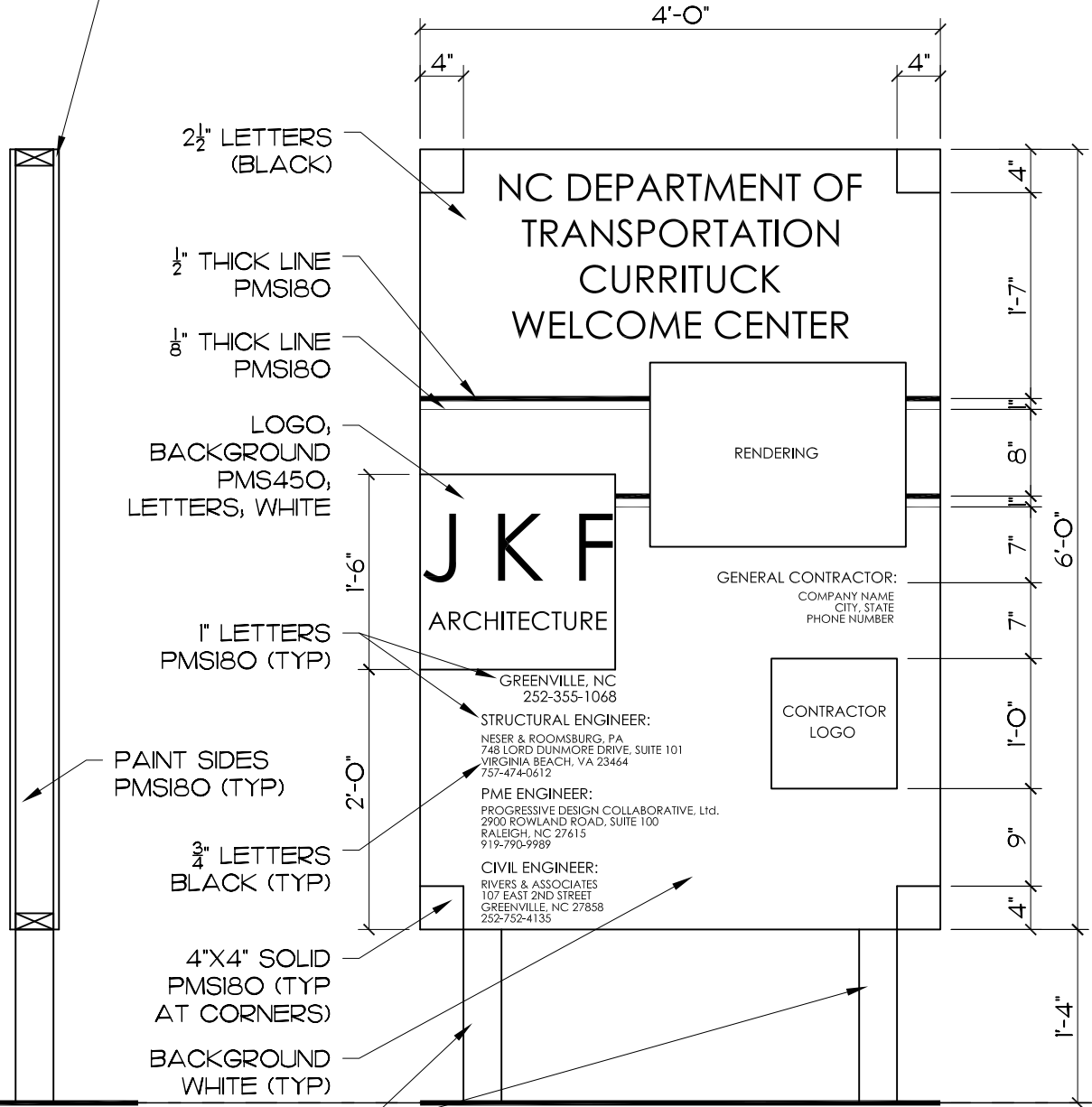
Qualifications:

Signed this \_\_\_ day of \_\_\_\_\_

Name

Title

3/4" GRADE B-B MEDIUM DENSITY OVERLAID EXTERIOR PLYWOOD. PROVIDE BOARD W. GRAPHICS ON BOTH SIDES OF FRAMING.



4"X4" PRESSURE TREATED POST PAINTED BLACK. EMBED INTO GROUND 48"

		NCDOT CURRITUCK WELCOME CENTER TOWN OF CURRITUCK, NC		DRAWN MCZ	SCALE 3/4"=1'-0"
		PROJECT SIGN		CHECKED JKF	DRAWING NO 015000
				DATE 6-26-2013	-6
				PROJECT NO. 2013-04	

P.O. BOX 20662  
 GREENVILLE, NC 27858  
 PHONE 252-355-1068

**SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
  - 1. Division 1 Section "Summary" for limitations on utility interruptions and other work restrictions.

## 1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

## 1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to Architect, **occupants of Project**, testing agencies, and authorities having jurisdiction.
- B. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.
- C. Sewer and Water Service: Provide a temporary water service to the site and pay for all utilization.

## 1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

## 1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.



**PART 2 - PRODUCTS**

## 2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum **2-inch**, 9-gage, galvanized steel, chain-link fabric fencing; minimum **6 feet** high with galvanized steel pipe posts; minimum **2-3/8-inch**- OD line posts and **2-7/8-inch**- OD corner and pull posts, with **1-5/8-inch**- OD top and bottom rails. Provide **galvanized steel** bases for supporting posts.
- B. Paint: Comply with requirements in Division 9 painting Sections.

## 2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading. Keep office clean and orderly. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of **10** individuals. Provide electrical power service and 120-V ac duplex receptacles. Furnish room with conference table, chairs, and **4-foot**- square tack board.
  - 3. Lighting fixtures capable of maintaining average illumination of **20 fc** at desk height.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
  - 1. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

**PART 3 - EXECUTION**

## 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

## 3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Heating **and Cooling**: Provide temporary heating **and cooling** required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
  - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install **one** telephone line(s) for each field office.
  - 1. Provide additional telephone lines for the following:
    - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.

## 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within **30 feet** of building lines. Comply with NFPA 241.
  - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Project Identification and Temporary Signs: Provide Project identification and other signs **as indicated on Drawings**. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

- C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
- E. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- F. Storm water Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rains.
- G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

#### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

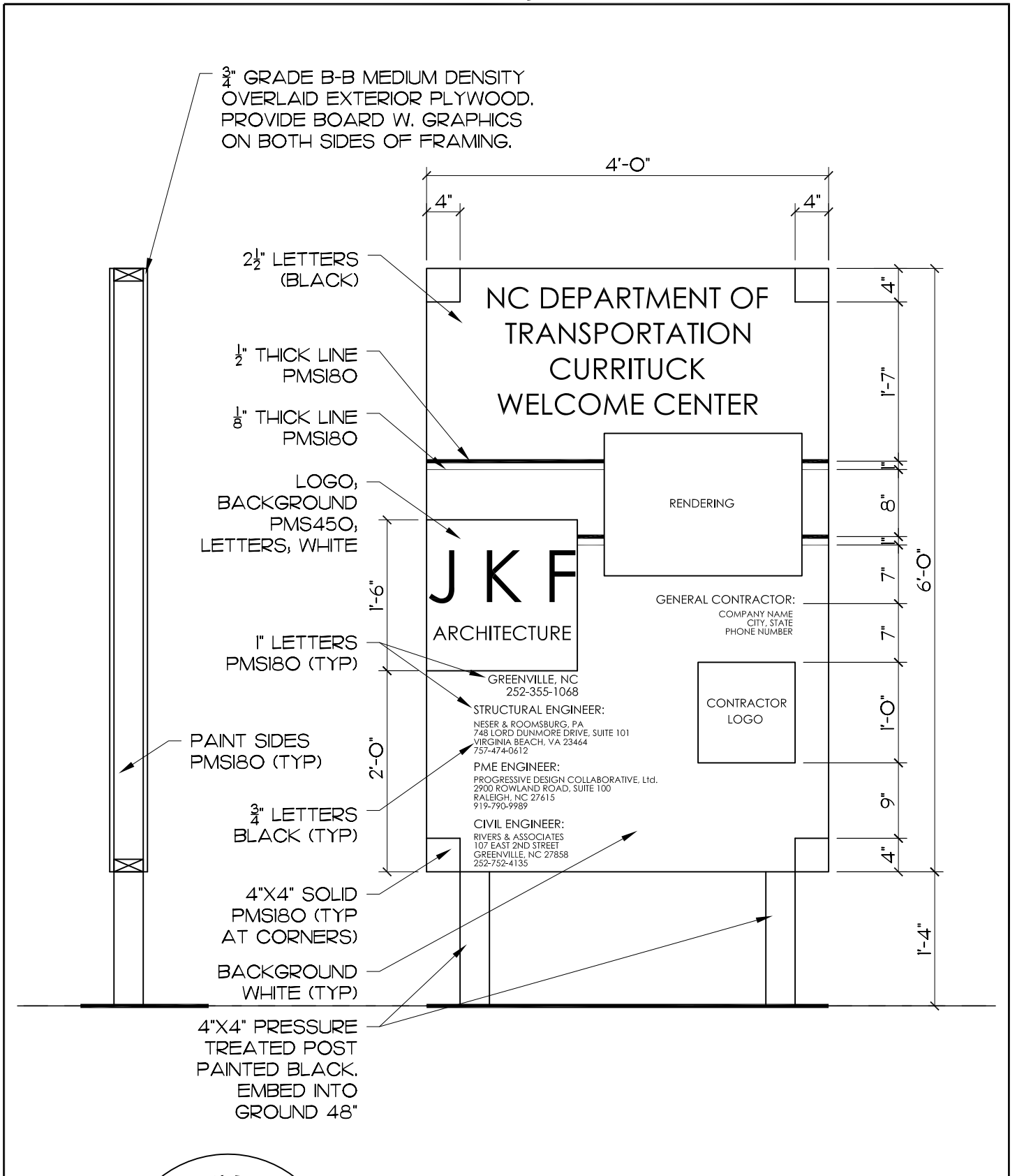
- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- C. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by **Owner** from fumes and noise.
- D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

#### 3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Pre-final inspection. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

3.6 PROJECT SIGN- As indicated in specification 015001.

**END OF SECTION 015000**



<p><b>JKF ARCHITECTURE</b></p> <p>P.O. BOX 20662 GREENVILLE, NC 27858 PHONE 252-355-1068</p>	<p><b>JOHN K. FARKAS</b> REGISTERED ARCHITECT 5922 NORTH CAROLINA GREENVILLE, N.C.</p>	<p>NCDOT CURRITUCK WELCOME CENTER TOWN OF CURRITUCK, NC</p>	<p>DRAWN <b>MCZ</b></p>	<p>SCALE <b>3/4"=1'-0"</b></p>
		<p>DRAWING TITLE <b>PROJECT SIGN</b></p>	<p>CHECKED <b>JKF</b></p>	<p>DRAWING NO <b>015000</b></p>
			<p>DATE <b>6-26-2013</b></p>	
			<p>PROJECT NO. <b>2013-04</b></p>	<p><b>-6</b></p>

**SECTION 016000 - PRODUCT REQUIREMENTS****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

## 1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

## 1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
  - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
  - 2. Form: Tabulate information for each product under the following column headings:
    - a. Specification Section number and title.
    - b. Generic name used in the Contract Documents.
    - c. Proprietary name, model number, and similar designations.
    - d. Manufacturer's name and address.
    - e. Supplier's name and address.
    - f. Installer's name and address.
    - g. Projected delivery date or time span of delivery period.
    - h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 10 days after date of award of the Work, submit **3** copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
  - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
4. Completed List: Within 10 days after approval of initial list by the Architect, submit **3** copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
5. Architect's Action: Architect will respond in writing to Contractor within 10 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
  - a. Form of Acceptance: Change Order.
  - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
  1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.
  3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  4. Store cementitious products and materials on elevated platforms.
  5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  7. Protect stored products from damage and liquids from freezing.
  8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## 1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
  3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

**PART 2 - PRODUCTS**

## 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
  4. Where products are accompanied by the term "as selected," Architect will make selection.
  5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- B. Product Selection Procedures:
1. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
  2. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.



- a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
- 3. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
  - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
  - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 PRODUCT SUBSTITUTIONS

- A. Conditions: Architect will consider Contractor's request for substitution within the first 30 days after Notice to Proceed only and only when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  - 2. Requested substitution does not require extensive revisions to the Contract Documents.
  - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - 4. Substitution request is fully documented and properly submitted.
  - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
  - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - 7. Requested substitution is compatible with other portions of the Work.
  - 8. Requested substitution has been coordinated with other portions of the Work.
  - 9. Requested substitution provides specified warranty.
  - 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

## **PART 3 - EXECUTION (Not Used)**

**END OF SECTION 016000**

**SECTION 017300 - EXECUTION****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. General installation of products.
  - 3. Progress cleaning.
  - 4. Starting and adjusting.
  - 5. Protection of installed construction.
  - 6. Correction of the Work.

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

## 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
  - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

## 3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

### 3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.4 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.5 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION 017300**

**SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL****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 administrative and procedural requirements for the following:
  - 1. Recycling nonhazardous **demolition and construction** waste.
  - 2. Disposing of nonhazardous **demolition and construction** waste.

## 1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

## 1.4 PERFORMANCE

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of **50** percent by weight of total waste generated by the Work.
  - 1. Demolition Waste:
    - a. Concrete.
    - b. Brick.
    - c. Concrete masonry units.
    - d. Wood studs.
    - e. Structural and miscellaneous steel.
    - f. Rough hardware.
    - g. Insulation.
    - h. Doors and frames.
    - i. Door hardware.

- j. Glazing.
- k. Metal studs.
- l. Gypsum board.
- m. Acoustical tile and panels.
- n. Carpet.
- o. Carpet pad.
- p. Plumbing fixtures.
- q. Piping.
- r. Supports and hangers.
- s. Valves.
- t. Mechanical equipment.
- u. Refrigerants.
- v. Electrical conduit.
- w. Copper wiring.
- x. Lighting fixtures.
- y. Lamps.
- z. Ballasts.
- aa. Electrical devices.
- bb. Switchgear and panelboards.
- cc. Transformers.

2. Construction Waste:

- a. Site-clearing waste.
- b. Masonry and CMU.
- c. Lumber.
- d. Metals.
- e. Insulation.
- f. Carpet and pad.
- g. Gypsum board.
- h. Piping.
- i. Electrical conduit.
- j. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
  - 1) Paper.
  - 2) Cardboard.
  - 3) Boxes.
  - 4) Plastic sheet and film.
  - 5) Polystyrene packaging.
  - 6) Wood crates.
  - 7) Plastic pails.

1.5 SUBMITTALS

- A. Waste Management Plan: Submit **3** copies of plan within **7** days of date established for **the Notice to Proceed**.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit **three** copies of report. Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in **tons**.
  - 4. Quantity of waste salvaged, both estimated and actual in **tons**.

5. Quantity of waste recycled, both estimated and actual in **tons**.
  6. Total quantity of waste recovered (salvaged plus recycled) in **tons**.
  7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit **three** copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

#### 1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

#### 1.7 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.



4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Forms: Prepare waste management plan on forms included at end of Part 3.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by **Architect**. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall **accrue to Contractor**.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
  1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

### 3.3 RECYCLING DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  1. Pulverize concrete to maximum **4-inch** size.
- B. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  1. Pulverize masonry to maximum **1-1/2-inch** size.
  2. Clean and stack undamaged, whole masonry units on wood pallets.
- C. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- D. Metals: Separate metals by type.
  1. Structural Steel: Stack members according to size, type of member, and length.
  2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- E. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
  1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- G. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  1. Store clean, dry carpet **and pad** in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- H. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- I. Plumbing Fixtures: Separate by type and size.
- J. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- K. Lighting Fixtures: Separate lamps by type and protect from breakage.
- L. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- M. Conduit: Reduce conduit to straight lengths and store by type and size.

## 3.4 RECYCLING CONSTRUCTION WASTE

- A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 1. Pulverize concrete to maximum **1-1/2-inch** size.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Pulverize masonry to maximum **3/4-inch** size.
  - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- E. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- F. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- G. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
  - 1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.
- H. Carpet **and Pad**: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet **and pad** in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- I. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- J. Plumbing Fixtures: Separate by type and size.
- K. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- L. Lighting Fixtures: Separate lamps by type and protect from breakage.
- M. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.
- N. Conduit: Reduce conduit to straight lengths and store by type and size.

## 3.5 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

**PART 4 - END OF SECTION 017419**

**SECTION 017700 - CLOSEOUT PROCEDURES****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Inspection procedures.
  2. Warranties.
  3. Final cleaning.

## 1.3 PRE-FINAL INSPECTION

- A. Preliminary Procedures: Before requesting inspection for determining date of Pre-final Inspection, complete the following. List items below that are incomplete in request.
1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  2. Advise Owner of pending insurance changeover requirements.
  3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
  6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Complete startup testing of systems.
  9. Submit test/adjust/balance records.
  10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  11. Advise Owner of changeover in heat and other utilities.
  12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  13. Complete final cleaning requirements, including touchup painting.
  14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for Pre-final inspection. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.
3. Architect will perform one reinspection.

#### 1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
  1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
  2. Complete previous punchlist
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Architect will perform one reinspection.

#### 1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Final Acceptance is indicated.
- B. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive **8-1/2-by-11-inch** paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
  4. Provide 6 copies in binders of all documents.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

**PART 2 - PRODUCTS**

## 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

**PART 3 - EXECUTION**

## 3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - k. Remove labels that are not permanent.
    - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

- n. Replace parts subject to unusual operating conditions.
  - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
  - r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

**END OF SECTION 017700**



**SECTION 017823 - OPERATION AND MAINTENANCE DATA****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Product maintenance manuals.
  - 5. Systems and equipment maintenance manuals.

## 1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

## 1.4 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
  - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.
  - 2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
  - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

## **PART 2 - PRODUCTS**

### **2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY**

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

### **2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS**

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.

3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold **8-1/2-by-11-inch** paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
  4. Supplementary Text: Prepared on **8-1/2-by-11-inch** white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

- a. If oversized drawings are necessary, fold drawings to same size as text pages and use as foldouts.
- b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

### 2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.
  5. Special operating instructions and procedures.

### 2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  2. Performance and design criteria if Contractor has delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.

10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.

3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

### **PART 3 - EXECUTION**

#### **3.1 MANUAL PREPARATION**

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of operation and maintenance manuals.
  - 2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."

- G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

**END OF SECTION 017823**



**SECTION 017839 - PROJECT RECORD DOCUMENTS****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.

## 1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit **one** set of marked-up Record Prints.
- B. Record Specifications: Submit **one copy** of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit **one copy** of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

**PART 2 - PRODUCTS**

## 2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
  - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or **Construction** Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

## 2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders and Record Drawings where applicable.

## 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

**PART 3 - EXECUTION**

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

**END OF SECTION 017839**

**SECTION 024116 - STRUCTURE DEMOLITION****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. Demolition and removal of buildings and site improvements.
  - 2. Removing below-grade construction.
  - 3. Disconnecting, capping or sealing, and removing site utilities.

## 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

## 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified refrigerant recovery technician.
- B. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Building Demolition Activities: Indicate the following:
  - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
  - 2. Shutoff and capping of utility services.
- D. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by demolition operations.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Owner assumes no responsibility for buildings and structures to be demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. On-site storage or sale of removed items or materials is not permitted.

1.8 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

**PART 2 - PRODUCTS**

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.

- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

### 3.2 PREPARATION

- A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.
- B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
  - 3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- C. Existing Utilities: See plumbing and electrical Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of demolition.

### 3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
  - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
  - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
  - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
  - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

### 3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
  - 2. Maintain fire watch during and for at least 4 hours after flame cutting operations.
  - 3. Maintain adequate ventilation when using cutting torches.
  - 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Explosives: Use of explosives is not permitted.

### 3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending 5 feet outside footprint indicated for new construction. Abandon below-grade construction outside this area.
  - 1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- C. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 5 feet outside footprint indicated for new construction. Abandon utilities outside this area.
  - 1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."
  - 2. Piping: Disconnect piping at unions, flanges, valves, or fittings.
  - 3. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.
- D. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
  - 1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
  - 2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

### 3.6 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

## 3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

## 3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Section 017419 "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

## 3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.
  - 1. Clean roadways of debris caused by debris transport.

**END OF SECTION 024116**



**SECTION 033000 - CAST-IN-PLACE CONCRETE****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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Slabs-on-grade.

## 1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Form materials and form-release agents.

4. Steel reinforcement and accessories.
5. Curing compounds.
6. Floor and slab treatments.
7. Bonding agents.
8. Adhesives.
9. Vapor retarders.
10. Semirigid joint filler.
11. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

#### 1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

- G. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete subcontractor.
  2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

### PART 2 - PRODUCTS

#### 2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

## 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  - 2. For slabs-on-grade, use plastic coated or stainless steel supports with sand plates or horizontal runners where base material will not support chair legs. Alternately, use concrete blocks having a compressive strength equal to or greater than the concrete being placed. Hooking of welded wire fabric is not permitted.

## 2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I or Type II.
    - a. Fly Ash: ASTM C 618, Class F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Water: ASTM C 94/C 94M and potable.

## 2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

## 2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class C or polyethylene sheet, ASTM D 4397, not less than 10 mils thick.. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

## 2.7 LIQUID FLOOR TREATMENTS

- A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

## 2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

## 2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

- D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use high-range water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

## 2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.58.
3. Slump Limit: 4 inches; 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

- B. Exterior Slabs and Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content for Exterior Slabs: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
5. Air Content for Interior Slabs: Do not allow air content of trowel-finished floors to exceed 3 percent.

## 2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
  - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

**PART 3 - EXECUTION**

## 3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
  - 2. Class C, 1/2 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Wet setting anchor rods and bolts is not permitted.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

### 3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

### 3.4 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

### 3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.



1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
  1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
  3. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. Saw joints shall be made no later than 12 hours after the initial concrete pour.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
  2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

## 3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## 3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
  - 1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

## 3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
  - 1. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
  - 1. Apply float finish to surfaces to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment

### 3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches,

and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

- a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
  - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
  - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
- a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.12 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Unless otherwise indicated, apply to interior concrete slabs not receiving a floor covering. Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
  1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  2. Do not apply to concrete that is less than 14 days' old.
  3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.
- B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

### 3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
  1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  2. After concrete has cured at least 14 days, correct high areas by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
  5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent

has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
  - 1. Steel reinforcement placement.
  - 2. Steel reinforcement welding.
  - 3. Headed bolts and studs.
  - 4. Verification of use of required design mixture.
  - 5. Concrete placement, including conveying and depositing.
  - 6. Curing procedures and maintenance of curing temperature.
  - 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
  - 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 6. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
  - 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

- a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
  - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
  9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
  10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
  12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

### 3.16 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

**END OF SECTION 033000**



**SECTION 042000 - MASONRY VENEER****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. Clay face brick.
  - 2. Mortar.
  - 3. Ties and anchors.
  - 4. Embedded flashing.
  - 5. Miscellaneous masonry accessories.

## 1.3 DEFINITIONS

## 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.5 SPECIAL REQUIREMENTS

- A. The Work of this Section shall be bid and provided as a single lump sum subcontract to the General Contractor (Square foot/ unit pricing of masonry labor and General Contractor furnished materials is not permitted). The Masonry Subcontractor shall be a firm, who specializes in masonry construction and shall furnish all materials, equipment, and labor required to complete the required masonry construction for this project.
- B. Additionally, the work of this section shall be bid and performed by a firm certified as a “North Carolina Masonry Contractors Association Certified Masonry Contractor” as described in the most current version of the NCMCA’s “Guide to Masonry Contractor Certification.” (North Carolina Masonry Contractors Association, PO Box 3463, Hickory, NC 28603-3463, (828) 324-1564, information@ncmca.com) . The masonry subcontractor shall at all times when work is in progress, provide an individual from its own staff designated by the North Carolina Masonry Contractors Association Masonry Contractor Certification Program as a “CMP-Certified Masonry Professional” or “CME-Certified Masonry Executive” (as described in the most current version of the NCMCA’s “Guide to Masonry Contractor Certification”) on-site to supervise work in progress.
- C. Lump Sum Masonry Contractors through the General Contractor, shall upon request of the Architect/ Owner provide evidence of at least 5 years experience with 5 projects of equivalent size and scope of experience performing work as a Lump Sum Masonry Contracting Firm.

- D. Masonry subcontractor shall not act as a broker, but shall perform the Work of this section with its own forces. Upon request of the Architect, General Contractor shall provide a copy of the Contract between General Contractor and Masonry Subcontractor (contract amounts may be omitted) indicating their contract is a lump sum contract.
- E. Definition: Lump Sum Masonry Subcontractor shall be a firm specializing in lump sum masonry contracting work and shall have been in masonry construction business for at least 5 years. Sub-subcontracting of masonry work is not permitted. The masonry subcontractor shall have a superintendent and crew chiefs (from its own staff) on site supervising all the masonry work.
  - 1. A listing of masonry contractors capable of providing a lump sum bid is available from the North Carolina Masonry Contractor's Association at 828-324-1564 (828-324-2179, fax) or on the Internet at [www.ncmca.com](http://www.ncmca.com).
- F. Daily preliminary cleaning of masonry is required for this project. The masonry subcontractor shall provide a person(s) to perform this task daily.
- G. If final cleaning of the masonry is to be subcontracted, the masonry subcontractor shall be responsible to supervise the cleaning operations, coordinate the type and application of cleaning materials in accordance with specific manufacturer's written recommendations. Masonry subcontractor shall certify to the Owner through the Architect that the proper cleaners were used, at the proper application rates, and complied with manufacturer's recommendations.

#### 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
- C. Samples for Initial Selection:
  - 1. Clay face brick, in the form of straps of five or more bricks.
  - 2. Weep holes/vents.
- D. Samples for Verification: For each type and color of the following:
  - 1. Clay face brick, in the form of straps of five or more bricks.
  - 2. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
  - 3. Weep holes and vents.
  - 4. Accessories embedded in masonry.

#### 1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Build mockups for typical exterior wall in sizes approximately **60 inches** long by **60 inches** high by full thickness, including face and backup wythes and accessories.
    - a. Include a sealant-filled joint at least **16 inches** long in mockup.

- b. Include lower corner of window opening, framed with stone trim, at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
  - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
  - d. Include wood studs, sheathing, water-resistive barrier sheathing joint-and-penetration treatment, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.
- 2. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
  - 3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
  - 4. Protect accepted mockups from the elements with weather-resistant membrane.
  - 5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down face of veneer, and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

### 2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

### 2.3 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
  1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
  2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
  4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Clay Face Brick: Facing brick complying with ASTM C 216.

1. **Products:** Subject to compliance with requirements, provide the following:
  - a. Taylor Clay Products.
  - b. Belden Brick
  - c. Statesville Brick Company
2. Grade: SW.
3. Type: FBX.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet.
7. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
8. Color and Texture: As selected by Architect from full range of red, smooth face bricks.

2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
  1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Mortar Cement: ASTM C 1329/C 1329M.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- G. Water: Potable.

2.5 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Tie Section: Triangular-shaped wire tie made from **0.25-inch-** diameter, hot-dip galvanized steel wire.
- D. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist a **100-lbf** load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of **1/16 inch**.
  2. Fabricate sheet metal anchor sections and other sheet metal parts from **0.105-inch-** thick steel sheet, galvanized after fabrication.
  3. Fabricate wire ties from **0.25-inch-** diameter, hot-dip galvanized-steel wire unless otherwise indicated.
  4. Fabricate wire connector sections from **0.25-inch-** diameter, hot-dip galvanized, carbon-steel wire.
  5. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
  6. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a sheet metal anchor section, **1-1/4 inches** wide by **6 inches** long, with screw holes top and bottom and with raised rib-stiffened strap, **5/8 inch** wide by **3-5/8 inches** long, stamped into center to provide a slot between strap and base for inserting wire tie.

## 2.6 EMBEDDED FLASHING MATERIALS

- A. Laminated Stainless Steel Fabric Flashing. Non-asphaltic: Use the following unless otherwise indicated:
1. Stainless steel core with polymer fabric laminated to one stainless steel face with non-asphalt adhesive. Stainless steel type: 304, ASTM A167. Fabric: polymer fabric; laminated back face of stainless steel core
    - a. **Products:** Subject to compliance with requirements, provide one of the following:
      - 1) [York Manufacturing, Inc.](#); Multi-Flash SS
      - 2) [STS Coatings, Inc.](#); Gorilla Flash Stainless Fabric
      - 3) [Illinois Products, Inc.](#); IPCO Stainless Steel Fabric Flashing
      - 4) [TK Products, Inc.](#); TK TWF
    - b. Accessories: Form the stainless steel flashing in the field or use 26 gauge stainless steel pre-manufactured corners.
- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from urethane.

- B. Weep/Vent Products: Use the following unless otherwise indicated:
1. Vinyl Weep Hole/Vent: Units made from flexible PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.
    - a. **Products:** Subject to compliance with requirements, provide one of the following:
      - 1) **Hohmann & Barnard, Inc.**; #343 Weep Hole.
      - 2) **Williams Products, Inc.**; Williams-Goodco Brick Vent.
      - 3) **Wire-Bond**; Louvered Weep Holes.
- C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. **Products:** Subject to compliance with requirements, provide one of the following:
    - a. **Advanced Building Products Inc.**; Mortar Break.
    - b. **Archovations, Inc.**; CavClear Masonry Mat.
    - c. **Heckmann Building Products Inc.**; Weep-Thru Mortar Deflector.
    - d. **Hohmann & Barnard, Inc.**; Mortar Trap.
    - e. **Mortar Net USA, Ltd.**; Mortar Net.
    - f. **Wire-Bond**; Cavity Net II
  2. Configuration: Provide one of the following:
    - a. Strips, full depth of cavity and **10 inches** high, with dovetail-shaped notches **7 inches** deep that prevent clogging with mortar droppings.

## 2.8 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

## 2.9 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
  2. Use portland cement-lime mortar unless otherwise indicated.
  3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, **[Property]** Specification. Use Type N unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds **30 g/30 sq. in.** per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

#### 3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
  1. For dimensions in cross section or elevation, do not vary by more than plus **1/2 inch** or minus **1/4 inch**.
  2. For location of elements in plan, do not vary from that indicated by more than plus or minus **1/2 inch**.
  3. For location of elements in elevation, do not vary from that indicated by more than plus or minus **1/4 inch** in a story height or **1/2 inch** total.
- B. Lines and Levels:
  1. For bed joints and top surfaces of bearing walls, do not vary from level by more than **1/4 inch in 10 feet**, or **1/2 inch** maximum.
  2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than **1/8 inch in 10 feet**, **1/4 inch in 20 feet**, or **1/2 inch** maximum.
  3. For vertical lines and surfaces, do not vary from plumb by more than **1/4 inch in 10 feet**, **3/8 inch in 20 feet**, or **1/2 inch** maximum.



4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch** maximum.
5. For lines and surfaces, do not vary from straight by more than **1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch** maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than **1/4 inch in 10 feet, or 1/2 inch** maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than **1/16 inch** except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus **1/8 inch**, with a maximum thickness limited to **1/2 inch**.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than **1/8 inch**.
3. For head and collar joints, do not vary from thickness indicated by more than plus **3/8 inch** or minus **1/4 inch**.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch**. Do not vary from adjacent bed-joint and head-joint thicknesses by more than **1/8 inch**.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than **1/16 inch** from one masonry unit to the next.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in; do not use units with less-than-nominal **4-inch** horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
  1. At anchors and ties, fully bed units and fill cells with mortar as needed to fully embed anchors and ties in mortar.
- B. Set cast-stone trim units in full bed of mortar with full vertical joints.
  1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  2. Allow cleaned surfaces to dry before setting.

3. Wet joint surfaces thoroughly before applying mortar.
  4. Rake out mortar joints for pointing with sealant.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
1. For glazed masonry units, use a nonmetallic jointer **3/4 inch** or more in width.

### 3.6 ANCHORED MASONRY VENEERS

- A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:
1. Fasten screw-attached anchors through sheathing to wall framing with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  2. Embed tie sections in masonry joints.
  3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  4. Space anchors as indicated, but not more than **16 inches** o.c. vertically and **18 inches** o.c. horizontally, with not less than one anchor for each **2 sq. ft.** of wall area. Install additional anchors within **12 inches** of openings and at intervals, not exceeding **8 inches**, around perimeter.
- B. Provide not less than **2 inches** of airspace between back of masonry veneer and face of insulation.
1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

### 3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete to comply with the following:
1. Provide an open space not less than **1/2 inch** wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  3. Space anchors as indicated, but not more than **24 inches** o.c. vertically and **36 inches** o.c. horizontally.

### 3.8 EXPANSION JOINTS

- A. General: Install expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form expansion joints as follows:
1. Build flanges of metal expansion strips into masonry. Lap each joint **4 inches** in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
  2. Build flanges of factory-fabricated, expansion-joint units into masonry.
  3. Build in compressible joint fillers where indicated.
  4. Form open joint full depth of brick wythe and of width indicated, but not less than **3/8 inch** for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

- C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than **3/8 inch**.
  - 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

### 3.9 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape.
  - 2. Extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least **8 inches**; with upper edge tucked under water-resistive barrier, lapping at least **4 inches**.
  - 3. At lintels and shelf angles, extend flashing a minimum of **6 inches** into masonry at each end. At heads and sills, extend flashing **6 inches** at ends and turn up not less than **2 inches** to form end dams.
  - 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than **1-1/2 inches** or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
  - 5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- E. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
  - 1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

### 3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.
  - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- C. Testing Prior to Construction: One set of tests.

- D. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

### 3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
  7. Clean stone trim to comply with stone supplier's written instructions.
  8. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

### 3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

**END OF SECTION 042613**

**SECTION 047200 - CAST STONE MASONRY****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. Cast-stone trim.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- 1. For cast-stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. Shop Drawings: Show fabrication and installation details for cast-stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

- 1. Include building elevations showing layout of units and locations of joints and anchors.

- C. Samples for Initial Selection: For colored mortar.

- D. Samples for Verification:

- 1. For each color and texture of cast stone required, 10 inches square in size.
- 2. For each trim shape required, 10 inches in length.
- 3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project.

- E. Full-Size Samples: For each shape of cast-stone unit required.

- 1. Make available for Architect's review at Project site.
- 2. Approved Samples may be installed in the Work.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

- B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

- 1. Provide test reports based on testing within previous two years.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast-stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute or the Precast/Prestressed Concrete Institute for Group A, Category AT.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Mockups: Furnish cast stone for installation in mockups specified in Section 043313.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast-stone units in suitable packs or pallets.
  - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast-stone units if required, using dollies with wood supports.
  - 2. Store cast-stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

## 1.7 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602/ACI 530.1/ASCE 6.

**PART 2 - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Source Limitations for Cast Stone: Obtain cast-stone units from single source from single manufacturer.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

## 2.2 CAST-STONE MATERIALS

- A. General: Comply with ASTM C 1364.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast-stone color indicated.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33/C 33M; gradation and colors as needed to produce required cast-stone textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33/C 33M, gradation and colors as needed to produce required cast-stone textures and colors.
- E. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
- F. Admixtures: Use only admixtures specified or approved in writing by Architect.
  - 1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
  - 2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
  - 3. Air-Entraining Admixture: ASTM C 260/C 260M.
  - 4. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 5. Water-Reducing, Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 6. Water-Reducing, Accelerating Admixture: ASTM C 494/C 494M, Type E.
- G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast-stone material.
  - 1. Epoxy Coating: ASTM A 775/A 775M.
  - 2. Galvanized Coating: ASTM A 767/A 767M.
- H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

## 2.3 CAST-STONE UNITS

- A. Cast-Stone Units: Comply with ASTM C 1364.
  - 1. Units shall be manufactured using the vibrant dry tamp or wet-cast method.
  - 2. Units shall be resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
  - 1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
  - 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
  - 3. Provide drips on projecting elements unless otherwise indicated.
- C. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

D. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:
  - a. No fewer than five days at mean daily temperature of 70 deg F or above.
  - b. No fewer than six days at mean daily temperature of 60 deg F or above.
  - c. No fewer than seven days at mean daily temperature of 50 deg F or above.
  - d. No fewer than eight days at mean daily temperature of 45 deg F or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

F. Colors and Textures: As selected by Architect from manufacturer's full range.

## 2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
  1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
  2. Pigments shall not exceed 10 percent of portland cement by weight.
  3. Pigments shall not exceed 5 percent of [masonry cement] [or] [mortar cement] by weight.
- F. Water: Potable.

## 2.5 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- B. Dowels: 1/2-inch- diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.



- C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast-stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

## 2.6 MORTAR MIXES

- A. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Use portland cement-lime mortar unless otherwise indicated.
- B. Comply with ASTM C 270, Proportion Specification.
  - 1. For setting mortar, use Type S.
  - 2. For pointing mortar, use Type N.
- C. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
  - 1. Mix to match Architect's sample.
  - 2. Application: Use colored-aggregate mortar for exposed mortar joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 SETTING CAST STONE IN MORTAR

- A. Install cast-stone units to comply with requirements in Section 044313.
- B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.
  - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
  - 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- D. Set units in full bed of mortar with full head joints unless otherwise indicated.
  - 1. Set units with joints 1/4 to 3/8 inch wide unless otherwise indicated.
  - 2. Build anchors and ties into mortar joints as units are set.
  - 3. Fill dowel holes and anchor slots with mortar.

4. Fill collar joints solid as units are set.
  5. Build concealed flashing into mortar joints as units are set.
  6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.
  7. Keep joints at shelf angles open to receive sealant.
- E. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- F. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- G. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.
- H. Rake out joints for pointing with sealant to depths of not less than 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.
- I. Point joints with sealant to comply with applicable requirements in Section 079200 "Joint Sealants."
1. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- J. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.
1. Keep joints free of mortar and other rigid materials.
  2. Build in compressible foam-plastic fillers where indicated.
  3. Form joint of width indicated, but not less than 3/8 inch.
  4. Prime cast-stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
  5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

### 3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

### 3.4 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
  - 1. Remove mortar fins and smears before tooling joints.
  - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
  - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
  - 5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  - 6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

**END OF SECTION 047200**

**SECTION 051200 - STRUCTURAL STEEL FRAMING****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:

- 1. Structural steel.
- 2. Grout.

- B. Related Requirements:

- 1. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.

## 1.3 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

## 1.4 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## 1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.

2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
  1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  2. Direct-tension indicators.
  3. Shop primers.
  4. Nonshrink grout.
- F. Source quality-control reports.
- G. Field quality-control and special inspection reports.

#### 1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- C. Comply with applicable provisions of the following specifications and documents:
  1. AISC 303.
  2. AISC 360.
  3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
  - 1. Select and complete connections using AISC 360.
- B. Moment Connections: Type FR, fully restrained.
- C. Construction: Combined system of moment frame and shear walls.

### 2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels and Angles-Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
  - 1. Weight Class: Standard.
  - 2. Finish: Black except where indicated to be galvanized.
- F. Welding Electrodes: Comply with AWS requirements.

### 2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
  - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
  - 1. Nuts: ASTM A 563 hex carbon steel.
  - 2. Plate Washers: ASTM A 36/A 36M carbon steel.

3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Plain.

C. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 [heavy-]hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened.
3. Finish: Plain.

## 2.4 PRIMER

- A. Primer for interior steel not exposed to public view: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Primer for exterior steel, steel in exterior walls not galvanized and steel exposed to public view: SSPC-Paint 22, epoxy polyamide primer complying with MPI#79 and compatible with topcoat.
- C. Galvanizing Repair Paint: ASTM A 780/A 780M.

## 2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
  1. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  2. Mark and match-mark materials for field assembly.
  3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Exposed Structural Steel: Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for exposed structural steel.
  1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
  2. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- D. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

## 2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
  - 3. Surfaces of high-strength bolted, slip-critical connections.
  - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
  - 5. Galvanized surfaces.
  - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning." For interior steel not exposed to public view.
  - 1. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." For exterior steel, steel in exterior walls, and steel exposed to public view.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. For exterior steel, steel in exterior walls, and steel exposed to public view, immediately after surface preparation, apply epoxy polyamide primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 3.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.



2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

## 2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
  1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
  2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

## 2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
  1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: In addition to visually inspection, shop-welded connections will be tested according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
  1. Liquid Penetrant Inspection: ASTM E 165.
  2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
  3. Ultrasonic Inspection: ASTM E 164.
  4. Radiographic Inspection: ASTM E 94.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates and Bearing Plates: Clean concrete- bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
  - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
  2. Verify weld materials and inspect welds.
  3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.

### 3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  2. Apply a compatible primer of same type as shop primer used on adjacent surfaces

**END OF SECTION 051200**

**SECTION 054000 - COLD-FORMED METAL FRAMING****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

## A. Section Includes:

- 1. Load-bearing wall framing.
- 2. Roof rafter framing.

## B. Related Requirements:

- 1. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
- 2. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.

## B. Shop Drawings:

- 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
- 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.

## B. Welding certificates.

- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

- 1. Steel sheet.

2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
  1. Design Loads: As indicated.
  2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height using a 10 year storm wind load.
    - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 10 lbf/sq. ft..
    - c. Roof Rafter Framing: Vertical deflection of 1/360 of the horizontally projected span for live loads.
  3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
- B. Cold-Formed Steel Framing Design Standards:

1. Floor and Roof Systems: AISI S210.
  2. Wall Studs: AISI S211.
  3. Headers: AISI S212.
  4. Lateral Design: AISI S213.
- C. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- 2.2 COLD-FORMED STEEL FRAMING, GENERAL
- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
  2. Coating: G90 or equivalent.
- 2.3 LOAD-BEARING WALL FRAMING
- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0566 inch.
  2. Flange Width: 1-5/8 inches.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
1. Minimum Base-Metal Thickness: Matching steel studs.
  2. Flange Width: 1-1/4 inches.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch.
  2. Flange Width: 1-5/8 inches.
- 2.4 ROOF-RAFTER FRAMING
- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges as indicated on the drawings.
- 2.5 FRAMING ACCESSORIES
- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing
  2. Roof over-framing.
  3. Bracing, bridging, and solid blocking.
  4. Web stiffeners.
  5. Anchor clips.
  6. End clips.
  7. Foundation clips.
  8. Gusset plates.
  9. Stud kickers and knee braces.
  10. Joist hangers and end closures.
  11. Hole reinforcing plates.
  12. Backer plates.

## 2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.8 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
  - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.



- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
  - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
  - 1. Cut framing members by sawing or shearing; do not torch cut.
  - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
  - 1. Anchor Spacing: 24 inches.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
  - 1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- E. Anchor studs to supporting structure as indicated.
- F. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
  - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
  - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- G. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
  - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- H. Install horizontal bridging in stud system, spaced vertically as indicated. Fasten at each stud intersection.
  - 1. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- I. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.5 JOIST INSTALLATION

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists as indicated.

1. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
  1. Joist Spacing: As indicated.
- D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated.
  1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:
  1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

### 3.6 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

### 3.7 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

**END OF SECTION 054000**

**SECTION 055000 - METAL FABRICATIONS****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Metal bollards.
4. Steel ladder.

## 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## 1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  1. Steel framing and supports for mechanical and electrical equipment.
  2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  3. Metal bollards.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

#### 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

### **PART 2 - PRODUCTS**

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

#### 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

#### 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  1. Provide stainless-steel fasteners for fastening aluminum.
  2. Provide stainless-steel fasteners for fastening stainless steel.
  3. Provide stainless-steel fasteners for fastening nickel silver.

## 2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- D. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

## 2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

## 2.7 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Prime bollards with zinc-rich primer.

## 2.8 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.9 METAL LADDERS

- A. General:
  - 1. Comply with ANSI A14.3.
- B. Steel Ladders:
  - 1. Space siderails 16 inches apart unless otherwise indicated.
  - 2. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
  - 3. Rungs: 3/4-inch- square steel bars.
  - 4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
7. Galvanize and prime ladders, including brackets.
8. Prime ladders, including brackets and fasteners, with zinc-rich primer.

## 2.10 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  1. Shop prime with universal shop primer unless indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:



1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

### 3.3 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
1. Do not fill removable bollards with concrete.
- B. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- C. Fill bollards solidly with concrete, mounding top surface to shed water.
1. Do not fill removable bollards with concrete.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

**END OF SECTION 055000**

**SECTION 055213 - PIPE AND TUBE RAILINGS****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. Stainless-steel pipe and tube railings.

## 1.3 COORDINATION

- A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Manufacturer's product lines of mechanically connected railings.
  - 2. Railing brackets.
  - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Shop Drawings shall be signed and sealed by a NC Professional Engineer.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- D. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- E. Evaluation Reports: For post-installed anchors , from ICC-ES.

## 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

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

## 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

**PART 2 - PRODUCTS**

## 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails and Top Rails of Guards:
    - a. Uniform load of 50 lbf/ ft. applied in any direction.
    - b. Concentrated load of 200 lbf applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Infill of Guards:
    - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
    - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F.

## 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

### 2.3 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 304.
- B. Pipe: ASTM A 312/A 312M, Grade TP 304.
- C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
- D. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

### 2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
  - 1. For stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
  - 1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

### 2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.

- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form Changes in Direction as Follows:
  - 1. As detailed.
  - 2. By flush bends or by inserting prefabricated flush-elbow fittings.
- J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
  - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- P. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

## 2.6 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines, or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
- D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

**PART 3 - EXECUTION**

## 3.1 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
  - 1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

## 3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

## 3.3 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.4 ADJUSTING AND CLEANING

- A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

3.5 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

**END OF SECTION 055213**

**SECTION 061000 - ROUGH CARPENTRY****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. Framing with dimension lumber.
  - 2. Framing with timber.
  - 3. Framing with engineered wood products.
  - 4. Wood blocking and nailers.
  - 5. Wood furring.
  - 6. Wood sleepers.

## 1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
  - 1. SPIB: The Southern Pine Inspection Bureau.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.



## 1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

**PART 2 - PRODUCTS**

## 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
  4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: **19 percent** unless otherwise indicated.
- C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

## 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; **Use Category UC3b for exterior construction not in contact with the ground.**
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
  3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
  5. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 DIMENSION LUMBER FRAMING

- A. Load-Bearing Partitions: Construction or No. 2 grade.
1. Application: Exterior walls where indicated.
  2. Species:
    - a. Southern pine; SPIB.
    - b. Mixed southern pine; SPIB.
    - c. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- B. Ceiling Joists: Construction or No. 2 grade.
1. Species:
    - a. Southern pine; SPIB.
    - b. Mixed southern pine; SPIB.
    - c. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. Joists, Rafters, and Other Framing Not Listed Above: Construction or No. 2 grade.
1. Species:
    - a. Southern pine; SPIB.
    - b. Mixed southern pine; SPIB.
    - c. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

## 2.4 TIMBER FRAMING

- A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:
1. Species and Grade: Southern pine; **No. 2** grade; SPIB.
  2. Maximum Moisture Content: 19 percent.

## 2.5 ENGINEERED WOOD PRODUCTS

- A. Engineered Wood Products, General: Products shall **contain no urea formaldehyde**. Source Limitations: Obtain each type of engineered **wood product from single source** from a single manufacturer.
- B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559. Members shall be Architectural Appearance Grade, sealed with a penetrating sealer for exterior above grade use, and bundle wrapped as standard with the manufacturer and approved. Members shall be complete with hardware for joining laminated members and for their connection to other construction.
1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal- depth members.
  2. Modulus of Elasticity, Edgewise: 2,200,000 psi.

## 2.6 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
  3. Rooftop equipment bases and support curbs.
  4. Cants.
  5. Furring.
  6. Grounds.
- B. For items of dimension lumber size, provide **No. 2** grade lumber **and the following species**:
1. Mixed southern pine; SPIB.

## 2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners **with hot-dip zinc coating complying with ASTM A 153/A 153M**. Exposed to view connections shall be made with **Type 304 stainless steel**.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

## 2.8 METAL FRAMING ANCHORS

- A. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those **indicated**. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
  - 1. Use for wood-preservative-treated lumber and where indicated.
- D. Stainless-Steel Sheet: ASTM A 666, **Type 316**.
  - 1. Use for exterior locations and where exposed connections indicated.
- E. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base. Capacity of hold-down anchors shall be as indicated.

## 2.9 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

**PART 3 - EXECUTION**

## 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

## 3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

### 3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**END OF SECTION 061000**

**SECTION 061516 - WOOD ROOF DECKING****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 solid-sawn wood roof decking
- B. Related Requirements:
  - 1. Section 061000 "Rough Carpentry" for dimension lumber items associated with wood roof decking.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For preservative-treated wood products, include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

## 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of wood roof decking to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood roof decking with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

**PART 2 - PRODUCTS**

## 2.1 WOOD ROOF DECKING, GENERAL

- A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Regional Materials: Wood roof decking shall be manufactured within 500 miles of Project site.

## 2.2 SOLID-SAWN WOOD ROOF DECKING

- A. Standard for Solid-Sawn Wood Roof Decking: Comply with AITC 112.
- B. Roof Decking Species: Southern pine.
- C. Roof Decking Nominal Size: 2 by 6.
- D. Roof Decking Grade: Commercial Decking.
- E. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that are not exposed to view.
- F. Moisture Content: Provide wood roof decking with 19 percent maximum moisture content at time of dressing.
- G. Face Surface: Smooth.
- H. Edge Pattern: Vee grooved.

## 2.3 PRESERVATIVE TREATMENT

- A. Pressure treat wood roof decking according to AWWA U1; Use Category UC3B.
- B. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  - 1. For exposed items indicated to receive a stained or natural finish, use products that do not contain colorants, bleed through, or otherwise adversely affect finishes.
- C. Use process that does not include water repellents or other substances that might interfere with application of indicated finishes.
- D. After treatment, redry materials to 19 percent maximum moisture content.

## 2.4 ACCESSORY MATERIALS

- A. Fasteners for Solid-Sawn Roof Decking: Provide fastener size and type complying with AITC 112 for thickness of deck used.
- B. Nails: Common; complying with ASTM F 1667, Type I, Style 10.



- C. Spikes: Round; complying with ASTM F 1667, Type III, Style 3.
- D. Fastener Material: Hot-dip galvanized steel.
- E. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Section 079200 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.
  - 1. Sealants shall have a VOC content of 250 g/L or less.
- F. Penetrating Sealer: Clear sanding sealer complying with Section 099300 "Staining and Transparent Finishing" and compatible with topcoats specified for use over it.
  - 1. Sealers shall have a VOC content of 350 g/L or less.

## 2.5 FABRICATION

- A. Shop Fabrication: Where preservative-treated roof decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.
- B. Predrill roof decking for lateral spiking to adjacent units to comply with AITC 112.
- C. Seal Coat: After fabricating and surfacing roof decking, apply a saturation coat of penetrating sealer.
- D. Apply indicated finish materials to comply with Section 099300 "Staining and Transparent Finishing" in fabrication shop.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine support framing in areas to receive wood roof decking for compliance with installation tolerances and other conditions affecting performance of wood roof decking.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install solid-sawn wood roof decking to comply with AITC 112.
  - 1. Locate end joints for two-span continuous lay-up.
- B. Where preservative-treated roof decking must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.
  - 1. For solid-sawn roof decking, use inorganic boron (SBX).
- C. Apply joint sealant to seal roof decking at exterior walls at the following locations:
  - 1. Between roof decking and supports located at exterior walls.
  - 2. Between roof decking and exterior walls that butt against underside of roof decking.

3. Between tongues and grooves of roof decking over exterior walls and supports at exterior walls.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged roof decking if repairs are not approved by Architect.

3.4 PROTECTION

- A. Provide water-resistive barrier over roof decking as the Work progresses to protect roof decking until roofing is applied.
- B. If, despite protection, roof decking becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**END OF SECTION 061516**

**SECTION 061600 - SHEATHING****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. Wall sheathing.
  - 2. Roof sheathing.
  - 3. Sheathing joint and penetration treatment.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

**PART 2 - PRODUCTS**

## 2.1 WOOD PANEL PRODUCTS

- A. Plywood: DOC PS 1.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

## 2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground;
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat all plywood used with roofing, flashing, vapor barriers, and waterproofing.

## 2.3 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior, Structural I sheathing.
  - 1. Span Rating: Not less than 16/0.
  - 2. Nominal Thickness: Not less than 5/8 inch.

## 2.4 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
  - 1. Span Rating: Not less than 24/0.
  - 2. Nominal Thickness: Not less than 3/4 inch.

## 2.5 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Subflooring: Exterior, Structural I single-floor panels or sheathing.
  - 1. Span Rating: Not less than 16 o.c..
  - 2. Nominal Thickness: Not less than 23/32 inch.

## 2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. NES NER-272 for power-driven fasteners.
  2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.
  1. .

**END OF SECTION 061600**

**SECTION 062013 - EXTERIOR FINISH CARPENTRY****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. Exterior wood trim.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- C. Samples for Verification:
  - 1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Compliance Certificates:
  - 1. For lumber that is not marked with grade stamp.
- B. Sample Warranties: For manufacturer's warranties.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

## 1.6 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
  - 1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

### 2.2 EXTERIOR TRIM

- A. Lumber Trim for Clear Finish:
  - 1. Species and Grade: Western red cedar, Clear Heart VG (Vertical Grain); NLGA, WCLIB, or WWPA.
  - 2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
  - 3. Finger Jointing: Not allowed.
  - 4. Face Surface: Surfaced (smooth).

### 2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
  - 1. For applications not otherwise indicated, provide hot-dip galvanized-steel fasteners.
- B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.
- C. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Section 079200 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.

### 2.4 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

**PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

## 3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

## 3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install flat-grain lumber with bark side exposed to weather.
- B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.
  - 1. Use scarf joints for end-to-end joints.
  - 2. Stagger end joints in adjacent and related members.
- C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.



## 3.5 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

## 3.6 CLEANING

- A. Clean exterior finish carpentry on exposed and semiexposed surfaces.

## 3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
  - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 062013**

**SECTION 062023 - INTERIOR FINISH CARPENTRY****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:

- 1. Interior trim.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
- B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.
- C. Samples for Verification:
  - 1. For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. for lumber and 8 by 10 inches for panels.

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

## 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and the following grading rules:
  1. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
- B. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
  1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
- C. Softwood Plywood: DOC PS 1.
- D. Hardboard: AHA A135.4.

### 2.2 INTERIOR TRIM

- A. Lumber Trim for Opaque Finish (Painted Finish):
  1. Species and Grade: Eastern white pine, D Select; NeLMA or NLGA.
  2. Species and Grade: White woods, D Select; WWPA.
  3. Species and Grade: Douglas fir-larch or Douglas fir south, Superior or C & Btr finish; NLGA, WCLIB, or WWPA.
  4. Maximum Moisture Content: 19 percent.
  5. Finger Jointing: Allowed.
  6. Face Surface: Surfaced (smooth).
- B. Moldings for Opaque Finish (Painted Finish): Made to patterns included in WMMPA WM 12.
  1. Softwood Moldings: WMMPA WM 4, P grade.
    - a. Species: Same as noted for Lumber Trim.
    - b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
  2. Hardwood Moldings: WMMPA HWM 2, P-grade.
    - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
    - b. Maximum Moisture Content: 9 percent.
  3. Finger Jointing: Allowed.
  4. Base Pattern: As indicated.
  5. Shoe-Mold Pattern: WM 129, 7/16-by-11/16-inch quarter-round shoe mold.

- 6. Casing Pattern: As indicated.

### 2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
  - 1. Wood glue shall have a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
  - 1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### 2.4 FABRICATION

- A. Back out or kerf backs of the following members except those with ends exposed in finished work:
  - 1. Interior standing and running trim except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

### 3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
  - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
  - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

### 3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
  - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
  - 2. Install trim after gypsum-board joint finishing operations are completed.
  - 3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

### 3.5 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

### 3.6 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

### 3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 062023**

**SECTION 064113 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS****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. Architectural wood cabinets.
- 2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
- 3. Shop finishing of architectural wood cabinets.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including cabinet hardware and accessories and finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show details full size.
  - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural wood cabinets.
  - 4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
  - 5. Apply AWI Quality Certification Program label to Shop Drawings.
- C. Samples for Initial Selection:
  - 1. Shop-applied transparent finishes.
- D. Samples for Verification:
  - 1. Lumber for transparent finish, not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.
  - 2. Veneer leaves representative of and selected from flitches to be used for transparent-finished cabinets.
  - 3. Exposed cabinet hardware and accessories, one unit for each type and finish.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

#### 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: 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. Shop is a certified participant in AWI's Quality Certification Program.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

#### 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

#### 1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.

### **PART 2 - PRODUCTS**

#### 2.1 ARCHITECTURAL CABINET FABRICATORS

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood veneers.



## 2.2 ARCHITECTURAL WOOD CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
1. Provide certificates from AWI certification program indicating that woodwork complies with requirements of grades specified.
  2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

## 2.3 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Type of Construction: Frameless.
- C. Cabinet and Door and Drawer Front Interface Style: Flush overlay.
- D. Reveal Dimension: 1/2 inch.
- E. Wood for Exposed Surfaces:
1. Species: White birch.
  2. Cut: Quarter cut/quarter sawn.
  3. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
  4. Matching of Veneer Leaves: Book match.
  5. Veneer Matching within Panel Face: Running match.
  6. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
  7. Comply with veneer and other matching requirements indicated for blueprint-matched paneling.
- F. Semiexposed Surfaces: Provide surface materials indicated below:
1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
  2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, same species indicated for exposed surfaces.
  3. Drawer Bottoms: Hardwood plywood.
- G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

## 2.4 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
  - 2. Wood Moisture Content: 8 to 13 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
  - 1. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
  - 2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

## 2.5 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal.
- G. Drawer Slides: BHMA A156.9.
  - 1. Grade 1: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
- H. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.
- I. Door Locks: BHMA A156.11, E07121.
- J. Drawer Locks: BHMA A156.11, E07041.
- K. Door and Drawer Silencers: BHMA A156.16, L03011.
- L. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick unless otherwise indicated.
- M. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Stainless Steel: BHMA 630.

- N. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

## 2.6 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.

## 2.7 FABRICATION

- A. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
  - 1. Corners of Cabinets: 1/16 inch unless otherwise indicated.
- B. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
  - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- D. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

## 2.8 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.

- C. Transparent Finish:
1. Grade: Premium.
  2. Finish: System - 4, water-based latex acrylic.
  3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
  4. Staining: None required.
  5. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss meter per ASTM D 523.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

#### **3.2 INSTALLATION**

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
  1. For shop finished items use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
  2. Maintain veneer sequence matching of cabinets with transparent finish.
  3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
  1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

**END OF SECTION 064113**

**SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS****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. Plastic-laminate-faced architectural cabinets.
- 2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product, including panel products, high-pressure decorative laminate, adhesive for bonding plastic laminate and cabinet hardware and accessories.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  - 1. Show details full size.
  - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
  - 3. Show locations and sizes of cutouts and holes for items installed in architectural plastic-laminate cabinets.
- C. Samples for Initial Selection:
  - 1. Plastic laminates.
- D. Samples for Verification:
  - 1. Plastic laminates, 8 by 10 inches, for each color, pattern, and surface finish and specified edge material applied to one edge.
  - 2. Exposed cabinet hardware and accessories, one unit for each type and finish.

## 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## 1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

## **PART 2 - PRODUCTS**

### 2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.
- B. Grade: Premium.
- C. Type of Construction: Frameless.

- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
    - a. **Formica Corporation.**
    - b. **Lamin-Art, Inc.**
    - c. **Wilsonart International Holdings, Inc.**
- E. Laminate Cladding for Exposed Surfaces:
1. Horizontal Surfaces: Grade HGS.
  2. Postformed Surfaces: Grade HGP.
  3. Vertical Surfaces: Grade HGS.
  4. Edges: Grade HGS.
  5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
- F. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
- G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As selected by Architect from laminate manufacturer's full range in the following categories:

## 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: 5 to 10 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.

## 2.3 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.



## 2.4 FABRICATION

- A. Fabricate cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
  - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

**PART 3 - EXECUTION**

## 3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

## 3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails[ **or finishing screws**] for exposed fastening, countersunk and filled flush with woodwork.
  - 1. Use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

**END OF SECTION 064116**

**SECTION 071113 - BITUMINOUS DAMPPROOFING****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. Cold-applied, emulsified-asphalt dampproofing.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

## 1.4 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

**PART 2 - PRODUCTS**

## 2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

## 2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Trowel Coats: ASTM D 1227, Type II, Class 1.
- B. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- C. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
- D. VOC Content: 30 g/L or less.

### 2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
  - 1. Test for surface moisture according to ASTM D 4263.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

### 3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
  - 1. Apply dampproofing to provide continuous plane of protection.
  - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
  - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
  - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
  - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
  - 2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.
- D. Where dampproofing interior face of above-grade, exterior concrete walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

#### 3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.

#### 3.5 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

**END OF SECTION 071113**

**SECTION 072100 - THERMAL INSULATION****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. Foam-plastic board insulation.
  - 2. Glass-fiber blanket insulation.
  - 3. Spray polyurethane foam insulation.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

## 1.5 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.

## 1.6 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, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  - 1. Type IV, 25 psi.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

## 2.2 GLASS-FIBER BLANKET INSULATION

- A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
  - 1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
  - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
  - 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

## 2.3 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  - 1. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.
  - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

**PART 3 - EXECUTION**

## 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation 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.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

### 3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

### 3.5 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. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
  - 5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- C. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.



- D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 PROTECTION

- A. Protect installed insulation 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 072500 - WEATHER BARRIERS****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Building wrap.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For [**water-resistive barrier**] [**and**] [**flexible flashing**], from ICC-ES.

**PART 2 - PRODUCTS**

## 2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
  - 1. Water-Vapor Permeance: Not less than 20 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).
  - 2. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
  - 3. Allowable UV Exposure Time: Not less than three months.
  - 4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

**PART 3 - EXECUTION**

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
  - 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
  - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Wrap: Comply with manufacturer's written instructions.
  - 1. Seal seams, edges, fasteners, and penetrations with tape.
  - 2. Extend into jambs of openings and seal corners with tape.

**END OF SECTION 072500**

**SECTION 074113 - STANDING-SEAM METAL ROOF PANELS****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 standing-seam metal roof panels.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
  - 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 methods and procedures related to metal panel installation, including manufacturer's written instructions.
  - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
  - 5. Review structural loading limitations of deck during and after roofing.
  - 6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
  - 7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
  - 8. Review temporary protection requirements for metal panel systems during and after installation.
  - 9. Review procedures for repair of metal panels damaged after installation.
  - 10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
  - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

- 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.
  - C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
    - 1. Include similar Samples of trim and accessories involving color selection.
  - D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
    - 1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer.
  - B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
  - C. Field quality-control reports.
  - D. Sample Warranties: For special warranties.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For metal panels to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
  - B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
  - B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
  - C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
  - D. Retain strippable protective covering on metal panels during installation.

## 1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

## 1.10 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

## 1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
  2. Other Design Loads: As indicated on Drawings.
  3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
1. Test-Pressure Difference: 1.57 lbf/sq. ft..
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
1. Test-Pressure Difference: 2.86 lbf/sq. ft..
- D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
1. Uplift Rating: UL 90.
- F. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
1. Fire/Windstorm Classification: Class 1A- 120.
  2. Hail Resistance: MH.
- G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

## 2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
1. **Products:** Subject to compliance with requirements, provide one of the following:
    - a. **AEP Span; A BlueScope Steel Company.**
    - b. **Architectural Metal Systems.**
    - c. **Berridge Manufacturing Company.**
    - d. **IMETCO.**

2. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, fully annealed.
  - a. Nominal Thickness: 0.038 inch.
  - b. Exterior Finish: 4.
3. Clips: Two-piece floating to accommodate thermal movement.
  - a. Material: 0.062-inch- thick, stainless-steel sheet.
4. Joint Type: Double folded.
5. Panel Coverage: 16 inches.
6. Panel Height: 1.5 inches.

### 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
  1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
  2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Carlisle Residential; a division of Carlisle Construction Materials.
  2. Grace Construction Products; W.R. Grace & Co. -- Conn.
  3. Owens Corning.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

### 2.4 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.



1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
  1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
  4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

## 2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Stainless-Steel Panels and Accessories:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - a. Run grain of directional finishes with long dimension of each piece.
  - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  - c. Directional Satin Finish: No. 4.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
  2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
    - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

#### **3.3 UNDERLAYMENT INSTALLATION**

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
  1. Apply over the entire roof surface.
- B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

## 3.4 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal panels.
  2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  3. Install screw fasteners in predrilled holes.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.
  5. Install flashing and trim as metal panel work proceeds.
  6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
  2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
  3. Copper Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
  4. Stainless-Steel Panels: Use stainless-steel fasteners.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
  2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
  4. Watertight Installation:
    - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
    - c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- H. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

### 3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

### 3.7 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

**SECTION 074646 - FIBER-CEMENT SIDING**

**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 fiber-cement siding and soffit.

1.3 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For fiber-cement siding and soffit including related accessories.
- C. Samples for Verification: For each type, color, texture, and pattern required.
  - 1. 12-inch- long-by-actual-width Sample of siding.
  - 2. 12-inch- long-by-actual-width Sample of soffit.
  - 3. 12-inch- long-by-actual-width Samples of trim and accessories.

1.6 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

## 1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish full lengths of fiber-cement siding and soffit including related accessories, in a quantity equal to 2 percent of amount installed.

## 1.9 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
  - 1. Build mockups for fiber-cement siding and soffit including accessories.
    - a. Size: 48 inches long by 60 inches high.
    - b. Include outside corner on one end of mockup and inside corner on other end.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

## 1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including cracking and deforming.
    - b. Deterioration of materials beyond normal weathering.
  - 2. Warranty Period: 25 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

## 2.2 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
  - 1. CertainTeed Corporation
  - 2. GAF MAterials
  - 3. James Hardie Building Products
  - 4. Nichiha Fiber Cement
  - 5. Norandex Building Materials
- B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than 5/16 inch.
- D. Horizontal Pattern: Boards 8-1/4 to 8-1/2 inches wide in plain style.
  - 1. Texture: Smooth.
- E. Panel Texture: 48-inch- wide sheets with smooth texture.
- F. Factory Priming: Manufacturer's standard acrylic primer.

## 2.3 FIBER-CEMENT SOFFIT

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
  - 1. CertainTeed Corporation
  - 2. GAF MAterials
  - 3. James Hardie Building Products
  - 4. Nichiha Fiber Cement
  - 5. Norandex Building Materials
- B. Nominal Thickness: Not less than 5/16 inch.
- C. Pattern: 24-inch- wide sheets with smooth texture.
- D. Ventilation: Provide unperforated soffit.
- E. Factory Priming: Manufacturer's standard acrylic primer.

## 2.4 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
  - 1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:
  - 1. Corner posts.



2. Door and window casings.
  3. Fasciae.
  4. Moldings and trim.
- C. Flashing: Provide 16 oz. copper flashing at window and door heads and where indicated.
- D. Fasteners:
1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
  2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
  3. For fastening fiber cement, use stainless-steel fasteners.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

#### 3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  1. Do not install damaged components.
  2. Install fasteners no more than 16" o.c.
- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

#### 3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

**END OF SECTION 074646**

**SECTION 079200 - JOINT SEALANTS****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. Silicone joint sealants.
  - 2. Mildew-resistant joint sealants.
  - 3. Latex joint sealants.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Sample Warranties: For special warranties.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

## 1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.

2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## 1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: Two years from date of Substantial Completion.
- B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  2. Disintegration of joint substrates from causes exceeding design specifications.
  3. Mechanical damage caused by individuals, tools, or other outside agents.
  4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
  1. Architectural sealants shall have a VOC content of 250 g/L or less.
  2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
  3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
- C. Products: Subject to compliance with requirements, provide one of the following:
  1. Dow Corning Corporation; 756 SMS.
  2. GE Construction Sealants; Momentive Performance Materials Inc.; Silpruf NB.

3. Pecora Corporation; 864NST.
4. Tremco Incorporated; Spectrem 2.

### 2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. BASF Construction Chemicals - Building Systems; Sonolastic SL 1.
  2. Pecora Corporation; NR-201.
  3. Sherwin-Williams Company (The); Stampede 1SL.
- C. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.

### 2.4 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
- C. Products: Subject to compliance with requirements, provide one of the following:
  1. Dow Corning Corporation; 786-M White.
  2. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
  3. Tremco Incorporated; Trensil 200.

### 2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. BASF Construction Chemicals - Building Systems; Sonolac.
  2. Pecora Corporation; AC-20.
  3. Sherwin-Williams Company (The); [850A][950A][PowerHouse].
  4. Tremco Incorporated; Tremflex 834.

### 2.6 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
  - a. Metal.
  - b. Glass.
  - c. Porcelain enamel.
  - d. Glazed surfaces of ceramic tile.

- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses in each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.

### 3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
  1. Joint Locations:
    - a. Isolation and contraction joints in cast-in-place concrete slabs.
  2. Joint Sealant: Urethane, M, P, 50, T, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  1. Joint Locations:
    - a. Control and expansion joints in unit masonry.
    - b. Joints in dimension stone cladding.
    - c. Joints between metal panels.
    - d. Joints between different materials listed above.
    - e. Perimeter joints between materials listed above and frames of doors windows and louvers.
    - f. Control and expansion joints in overhead surfaces.
  2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
  1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in stone flooring.
    - c. Control and expansion joints in tile flooring.
  2. Joint Sealant: Urethane, S, P, 25, T, NT.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Tile control and expansion joints.
  2. Joint Sealant: Urethane, S, NS, 25, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames of interior doors windows.
  2. Joint Sealant: Acrylic latex.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
  2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- G. Joint-Sealant Application: Concealed mastics.
1. Joint Locations:
    - a. Aluminum thresholds.
    - b. Sill plates.
  2. Joint Sealant: Butyl-rubber based.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

**END OF SECTION 079200**



**SECTION 081213 - HOLLOW METAL FRAMES****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes hollow-metal frames.

## 1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

## 1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions and finishes.
- B. Shop Drawings: Include the following:
  - 1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 2. Locations of reinforcement and preparations for hardware.
  - 3. Details of each different wall opening condition.
  - 4. Details of anchorages, joints, field splices, and connections.
  - 5. Details of moldings, removable stops, and glazing.
  - 6. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of frame assembly, for tests performed by a qualified testing agency.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each unit to permit air circulation.

**PART 2 - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

## 2.2 INTERIOR FRAMES

- A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Hollow-Metal Frames: NAAMM-HMMA 860..
  - 1. Physical Performance: Level A according to SDI A250.4.
  - 2. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
  - 3. Construction: Full profile welded.
  - 4. Exposed Finish: Prime.

## 2.3 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

## 2.4 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- D. Glazing: Comply with requirements in Section 088000 "Glazing."

## 2.5 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  2. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - 1) Three anchors per jamb up to 60 inches high.
      - 2) Four anchors per jamb from 60 to 90 inches high.
      - 3) Five anchors per jamb from 90 to 96 inches high.
      - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
  3. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
  4. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
  5. Terminated Stops: Terminate stops 6 inches above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- C. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce frames to receive nontemplated, mortised, and surface-mounted hardware.
  2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- D. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
  2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.
  4. Provide loose stops and moldings on inside of hollow-metal work.
  5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.6 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## 2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

**PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap frames to receive nontemplated, mortised, and surface-mounted hardware.

## 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - b. Install frames with removable stops located on secure side of opening.
    - c. Install door silencers in frames before grouting.

- d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
  - e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
- 2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
  - 3. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
  - 4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus **1/16 inch**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus **1/16 inch**, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus **1/16 inch**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus **1/16 inch**, measured at jambs at floor.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
    - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than **9 inches** o.c. and not more than **2 inches** o.c. from each corner.

#### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

**END OF SECTION 081213**

**SECTION 081416 - 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 doors and transom panels with wood-veneer faces.
  - 2. Factory finishing flush wood doors.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
  - 1. Dimensions and locations of blocking.
  - 2. Dimensions and locations of mortises and holes for hardware.
  - 3. Dimensions and locations of cutouts.
  - 4. Undercuts.
  - 5. Requirements for veneer matching.
  - 6. Doors to be factory finished and finish requirements.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Samples for Verification:
  - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
  - 2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
    - a. Provide Samples for each species of veneer and solid lumber required.
    - b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors.
  - 3. Frames for light openings, 6 inches long, for each material, type, and finish required.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

## 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, 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.

## 1.7 WARRANTY

- A. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Algoma Hardwoods, Inc.
  - 2. Eggers Industries.
  - 3. Graham Wood Doors; ASSA ABLOY Group company.
  - 4. Marshfield DoorSystems, Inc.
  - 5. Mohawk Flush Doors, Inc.
  - 6. Oshkosh Door Company.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

## 2.2 FLUSH WOOD DOORS, GENERAL

- A. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade: Heavy Duty.

## C. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.
  - a. Screw Withdrawal, Face: 700 lbf.
  - b. Screw Withdrawal, Edge: 400 lbf.

## 2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

## A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade AA faces.
2. Species: Select white birch.
3. Cut: Rotary cut.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
8. Exposed Vertical and Top Edges: Same species as faces - edge Type A.
9. Core: Glued wood stave.
10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
11. WDMA I.S.1-A Performance Grade: Heavy Duty.

## 2.4 LIGHT FRAMES AND LOUVERS

## A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Recessed 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.

## B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

## C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."



## 2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
  - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors that are indicated to receive transparent finish.
- C. Transparent Finish:
  - 1. Grade: Premium.
  - 2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 9, UV curable, acrylated epoxy, polyester, or urethane or System 11, catalyzed polyurethane.
  - 3. Staining: As selected by Architect from manufacturer's full range.
  - 4. Effect: Filled finish.
  - 5. Sheen: Semigloss.

**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.
  - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

## 3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. 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 081416**

**SECTION 083113 - ACCESS DOORS AND FRAMES****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Access doors and frames for walls and ceilings.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details materials, individual components and profiles, and finishes.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Detail fabrication and installation of access doors and frames for each type of substrate.

**PART 2 - PRODUCTS**

## 2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Access Panel Solutions.
  - 2. Babcock-Davis.
  - 3. JL Industries, Inc.; a division of the Activar Construction Products Group.
  - 4. Larsens Manufacturing Company.
  - 5. Nystrom, Inc.
- B. Flush Access Doors with Concealed Flanges:
  - 1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
  - 2. Locations: Wall and ceiling.
  - 3. Door Size: 24x24.
  - 4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
    - a. Finish: Factory prime.

5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
6. Frame Material: Same material and thickness as door.
7. Hinges: Manufacturer's standard.
8. Hardware: Lock.

C. Exterior Flush Access Doors:

1. Assembly Description: Fabricate door to be weatherproof and fit flush to frame. Provide manufacturer's standard 2-inch- thick fiberglass insulation and extruded door gaskets. Provide manufacturer's standard-width frame for surface mounting, proportional to door size.
2. Locations: Soffit.
3. Door Size: 24x24.
4. Stainless-Steel Sheet for Door: Nominal 0.062 inch, 16 gage.
  - a. Finish: No. 4.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.
7. Hardware: Lock.

D. Hardware:

1. Lock: Cylinder.

## 2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines or blend into finish.
- C. Frame Anchors: Same type as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

## 2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
  2. Provide mounting holes in frames for attachment of units to metal or wood framing.

- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
  - 1. For cylinder locks, furnish two keys per lock and key all locks alike.

## 2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Steel and Metallic-Coated-Steel Finishes:
  - 1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
- E. Stainless-Steel Finishes:
  - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
  - 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
    - a. Run grain of directional finishes with long dimension of each piece.
    - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
    - c. Directional Satin Finish: No. 4.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

### 3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

**END OF SECTION 083113**

**SECTION 083326 - OVERHEAD COILING GRILLES****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. Open-curtain overhead coiling grilles.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling grille and accessory.
  - 1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
  - 1. Include plans, elevations, sections, and mounting details.
  - 2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
  - 4. Show locations of controls, locking devices, and other accessories.
  - 5. Include diagrams for power, signal, and control wiring.
- C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
  - 1. Open-curtain grille with full-size components consisting of rods, spacers, and links as required to illustrate each assembly.
  - 2. Closed-curtain grille with full-size components consisting of ribs and infill as required to illustrate each assembly.
  - 3. Bottom bar with sensor edge.
  - 4. Guides.
  - 5. Mounting frame.
  - 6. Brackets.
  - 7. Hood.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

**PART 2 - PRODUCTS**

## 2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain overhead coiling grilles from single source from single manufacturer.
  - 1. Obtain operators and controls from overhead coiling-grille manufacturer.

## 2.2 OPEN-CURTAIN GRILLE ASSEMBLY

- A. Open-Curtain Grille: Overhead coiling, countertop grille with a curtain having a network of horizontal rods that interconnect with vertical links.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ACME Rolling Doors.
    - b. Clopay Building Products.
    - c. Overhead Door Corporation.
    - d. Raynor.
- B. Operation Cycles: Grille components and operators capable of operating for not less than 50,000. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.
  - 1. Include tamperproof cycle counter.
- C. Grille Curtain Material: Stainless steel.
  - 1. Rod Spacing: Approximately 1-1/2 inches o.c.
  - 2. Link Spacing: Approximately 9 inches apart in a brick (staggered) pattern.
  - 3. Spacers: Metal tubes matching curtain material.
- D. Bottom Bar: Continuous tubular shape, fabricated from stainless steel and finished.
- E. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- F. Hood: Stainless steel.

1. Shape: Square.
2. Mounting: Face of wall.

G. Locking Devices: Equip grille with locking device assembly and chain lock keeper.

1. Locking Device Assembly: Cremone type, both jamb sides locking bars, operable from outside with cylinder.

H. Electric Grille Operator:

1. Usage Classification: Heavy duty, 25 or more cycles per hour and more than 90 cycles per day.
2. Operator Location: Top of hood.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
4. Motor Exposure: Interior.
5. Emergency Manual Operation: Push-up type.
6. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom bar.

- a. Sensor Edge Bulb Color: Black.

7. Control Station: Interior mounted.

I. Curtain Accessories: Equip grille with push/pull handles.

J. Grille Finish:

1. Stainless-Steel Finish: No. 4 (polished directional satin).

## 2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.4 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.

1. Stainless-Steel Grille Curtain: ASTM A 666 or ASTM A 240/A 240M, Type 300 series.

B. Bottom Bar: Manufacturer's standard continuous shape unless otherwise indicated, finished to match grille.

C. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

## 2.5 HOODS AND ACCESSORIES

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for



stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Stainless Steel: **0.025-inch-** thick stainless-steel sheet, Type 304, complying with ASTM A 666 or ASTM A 240/A 240M.
- B. Push/Pull Handles: Equip push-up-operated or emergency-operated grille with lifting handles on each side of grille, finished to match grille.

## 2.6 COUNTERBALANCING MECHANISM

- A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than **0.03 in./ft.** of span under full load.
- C. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

## 2.7 ELECTRIC GRILLE OPERATORS

- A. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille and operation cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.
  1. Comply with NFPA 70.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each grille.
- C. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.
  1. Electrical Characteristics:
    - a. Phase: Single phase.
    - b. Volts: 115 V.
    - c. Hertz: 60.
  2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate grille in either direction from any position, at a speed not less than **8 in./sec.** and not more than **12 in./sec.**, without exceeding nameplate ratings or service factor.
  3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
  4. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

- D. Limit Switches: Equip motorized grille with adjustable switches interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.
- E. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
  - 1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- F. Emergency Manual Operation: Equip electrically powered grille with capability for emergency manual operation. Design manual mechanism so required force for grille operation does not exceed **25 lbf**.
- G. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- H. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

## 2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA's "Metal Finishes Manual for Architectural and Metal Products (AMP 500-06)" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## 2.9 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
  - 1. Run grain of directional finishes with long dimension of each piece.
  - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
  - 3. Directional Satin Finish: No. 4.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.
- B. Install overhead coiling grilles, hoods, controls, and operators at the mounting locations indicated for each grille.
- C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.
- D. Power-Operated Grilles: Install according to UL 325.

## 3.3 STARTUP SERVICE

- A. Perform installation and startup checks according to manufacturer's written instructions.
- B. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- C. Test grille opening when activated by detector, fire-alarm system, emergency-egress release, or self-opening mechanism as required. Reset grille-opening mechanism after successful test.

## 3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly, so that grilles operate easily, free of warp, twist, or distortion.
  - 1. Adjust exterior components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

## 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles.

**END OF SECTION 083326**

**SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS****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. Exterior storefront framing.
  - 2. Exterior manual-swing entrance doors and door-frame units.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
  - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
  - 1. Joinery, including concealed welds.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.

5. Flashing and drainage.

- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- B. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Sample Warranties: For special warranties.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Laboratory Mockup Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.
- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

- E. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of storefront systems.

## 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration created by wind and thermal and structural movements.
    - c. Deterioration of metals and other materials beyond normal weathering.
    - d. Water penetration through fixed glazing and framing areas.
    - e. Failure of operating components.
  - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- B. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings.

- C. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to **3/4 inch**, whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or **1/8 inch**, whichever is smaller.
- D. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of **0.06 cfm/sq. ft.** at a static-air-pressure differential of [**6.24 lbf/sq. ft.**].
  2. Entrance Doors:
    - a. Pair of Doors: Maximum air leakage of **1.0 cfm/sq. ft.** at a static-air-pressure differential of **1.57 lbf/sq. ft.**.
    - b. Single Doors: Maximum air leakage of **0.5 cfm/sq. ft.** at a static-air-pressure differential of **1.57 lbf/sq. ft.**.
- F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than **10 lbf/sq. ft.**
- G. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than **10 lbf/sq. ft.**
  2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- H. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than **0.45 Btu/sq. ft. x h x deg F** as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
  3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.

- I. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 3.
  - 1. Large-Missile Test: For glazed openings located within 30 feet of grade.
- J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
  - 2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    - b. Low Exterior Ambient-Air Temperature: 0 deg F.
    - c. Interior Ambient-Air Temperature: 75 deg F.
- K. Structural-Sealant Joints:
  - 1. Designed to carry gravity loads of glazing.
  - 2. Designed to produce tensile or shear stress of less than 20 psi.

## 2.2 PERFORMANCE REQUIREMENTS- AMP DOORS

- A. General: Provide door assemblies that have been designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.
- C. Impact Strength, AMP Doors and Panels, Nominal Value, ASTM D 256: 3.9 foot-pounds per inch of notch.
- D. Tensile Strength, AMP Doors and Panels, Nominal Value, ASTM D 638: 7,900 psi.
- E. Flexural Strength, AMP Doors and Panels, Nominal Value, ASTM D 790: 18,100 psi.
- F. Water Absorption, AMP Doors and Panels, Nominal Value, ASTM D 570: 0.49 percent after 24 hours.
- G. Indentation Hardness, AMP Doors and Panels, Nominal Value, ASTM D 2583: 38.
- H. Abrasion Resistance, Face Sheet, Taber Abrasion Test, 25 Cycles at 1,000 Gram Weight with CS-17 Wheel: Maximum of 0.022 average weight loss percentage.
- I. Compressive Strength, Foam Core, Nominal Value, ASTM D 1621: 79.9 psi.
- J. Compressive Modulus, Foam Core, Nominal Value, ASTM D 1621: 370 psi.
- K. Tensile Adhesion, Foam Core, Nominal Value, ASTM D 1623: 45.3 psi
- L. Thermal and Humid Aging, Nominal Value, 158 Degrees F and 100 Percent Humidity for 14 Days, ASTM D 2126: Minus 5.14 percent volume change..

## 2.3 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Commercial Architectural Products, Inc.
  - 2. EFCO Corporation.
  - 3. Kawneer North America; an Alcoa company.



## 4. TRACO.

- B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

## 2.4 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: **Clear anodic finish.**
5. Fabrication Method: Field-fabricated stick system.

- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

- D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
  - a. Sheet and Plate: ASTM B 209.
  - b. Extruded Bars, Rods, Profiles, and Tubes: **ASTM B 221.**
  - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
  - d. Structural Profiles: ASTM B 308/B 308M.
2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
  - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
  - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
  - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

## 2.5 ENTRANCE DOOR SYSTEMS- STILE &amp; RAIL ALUMINUM DOOR

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: **1-3/4-inch** overall thickness, with minimum **0.125-inch** thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
  - a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
2. Door Design: As indicated.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

- a. Provide nonremovable glazing stops on outside of door.

## 2.6 ENTRANCE DOOR SYSTEM- AMP DOOR

- A. Model: SL-19 Flush Woodgrain Doors with acrylic modified polyester (AMP) face sheets.
- B. Stiles and Rails: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes, minimum of 2-5/16-inch depth.
- C. Corners: Mitered
- D. Provide joinery of 3/8-inch diameter full-width tie rods through extruded splines top and bottom integral to standard tubular shaped stiles and rails reinforced to accept hardware as specified.
- E. Securing Internal Door Extrusions: 3/16-inch angle blocks and locking hex nuts for joinery. Welds, glue, or other methods are not acceptable
- F. Furnish extruded stiles and rails with integral reglets to accept face sheets. Lock face sheets into place to permit flush appearance.
- G. Rail caps or other face sheet capture methods are not acceptable.
- H. Extrude top and bottom rail legs for interlocking continuous weather bar.
- I. Meeting Stiles: Pile brush weatherseals. Extrude meeting stile to include integral pocket to accept pile brush weatherseals.
- J. Bottom of Door: Install bottom weather bar with nylon brush weatherstripping into extruded interlocking edge of bottom rail.
- K. Glue: Use of glue to bond sheet to core or extrusions is not acceptable
- L. Face Sheet: AMP, 0.120-inch thickness, painted surface finish.
- M. Texture: Woodgrain.
- N. Core Material: Poured-in-place polyurethane foam; Minimum of 5 pounds per cubic foot; R-Value: Minimum of 9.
- O. Cutouts: Manufacture doors with cutouts for required vision lites, louvers, and panels. Factory install vision lites, louvers, and panels.
- P. Hardware: Premachine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
- Q. MATERIALS: Aluminum extrusions made from prime-equivalent billet that is produced from 100% reprocessed 6063-T6 alloy recovered from industrial processes: ASTM B 221. Sheet and Plate to be ASTM B 209.
- R. Alloy and Temper: As required by manufacturer for strength, corrosion resistance, application of required finish, and control of color.
- S. Components: Door and frame components from same manufacturer.

- T. Fasteners: Aluminum, 18-8 stainless steel, or other noncorrosive metal. Compatible with items to be fastened.

## 2.7 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- B. Weather Stripping: Manufacturer's standard replaceable components.
  - 1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
  - 2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- C. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- D. Silencers: BHMA A156.16, Grade 1.

## 2.8 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: Comply with Section 088000 "Glazing."
- D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.
  - 1. Color: Black.
- E. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
  - 1. Color: Match structural sealant.

## 2.9 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of **1 inch** that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

- C. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

## 2.10 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  1. Profiles that are sharp, straight, and free of defects or deformations.
  2. Accurately fitted joints with ends coped or mitered.
  3. Physical and thermal isolation of glazing from framing members.
  4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  5. Provisions for field replacement of glazing from interior.
  6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
  1. At exterior doors, provide compression weather stripping at fixed stops.
  2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- E. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
  1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  2. At exterior doors, provide weather sweeps applied to door bottoms.
- F. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.11 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF or FEVE resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

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

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

#### 3.3 INSTALLATION

##### A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

##### B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

- D. Install components plumb and true in alignment with established lines and grades.

- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weatherstripping contact and hardware movement to produce proper operation.

- F. Install glazing as specified in Section 088000 "Glazing."

- G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

- H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

### 3.4 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
  4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

**END OF SECTION 084113**

**SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS****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 glazed aluminum curtain walls.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  - 2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
  - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
  - 1. Joinery, including concealed welds.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.
  - 5. Flashing and drainage.

- F. Delegated-Design Submittal: For glazed aluminum curtain walls indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Preconstruction Laboratory Mockup Testing Submittals:
  - 1. Testing Program: Developed specifically for Project.
  - 2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
  - 3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.
- B. Energy Performance Certificates: For glazed aluminum curtain walls, accessories, and components from manufacturer.
  - 1. Basis for Certification: NFRC-certified energy performance values for each glazed aluminum curtain wall.
- C. Product Test Reports: For glazed aluminum curtain walls, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- E. Source quality-control reports.
- F. Field quality-control reports.
- G. Sample Warranties: For special warranties.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.
- B. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Laboratory Mockup Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- C. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.



- D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- E. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of curtain wall assemblies.

## 1.7 WARRANTY

- A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including, but not limited to, excessive deflection.
    - b. Noise or vibration created by wind and thermal and structural movements.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    - d. Water penetration through fixed glazing and framing areas.
    - e. Failure of operating components.
  - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  - 2. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, Licensed in the State of North Carolina," to design glazed aluminum curtain walls.
- B. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
1. Wind Loads: As indicated on Drawings.
  2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:
1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
  3. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
  4. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
    - a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4-inch for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
  2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.
- I. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
  3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.
- J. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows:
1. Outdoor-Indoor Transmission Class: Minimum 26.
- K. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 3.
1. Large-Missile Test: For glazed openings located within 30 feet of grade.
  2. Small-Missile Test: For glazed openings located more than 30 feet above grade.
- L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
  2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
    - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    - b. Low Exterior Ambient-Air Temperature: 0 deg F.
- M. Structural-Sealant Joints:
1. Designed to carry gravity loads of glazing.
  2. Designed to produce tensile or shear stress of less than 20 psi.
- N. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
  2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

## 2.2 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. EFCO Corporation.
  2. Kawneer North America; an Alcoa company.
  3. TRACO.
  4. Tubelite Inc.
  5. Source Limitations: Obtain all components of curtain wall system, including framing entrances and sun control and accessories, from single manufacturer.

## 2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Thermally broken.
  2. Glazing System: Retained mechanically with gaskets on four sides.
  3. Glazing Plane: Front.
  4. Finish: Clear anodic finish.
  5. Fabrication Method: Either factory- or field-fabricated system.
- B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.
1. Include snap-on aluminum trim that conceals fasteners.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    - a. Sheet and Plate: ASTM B 209.
    - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
    - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
    - d. Structural Profiles: ASTM B 308/B 308M.
  2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
    - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
    - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
    - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

## 2.4 ENTRANCES

- A. Entrances: Comply with Section 084113 "Aluminum-Framed Entrances and Storefronts."

## 2.5 SUN CONTROL

- A. Sunshades: Assemblies consisting of manufacturer's standard outrigger brackets, louvers, and fascia, designed for attachment to curtain wall with mechanical fasteners.
1. Orientation: Horizontal.
  2. Projection from Wall: As indicated on Drawings.
  3. Outriggers: As indicated.
  4. Louvers:
    - a. Number: As indicated.
    - b. Shape: Square.
    - c. Width: As indicated.
    - d. Mounting Angle: As indicated.
  5. Finish: Color Anodic Finish.
- B. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    - a. Sheet and Plate: ASTM B 209.
    - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
    - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
    - d. Structural Profiles: ASTM B 308/B 308M.

## 2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less.
- E. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.
1. Color: Black.
- F. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.
1. Color: Match structural sealant.

## 2.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
  - 3. Use exposed fasteners with countersunk Phillips screw heads, fabricated from 300 series stainless steel.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.
- D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

## 2.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing from exterior.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
  - 7. Components curved to indicated radii.
- D. Fabricate components to resist water penetration as follows:
  - 1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
  - 2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.
- E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method similar to the Basis of Design.
- F. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Prepare surfaces that are in contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion.
3. Preparation includes, but is not limited to, cleaning and priming surfaces.
4. Seal joints watertight unless otherwise indicated.
5. Install glazing to comply with requirements in Section 088000 "Glazing."

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

B. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from full range of industry colors and color densities.

## 2.10 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

### 3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

1. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

G. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

### 3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
  - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
  - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
  - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

**END OF SECTION 084413**



**SECTION 085200 - WOOD WINDOWS****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 vinyl-clad wood windows.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, **2 by 4 inches** in size.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
  - 1. Include similar Samples of hardware and accessories involving color selection.
- E. Samples for Verification: For wood windows and components required, prepared on Samples of size indicated below:
  - 1. Exposed Finishes: **2 by 4 inches**.
  - 2. Exposed Hardware: Full-size units.
- F. Product Schedule: For wood windows. Use same designations indicated on Drawings.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of wood window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's warranties.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating wood windows that meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.

## 1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
  - a. Failure to meet performance requirements.
  - b. Structural failures including excessive deflection, water leakage, and air infiltration.
  - c. Faulty operation of movable sash and hardware.
  - d. Deterioration of materials and finishes beyond normal weathering.
  - e. Failure of insulating glass.
2. Warranty Period:
  - a. Window: 10 years from date of Substantial Completion.
  - b. Glazing Units: 10 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Vinyl-Clad Wood Windows:
  - a. Andersen Windows Inc.; Andersen Corporation.
  - b. Peachtree Doors and Windows.
  - c. Weather Shield Mfg., Inc.

- B. Source Limitations: Obtain wood windows from single source from single manufacturer.

## 2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: WDMA certified with label attached to each window.

- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: AW.
2. Minimum Performance Grade: 40.

- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.17.
- E. Sound Transmission Class (STC): Rated for not less than 26 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- F. Outside-Inside Transmission Class (OITC): Rated for not less than 22 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
- G. Windborne-Debris Resistance: Capable of resisting impact from windborne debris based on 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.

### 2.3 WOOD WINDOWS

- A. Operating Types: Provide the following operating types in locations indicated on Drawings:
  - 1. Awning: Project out.
  - 2. Double hung.
  - 3. Horizontal sliding.
  - 4. Fixed.
- B. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.
  - 1. Exterior Finish: Vinyl-clad wood.
    - a. Color: As selected by Architect from manufacturer's full range.
  - 2. Interior Finish: Manufacturer's standard stain-and varnish-finish.
    - a. Exposed Unfinished Wood Surfaces: Manufacturer's standard species.
    - b. Color: As selected by Architect from manufacturer's full range.
- C. Insulating-Glass Units: ASTM E 2190 and ASTM E 1996.
  - 1. Glass: ASTM C 1036, Type 1, Class 1, q3.
    - a. Tint: Clear.
    - b. Kind: Fully tempered.
  - 2. Lites: Two.
  - 3. Filling: Fill space between glass lites with Argon.
  - 4. Low-E Coating: Pyrolytic on second surface.
  - 5. Glass is to be Monolithic Impact-Resistant Glass Reinforced with a clear plastic laminate sandwiched between two panes to resist wind impact in accordance with large missile test of ASTM E 1996.
- D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

- E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- F. Projected Window Hardware:
1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
    - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
  2. Hinges: Stainless-steel hinges with stainless-steel-reinforced, sliding nylon shoes.
  3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.
  4. Limit Devices: Concealed friction adjuster, adjustable stay bar limit devices designed to restrict sash opening.
    - a. Limit clear opening to 4 inches for ventilation; with custodial key release.
  5. Operator Stud Cover: Matching operator handle finish. Provide in locations where operator handle is removed for controlled access.
  6. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches above floor.
- G. Hung Window Hardware:
1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
  2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
  3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.
- H. Horizontal-Sliding Window Hardware:
1. Sill Cap/Track: Rigid PVC or other weather-resistant plastic track with manufacturer's standard integral color, of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
  2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
  3. Roller Assemblies: Low-friction design.
- I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.4 ACCESSORIES

- A. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.
  1. Quantity and Type: One per sash, removable from exposed surface of interior lite.
  2. Material: Manufacturer's standard.
  3. Pattern: As indicated on Drawings.
  4. Profile: As selected by Architect from manufacturer's full range.
  5. Color: As selected by Architect from manufacturer's full range.

## 2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
  1. Type and Location: Full, inside for project-out, Full, outside for double-hung sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
  1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
  2. Finish for Exterior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.
- C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656.
  1. Mesh Color: Manufacturer's standard.

## 2.6 FABRICATION

- A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze wood windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- E. Window Assemblies: Provide operating and fixed units in configuration indicated. Provide window frames, sashes, hardware, and other trim and components necessary for a complete, secure, and weathertight installation, including the following:

1. Angled mullion posts with interior and exterior trim.
  2. Angled interior and exterior extension and trim.
  3. Top and bottom plywood platforms.
  4. Exterior head and sill casings and trim.
  5. Support brackets.
- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

#### 3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
  1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085200

**SECTION 087100 - DOOR HARDWARE****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. Mechanical door hardware for the following:
    - a. Swinging doors.
    - b. Electrified Door Hardware

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
  - 1. Wiring Diagrams: For power, signal, and control wiring and including the following:
    - a. Details of interface of electrified door hardware and building safety and security systems.
    - b. Schematic diagram of systems that interface with electrified door hardware.
    - c. Point-to-point wiring.
    - d. Risers.
    - e. Elevations doors controlled by electrified door hardware.
  - 2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Samples for Initial Selection: For plastic protective trim units in each finish, color, and texture required for each type of trim unit indicated.
- D. Samples for Verification: For exposed door hardware of each type required, in each finish specified, prepared on Samples of size indicated below. Tag Samples with full description for coordination with the door hardware schedule. Submit Samples before, or concurrent with, submission of door hardware schedule.
  - 1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.
    - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.



## E. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
  - b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
  - c. Content: Include the following information:
    - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
    - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
    - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
    - 5) Fastenings and other pertinent information.
    - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
    - 7) Mounting locations for door hardware.
    - 8) List of related door devices specified in other Sections for each door and frame.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.
- B. Product Certificates: For electrified door hardware, from the manufacturer.
- C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Warranty: Special warranty specified in this Section.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
  - 1. For door hardware, an Architectural Hardware Consultant (AHC).
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer.
  - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- E. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
  - 2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    - b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
  - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
  - 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- G. Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." In addition to Owner Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
  - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
  - 2. Preliminary key system schematic diagram.
  - 3. Address for delivery of keys.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

## 1.8 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including excessive deflection, cracking, or breakage.
    - b. Faulty operation of doors and door hardware.
    - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
  - 2. Warranty Period: Insert number years from date of Substantial Completion, unless otherwise indicated.
    - a. Exit Devices: Two years from date of Substantial Completion.
    - b. Manual Closers: 10 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

## 2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

## 2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hager Companies.
2. McKinney Products Company; an ASSA ABLOY Group company.
3. Stanley Commercial Hardware; a division of Stanley Security Services.

## 2.3 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hager Companies.
2. McKinney Products Company; an ASSA ABLOY Group company.
3. Select Products Limited.
4. Stanley Commercial Hardware; a division of Stanley Security Services.

## 2.4 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
2. Deadbolts: Minimum 1-inch bolt throw.

- C. Lock Backset: 2-3/4 inches, unless otherwise indicated.
- D. Lock Trim:
  - 1. Levers: Cast.
  - 2. Escutcheons (Roses): Cast.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
  - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
- F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
- G. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Corbin Russwin; an ASSA ABLOY Group company.
  - 2. SARGENT Manufacturing Company; ASSA ABLOY.
  - 3. Schlage; an Ingersoll-Rand brand.
  - 4. Yale Security Inc; an ASSA ABLOY Group company.

## 2.5 AUXILIARY LOCKS

- A. Mortise Auxiliary Locks: BHMA A156.5; Grade [1] [2]; with strike that suits frame.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hager Companies.
  - 2. SARGENT Manufacturing Company; ASSA ABLOY.
  - 3. Schlage; an Ingersoll-Rand brand.
  - 4. Yale Security Inc; an ASSA ABLOY Group company.

## 2.6 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
  - 1. Manufacturer: Same manufacturer as for locking devices.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Corbin Russwin; an ASSA ABLOY Group company.
  - 2. Hager Companies.
  - 3. SARGENT Manufacturing Company; ASSA ABLOY.
  - 4. Yale Security Inc; an ASSA ABLOY Group company.
- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

## 2.7 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
  - 1. Master Key System: Change keys and a master key operate cylinders.
- B. Keys: Nickel silver.
  - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
    - a. Notation: "DO NOT DUPLICATE."
  - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
    - a. Cylinder Change Keys: Three.
    - b. Master Keys: Five.

## 2.8 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release; and with internal override.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.

## 2.9 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Corbin Russwin; an ASSA ABLOY Group company.
  - 2. LCN; an Ingersoll-Rand brand.
  - 3. SARGENT Manufacturing Company; ASSA ABLOY.
  - 4. Yale Security Inc; an ASSA ABLOY Group company.

## 2.10 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast aluminum base metal.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hager Companies.
  - 2. Ives; an Ingersoll Rand brand.
  - 3. Stanley Commercial Hardware; a division of Stanley Security Services.

## 2.11 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hager Companies.
  - 2. National Guard Products, Inc.
  - 3. Pemko Manufacturing Co.
  - 4. Zero International, Inc.

## 2.12 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hager Companies.
  - 2. Pemko Manufacturing Co.
  - 3. Zero International, Inc.

## 2.13 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Baldwin Hardware Corporation.
  - 2. Ives; an Ingersoll Rand brand.
  - 3. Trimco.

## 2.14 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
  - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:
  - a. Wood or Machine Screws: For the following:
    - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
    - 2) Strike plates to frames.
    - 3) Closers to doors and frames.
  - b. Steel Through Bolts: For the following unless door blocking is provided:
    - 1) Surface hinges to doors.
    - 2) Closers to doors and frames.
    - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

## 2.15 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.



## 3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

## 3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings or to comply with the following unless otherwise indicated or required to comply with governing regulations.
  - 1. Custom Steel Doors and Frames: HMMA 831.
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Replace construction cores with permanent cores as directed by Owner.
  - 2. Furnish permanent cores to Owner for installation.
- E. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DOOR HARDWARE SCHEDULE

**Door Hardware Set No. 1**

**Exterior Pair Aluminum Doors**

2	Continuous Gear Hinge	Hager, Roton	780HD-Clear Anodized.	
1	Closers	Corbin-Russwin	DC8210xA4	689
1	Exit Device (Elec. Retraction) w/ Ext. Trim	Corbin-Russwin	ED5200-F08-A9-M94	630
1	Exit Device w/ Ext. Trim	Corbin-Russwin	ED5200-F08-A9	630
2	Cylinder			630
1	Threshold	Hager	520S	Al.
1	Keyed Removable Mullion	Alum. To Match Alum. Framing		
1	Weather-strip set	By Door Manuf.(Full perimeter incl. bottom)		
1	Automatic Door Operator	Norton 5700-LEO Series or equal by LCN or Von Duprin. Provide 1 interior & 1 exterior actuator. Provide aluminum finish to match storefront framing. Provide all control wiring as required for electric latch retraction. All wiring is to be concealed in Aluminum Curtain Wall Framing.		

**Door Hardware Set No. 2**

**Exterior Aluminum AMP Door**

1	Continuous Gear Hinge	Hager, Roton	780HD-Painted.	
1	Closers	Corbin-Russwin	DC8210xA4	689

1	Lockset (Entrance)	Corbin-Russwin	ML2024-ASM	630
1	Cylinder			626
1	Threshold	Hager	520S	AI
1	Weather-strip set	By Door Manuf.(Full perimeter incl. bottom)		

**Door Hardware Set No. 3****Exterior Aluminum AMP Door**

1	Continuous Gear Hinge	Hager, Roton	780HD-Painted.	
1	Push Plate	Hager ("PUSH" engraved)	A40R-CFC (3.5x15")	630
1	Plate + Pull	Hager	A40R-CFC (3.5x15")+P4E	630
1	Closers	Corbin-Russwin	DC8210xA4	689
1	Cylinder			626
1	Threshold	Hager	520S	AI
1	Weather-strip set	By FRP Door Manuf.(Full perimeter incl. bottom)		

**Door Hardware Set No. 4****Exterior Aluminum AMP Door**

1	Continuous Gear Hinge	Hager, Roton	780HD-Painted.	
1	Lockset (Storage-Hazard)	Corbin-Russwin	ML2057-ASM-M25	630
1	Closers	Corbin-Russwin	DC8200xA10	689
1	Cylinder			626
1	Threshold	Hager	520S	AI
1	Weather-strip set	By FRP Door Manuf.(Full perimeter incl. bottom)		

**Door Hardware Set No. 5****Interior Wood Doors Non-rated**

1.5	Pr. Hinges	Hager	BB1168, 4 1/2" x 4 1/2"	
1	Closers	Corbin-Russwin	DC8200xA10	689
1	Push Plate	Hager ("PUSH" engraved)	A40R-CFC (3.5x15")	630
1	Plate + Pull	Hager	A40R-CFC (3.5x15")+P4E	630
1	Deadbolt/Cylinder			626
2	Kickplate, 12"x1/2"LDW			630

**Door Hardware Set No. 6****Interior Wood Doors Non-rated**

1.5	Pr. Hinges	Hager	BB1168, 4 1/2" x 4 1/2"	
1	Lockset- Office	Corbin-Russwin	ML2051-ASM	630
1	Cylinder			626
2	Kickplate, 12"x1/2"LDW			630

**Door Hardware Set No. 7****Interior Wood Doors Non-rated**

1.5	Pr. Hinges	Hager	BB1168, 4 1/2" x 4 1/2"	
1	Closers	Corbin-Russwin	DC8200xA10	689
1	Lockset- (Office)	Corbin-Russwin	ML2057-ASM-M25	630
1	Cylinder			626
2	Kickplate, 12"x1/2"LDW			630

**Door Hardware Set No. 8****Interior Wood Doors Non-rated**

1.5	Pr. Hinges	Hager	BB1168, 4 1/2" x 4 1/2"	
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1	Lockset- (Storage Hazard)	Corbin-Russwin	ML2057-ASM-M25	630
1	Cylinder			626
2	Kickplate, 12"x1/2"LDW			630

**Door Hardware Set No. 9**

**Interior Wood Doors Non-rated**

1.5	Pr. Hinges	Hager	BB1168, 4 1/2" x 4 1/2"	
1	Closers	Corbin-Russwin	DC8200xA10	689
1	Lockset- Privacy	Corbin-Russwin	ML2060	630
1	Cylinder			626
2	Kickplate, 12"x1/2"LDW			630

**END OF SECTION 087100**

**SECTION 088000 - GLAZING**

## 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. Glass for doors, interior borrowed lites, glazed curtain walls.
  - 2. Glazing sealants and accessories.

## 1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

## 1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of the following products; 12 inches square.
  - 1. Coated glass.
  - 2. Insulating glass.
- C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths.
- D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturers of insulating-glass units with sputter-coated, low-E coatings.

- B. Product Certificates: For glass.
- C. Product Test Reports: For coated glass, insulating glass and glazing sealants, for tests performed by a qualified testing agency.
  - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Sample Warranties: For special warranties.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

#### 1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: 10 years from date of Substantial Completion.

- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. GTI; Glaz-Tech Industries.
  2. Guardian Industries Corp.; SunGuard.
  3. PPG Industries, Inc.
  4. Viracon, Inc.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
1. Obtain tinted glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

### 2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
1. Design Wind Pressures: As indicated on Drawings.
  2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
    - a. Wind Design Data: As indicated on Drawings.
    - b. Basic Wind Speed: 115 MPH.
    - c. Importance Factor: As indicated
    - d. Exposure Category: As indicated..
  3. Design Snow Loads: As indicated on Drawings.
  4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
  5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

- C. Windborne-Debris-Impact Resistance: Exterior glazing shall comply with enhanced-protection testing requirements in ASTM E 1996 for Wind Zone 3 when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on Project and shall be installed in same manner as glazing indicated for use on Project.
  - 1. Large-Missile Test: For glazing located within **30 feet** of grade.
  - 2. Small-Missile Test: For glazing located more than **30 feet** above grade.
- D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
  - 1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
  - 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  - 3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as **Btu/sq. ft. x h x deg F**.
  - 4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  - 5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

### 2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

### 2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.



- B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

## 2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
  - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
  - 2. Spacer: Aluminum with mill or clear anodic finish.
  - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

## 2.6 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. Field-applied sealants shall have a VOC content of not more than 250 g/L.
  - 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

## 2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 804.3 tape, where indicated.
  - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
  - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## 2.9 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  2. Presence and functioning of weep systems.
  3. Minimum required face and edge clearances.
  4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

## 3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

## 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

## 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

## 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

### 3.8 MONOLITHIC GLASS SCHEDULE

- A. Glass Type : Clear fully tempered float glass.
  - 1. Minimum Thickness: 1/4-inch.
  - 2. Safety glazing required.

### 3.9 INSULATING GLASS SCHEDULE

- A. Glass Type : Low-E-coated, tinted insulating glass.
  - 1. Basis-of-Design Product: PPG Soloargray + Solarban 60 Cear.
  - 2. Overall Unit Thickness: 1 inch.
  - 3. Minimum Thickness of Each Glass Lite: 6 mm.
  - 4. Outdoor Lite: Tinted fully tempered float glass.
  - 5. Tint Color: Gray.
  - 6. Interspace Content: Argon.
  - 7. Indoor Lite: Clear fully tempered float glass.
  - 8. Low-E Coating: Pyrolytic or sputtered on second or third surface.
  - 9. Winter Nighttime U-Factor: 0.29 maximum.
  - 10. Summer Daytime U-Factor: 0.27 maximum.
  - 11. Visible Light Transmittance: 35 percent minimum.
  - 12. Solar Heat Gain Coefficient: 0.38 maximum.
  - 13. Safety glazing required.

**END OF SECTION 088000**

**SECTION 088300 - MIRRORS****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 the following types of silvered flat glass mirrors:
  - 1. Tempered glass mirrors qualifying as safety glazing.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
- C. Samples: For each type of the following:
  - 1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.
  - 2. Mirror Clips: Full size.
  - 3. Mirror Trim: 12 inches long.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of mirror and mirror mastic.
- B. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.
- C. Sample Warranty: For special warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For mirrors to include in maintenance manuals.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
  - 1. Warranty Period: Five years from date of Project Acceptance.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- B. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

### 2.2 SILVERED FLAT GLASS MIRRORS

- A. Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
- B. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; clear.
  - 1. Nominal Thickness: 4.0 mm.
- C. Safety Glazing Products: For tempered mirrors, provide products that comply with 16 CFR 1201, Category II.

### 2.3 MISCELLANEOUS MATERIALS

- A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

- C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
  - 1. Adhesive shall have a VOC content of 70 g/L or less.
- D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

## 2.4 MIRROR HARDWARE

- A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.
  - 1. Bottom Trim: J-channels formed with front leg and back leg not less than **3/8 and 7/8 inch** in height, respectively, and a thickness of not less than **0.04 inch**.
  - 2. Top Trim: J-channels formed with front leg and back leg not less than **5/8 and 1 inch** in height, respectively, and a thickness of not less than **0.04 inch**.
  - 3. Finish: Clear bright anodized.
- B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
- C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

## 2.5 FABRICATION

- A. Fabricate mirrors in the shop to greatest extent possible.
- B. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.
- C. Mirror Edge Treatment: Rounded polished.
  - 1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
  - 2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.
- D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.



**PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

## 3.2 PREPARATION

- A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

## 3.3 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
  - 1. GANA Publications: "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- B. Provide a minimum airspace of **1/8 inch** between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.
- C. Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
  - 1. Aluminum J-Channels: Provide setting blocks **1/8 inch** thick by **4 inches** long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than **1/4 inch** wide by **3/8 inch** long at bottom channel.
  - 2. Install mastic as follows:
    - a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
    - b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
    - c. After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of **1/8 inch** between back of mirrors and mounting surface.

## 3.4 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.

- C. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Clean exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Clean mirrors as recommended in writing by mirror manufacturer.

**END OF SECTION 088300**

**SECTION 092216 - NON-STRUCTURAL METAL FRAMING****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
  - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

**PART 2 - PRODUCTS**

## 2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

## 2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
  - 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
  - 1. Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: As indicated on Drawings.
    - b. Depth: As indicated on Drawings.
  - 2. Dimpled Steel Studs and Runners:
    - a. Minimum Base-Metal Thickness: As indicated on Drawings.
    - b. Depth: As indicated on Drawings.

- C. Slip-Type Head Joints: Where indicated, provide the following:
  - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
  - 1. Minimum Base-Metal Thickness: 0.033 inch.

### 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
  - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
  - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
  - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
  - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

### 3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
  - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

#### 3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
  - 2. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
  - 1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 2. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 3. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

**END OF SECTION 092216**

**SECTION 092900 - GYPSUM BOARD****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
  - 2. Tile backing panels.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
  - 1. Trim Accessories: Full-size Sample in **12-inch-** long length for each trim accessory indicated.

## 1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

## 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**PART 2 - PRODUCTS**

## 2.1 PERFORMANCE REQUIREMENTS

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

## 2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

## 2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. American Gypsum.
  - 2. CertainTeed Corporation.
  - 3. Georgia-Pacific Building Products.
  - 4. National Gypsum Company.
  - 5. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
  - 1. Thickness: **5/8 inch**.
  - 2. Long Edges: Tapered.
- C. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
  - 1. Core: 5/8 inch.
  - 2. Long Edges: Tapered.
  - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.4 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. CertainTeed Corporation.
    - b. James Hardie Building Products, Inc.
    - c. National Gypsum Company.
    - d. USG Corporation.
  - 2. Thickness: **5/8 inch**.
  - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
  - 2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. Expansion (control) joint.

## 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
  - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
  - 1. Cementitious Backer Units: As recommended by backer unit manufacturer.
  - 2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

## 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 to 0.112 inch** thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.



- D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - 1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch** of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft.** in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow **1/4- to 3/8-inch-** wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide **1/4- to 1/2-inch-** wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
  - 2. Moisture- and Mold-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
  - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### 3.4 APPLYING TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated and locations indicated to receive tile.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

### 3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
  - 1. Cornerbead: Use at outside corners.
  - 2. LC-Bead: Use at exposed panel edges.

## 3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

## 3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 092900**

**SECTION 093013 - CERAMIC TILING****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Porcelain tile.
  - 2. Waterproof membrane.

## 1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."
- C. Module Size: Actual tile size plus joint width indicated.
- D. Face Size: Actual tile size, excluding spacer lugs.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Full-size units of each type of trim and accessory for each color and finish required.
  - 3. Stone thresholds in 6-inch lengths.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed, but no less than one small unopened bag, for each type, composition, and color indicated.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Installer is a five-star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
  - 2. Installer employs Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
- D. Store liquid materials in unopened containers and protected from freezing.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

**PART 2 - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
  2. Obtain waterproof membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
1. Stone thresholds.
  2. Waterproof membrane.

## 2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

## 2.3 TILE PRODUCTS

- A. Ceramic Tile Type **CT1**: **Unglazed** porcelain tile.
- A. Daltile "Forest Park" (Basis for Design).
  - B. American Olean
  - C. Crossville
1. Certification: Tile certified by the Porcelain Tile Certification Agency.
  2. Face Size: 9"x36".
  3. Thickness: **3/8 inch**.
  4. Tile Color, Glaze, and Pattern: **As selected by Architect from manufacturer's full range**.
  5. Grout Color: **As selected by Architect from manufacturer's full range**.
  6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable **and matching characteristics of adjoining flat tile**. Provide shapes as follows, selected from manufacturer's standard shapes:
    - a. Internal Corners: Field-buttet square corners.

- b. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from **1/2 to 1/4 inch** across nominal **4-inch** dimension.

B. Ceramic Tile Type **CT2: Unglazed** porcelain tile.

A. Daltile "Santino" (Basis for Design).

B. American Olean

C. Crossville

1. Certification: Tile certified by the Porcelain Tile Certification Agency.
2. Face Size: 12"x24".
3. Thickness: **3/8 inch**.
4. Tile Color, Glaze, and Pattern: **As selected by Architect from manufacturer's full range.**
5. Grout Color: **As selected by Architect from manufacturer's full range.**
6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable **and matching characteristics of adjoining flat tile**. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Internal Corners: Field-buttet square corners.
  - b. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from **1/2 to 1/4 inch** across nominal **4-inch** dimension.

C. Ceramic Tile Type **CT3: Unglazed** porcelain tile.

A. Daltile "City View" (Basis for Design).

B. American Olean

C. Crossville

1. Certification: Tile certified by the Porcelain Tile Certification Agency.
2. Face Size: 12"x12" as indicated.
3. Thickness: **3/8 inch**.
4. Tile Color, Glaze, and Pattern: **As selected by Architect from manufacturer's full range.**
5. Grout Color: **As selected by Architect from manufacturer's full range.**
6. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable **and matching characteristics of adjoining flat tile**. Provide shapes as follows, selected from manufacturer's standard shapes:
  - a. Internal Corners: Field-buttet square corners.
  - b. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from **1/2 to 1/4 inch** across nominal **4-inch** dimension.

D.

## 2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to **1/16 inch** above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to **1/2 inch** or less above adjacent floor surface.

B. Slate Thresholds: ASTM C 629/C 629M, Classification II Interior, with fine, even grain and honed finish.

1. Description: Uniform, black or gray stone and unfading.

## 2.5 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric.

1. Nominal Thickness: **0.040 inch**.

C. PVC Sheet: PVC heat-fused on both sides to facings of nonwoven polyester.

1. Nominal Thickness: **0.040 inch**.

D. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, SBS-modified-bituminous sheet with fabric reinforcement facing; **0.040-inch** nominal thickness.

## 2.6 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.

1. Cleavage Membrane: Asphalt felt, ASTM D 226/D 226M, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, **4.0 mils** thick.
2. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, **2 by 2 inches** by **0.062-inch** diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.
3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C 847.
  - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
  - b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
  - c. Weight: **2.5 lb/sq. yd.**
4. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.

B. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.

1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.



## 2.7 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. High-Performance Tile Grout: ANSI A118.7.
  - 1. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

## 2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

## 2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with adhesives, bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
  4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped **1/4 inch per foot** toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### 3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet areas.
    - b. Tile floors consisting of tiles **8 by 8 inches** or larger.
    - c. Tile floors consisting of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Tile: **1/4 inch.**

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thinset).
2. Do not extend **waterproofing or crack isolation membrane** under thresholds set in **latex-portland cement** mortar. Fill joints between such thresholds and adjoining tile set on **waterproofing or crack isolation membrane** with elastomeric sealant.

K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

### 3.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

### 3.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on

samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

### 3.6 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

### 3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

#### A. Interior Floor Installations, Concrete Subfloor:

- 1. Ceramic Tile Installation (TOILETS 112 & 113): TCNA F121 and ANSI A108.1A; cement mortar bed (thickset) on waterproof membrane.
  - a. Ceramic Tile Type: 12 x 12 Unglazed Porcelain Tile.
  - b. Bond Coat for Cured-Bed Method: Latex- portland cement mortar.
  - c. Grout: High-performance sanded grout.
  - d. Provide Bonded Waterproof membrane ANSI A108.10 above cement mortar bed and extending up walls as shown on Drawings. Waterproof all penetrations, corners, and extend waterproof membrane into floor drains.
  - e. Provide a cleavage membrane, loose-laid below mudbed.
- 2. Ceramic Tile Installation (TOILET 107): TCNA F121 and ANSI A108.1A; cement mortar bed (thickset) on waterproof membrane.
  - a. Ceramic Tile Type: 12 x 12 Unglazed Porcelain Tile.
  - b. Bond Coat for Cured-Bed Method: Latex- portland cement mortar.
  - c. Grout: High-performance sanded grout.
  - d. Provide Bonded Waterproof membrane ANSI A108.10 above cement mortar bed and extending up walls as shown on Drawings. Waterproof all penetrations, corners, and extend waterproof membrane into floor drains.
  - e. In shower pan area, transition waterproof membrane under the mortar bed and loose lay under shower pan mortar bed. No cleavage membrane required under shower pan.

#### B. Interior Wall Installations, Metal Studs:

- 1. Ceramic Tile Installation (All Toilets/Showers): TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units.
  - a. Ceramic Tile Type: 12 x 12 Unglazed Porcelain Tile.
  - b. Thinset Mortar: Latex- portland cement mortar.
  - c. Grout: High-performance sanded grout.

**END OF SECTION 093013**

**SECTION 095113 - ACOUSTICAL PANEL CEILINGS****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, **6 inches** in size.
- C. Samples for Initial Selection: For components with factory-applied color finishes.
- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
  - 1. Acoustical Panel: Set of **6-inch-** square Samples of each type, color, pattern, and texture.
  - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of **6-inch-** long Samples of each type, finish, and color.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
  - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

## 1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

**PART 2 - PRODUCTS**

## 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
  - 2. Smoke-Developed Index: 50 or less.

## 2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
  - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
  - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- D. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

- E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
  - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

### 2.3 ACOUSTICAL PANELS

- A. Retain this article with "Acoustical Panels, General" Article.
- B. Copy this article and re-edit for each product.
- C. Insert number to complete drawing designation. Use same designation for acoustical panels in this article and for suspension system in "Metal Suspension System" Article; together, they make up the ceiling. Use these designations on Drawings to identify each ceiling assembly.
- D. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, "Cirrus Tegular #589SP", or comparable product by one of the following:
  - 1. Armstrong World Industries, Inc.
  - 2. CertainTeed Corp.
  - 3. Chicago Metallic Corporation.
  - 4. Tectum Inc.
  - 5. Pattern: E (lightly textured).
- E. Color: White.
- F. LR: Not less than 0.86.
- G. NRC: Not less than 0.70.
- H. CAC: Not less than 35.
- I. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.
- J. Thickness: **3/4 inch.**
- K. Modular Size: **24 by 24 inches.**
- L. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

### 2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
  - 1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
  3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
  4. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than **0.106-inch-**diameter wire.
- D. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than **7/8 inch** wide; formed with **0.04-inch-** thick, galvanized-steel sheet complying with ASTM A 653/A 653M, **G90** coating designation; with bolted connections and **5/16-inch-** diameter bolts.
- F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

## 2.5 METAL SUSPENSION SYSTEM

- A. Retain this article with "Metal Suspension Systems, General" Article.
- B. Copy this article and re-edit for each product.
- C. Insert number to complete drawing designation. Use same designation for suspension system in this article and for acoustical panels in "Acoustical Panels" Article; together, they make up the ceiling. Use these designations on Drawings to identify each ceiling assembly.
- D. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Armstrong World Industries, Inc.
  2. CertainTeed Corporation.
  3. Chicago Metallic Corporation.
  4. USG Interiors, Inc.
  5. Cap Finish: Painted white.
- E. Narrow-Face, Single-Web, Extruded-Aluminum Suspension System: Main and cross runners formed from extruded aluminum to produce structural members with **9/16-inch-** wide faces.
1. Structural Classification: Heavy-duty system.
  2. Face Design: Screw-slot profile.
  3. Face Finish: Painted white.



## 2.6 METAL EDGE MOLDINGS AND TRIM

- A. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of **1.5 mils**. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

## 2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
  2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
  3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

### 3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  8. Do not attach hangers to steel deck tabs.
  9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  10. Space hangers not more than **48 inches** o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than **8 inches** from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than **16 inches** o.c. and not more than **3 inches** from ends, leveling with ceiling suspension system to a tolerance of **1/8 inch in 12 feet**. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
    - a. As indicated on reflected ceiling plans.
    - b. Install panels in a basket-weave pattern.
  2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

## 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION 095113**

**SECTION 096519 - RESILIENT TILE FLOORING****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Vinyl composition floor tile.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Full-size units of each color and pattern of floor tile required.
- C. Samples for Initial Selection: For each type of floor tile indicated.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

## 1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
  1. 48 hours before installation.
  2. During installation.
  3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

**PART 2 - PRODUCTS**

## 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

## 2.2 VINYL COMPOSITION FLOOR TILE

- A. Copy this article and re-edit for each vinyl composition product.
- B. Insert drawing designation. Use these designations on Drawings to identify each product.
- C. Tile Standard: ASTM F 1066, Class 3, surface-pattern tile.
- D. Wearing Surface: Smooth.
- E. Thickness: 0.125 inch.
- F. Size: 12 by 12 inches.
- G. Colors and Patterns: As selected by Architect from full range of industry colors.

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
  - 1. Adhesives shall comply with the following limits for VOC content:
    - a. Vinyl Composition Tile Adhesives: 50 g/L or less.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

**PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
  - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of **3 lb of water/1000 sq. ft.** in 24 hours.
    - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.

- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
  - 1. Apply two coat(s).
- E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- F. Cover floor tile until Substantial Completion.

**END OF SECTION 096519**



**SECTION 096813 - TILE CARPETING****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes modular, tufted carpet tile.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
  - 2. Include installation recommendations for each type of substrate.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet Tile: Full-size Sample.
  - 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

#### 1.9 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

#### 1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
  3. Warranty Period: 10 years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 CARPET TILE

- A. Products: Subject to compliance with requirements, provide one of the following:
  1. Basis for Design: Lee's Commercial Carpet; "Emerging Lights Modular", equivalent by Manington, Shaw, Patcraft.
    - a. Color: As selected by Architect from manufacturer's full range. Allow for multiple colors or accents or borders in all spaces.

- b. Construction - tufted
  - c. **Surface Texture** - textured loop graphics
  - d. **Gauge** - 1/12" (47/10 cm)
  - e. **Stitches Per Inch** -10.5 per inch (41.34/10 cm)
  - f. **Finished Pile Thickness** - 0.106" avg
  - g. **Dye Method** - yarn dyed
  - h. **Backing Material** - ICT-RC-Fiberglass Reinforced Thermoplastic Composite Tile
  - i. **Face Yarn** - Antron® Legacy nylon 6,6 with DuraTech Soil Protection by DuPont
  - j. **Fiber Technology** - Duracolor® by LEES Stain Resistant System. Passes GSA requirements for permanent stain resistant carpet\*
  - k. **Face Weight** -26 oz/yd<sup>2</sup>
  - l. **Size/Width** - 24" x 24"
  - m. **Installation Method** - quarter turn
  - n. **Pattern Repeat** - n/a
  - o. **Static** - 3.0 kv when tested under the Standard Shuffle Test 70 degrees Fahrenheit (21 degrees Celsius) - 20% R.H.
  - p. **Flammability** - Passes DOC-FF-1-70 Pill Test
  - q. **Flooring Radiant Panel Test** - Meets NFPA Class 1 when tested under ASTM E-648 glue down
  - r. **Smoke Density** - NBS Smoke Chamber NFPA-258 - Less than 450 Flaming Mode
  - s. **CRI Green Label Plus Certified** - Y
  - t. **Construction Materials** - 100% man-made materials for superior stability. Specifications are subject to change without notice when such changes do not alter product performance. Slight color variation may occur from dye lot to dye lot.
  - u. **WARRANTIES**
    - 1) **Wear** - Lifetime of Carpet. No more than 10% face yarn loss by weight in normal use.
    - 2) **Static** - Lifetime of Carpet.
    - 3) **Edge Ravel** - Lifetime of Carpet. Guaranteed no edge ravel in normal use.
    - 4) **Delamination** - Lifetime of Carpet. Guaranteed no delamination in normal use (no chair pads required).
    - 5) **Tuft Bind** - Lifetime of Carpet.
    - 6) **Adhesive** - As recommended by carpet tile manufacturer.
2. **Stain Resistance** - Lifetime stain warranty and a 10 year Lightfastness and Atmospheric Contaminant Warranty on all carpets.  
 \* Under GSA requirements stain resistant carpets must score no less than 8.0 (10.0 is best) on the AATCC Red 40 Stain Scale. Carpet samples must first be exposed to 100 revolutions of the Taber abrader (1,000-gram weight per H-18 wheel) and then the abraded area must be stain tested using AATCC test method 175."

## 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
  - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
  - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
  - 2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
  - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions **1/8 inch** wide or wider and protrusions more than **1/32 inch** unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

#### 3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.
- H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

**END OF SECTION 096813**

**SECTION 099123 - INTERIOR PAINTING****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
  - 1. Gypsum board.

## 1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Paint: 5 percent, but not less than 1 unopened gal. of each material and color applied.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.

#### 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Behr Process Corporation.
  2. Glidden Professional.
  3. Lenmar Lacquers; Benjamin Moore & Co.
  4. PPG Architectural Finishes, Inc.
  5. Pratt & Lambert.
  6. Sherwin-Williams; Paint Stores Group.

#### 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
1. Flat Paints and Coatings: 50 g/L.
  2. Nonflat Paints and Coatings: 150 g/L.
  3. Dry-Fog Coatings: 400 g/L.
  4. Primers, Sealers, and Undercoaters: 200 g/L.
  5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
  6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
  7. Pretreatment Wash Primers: 420 g/L.
  8. Floor Coatings: 100 g/L.
  9. Shellacs, Clear: 730 g/L.
  10. Shellacs, Pigmented: 550 g/L.
- D. Colors: As selected by Architect from manufacturer's full range.
1. 10 percent of surface area will be painted with deep tones.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  1. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

#### **3.2 PREPARATION**

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.



- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - 1. Paint the following work where exposed in equipment rooms:
    - a. Uninsulated metal piping.
    - b. Metal conduit.
    - c. Plastic conduit.
    - d. Tanks that do not have factory-applied final finishes.
  - 2. Paint the following work where exposed in occupied spaces:
    - a. Pipe hangers and supports.
    - b. Metal conduit.
    - c. Other items as directed by Architect.
  - 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

## 3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
  - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
  - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

## 3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 3.6 INTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
  - 1. Alkyd System:
    - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
    - b. Intermediate Coat: Alkyd, interior, matching topcoat.
    - c. Topcoat (2 coats, minimum): Alkyd, interior, semi-gloss (Gloss Level 5), MPI #47.
- B. Wood Substrates: Including wood trim.
  - 1. High-Performance Architectural Latex System:
    - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
    - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
    - c. Topcoat (2 coats, minimum): Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.
- C. Gypsum Board Substrates:
  - 1. High-Performance Architectural Latex System:
    - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
    - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
    - c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 4), MPI #140.

END OF SECTION 099123

**SECTION 099300 - STAINING AND TRANSPARENT FINISHING****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section includes surface preparation and application of wood finishes on the following substrates:

- 1. Exterior Substrates:

- a. Exposed dimension lumber (rough carpentry).
- b. Dressed lumber (finish carpentry).
- c. Exposed wood decking.

- 2. Interior Substrates:

- a. Exposed dimension lumber (rough carpentry).
- b. Dressed lumber (finish carpentry).
- c. Exposed wood decking.

## 1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- D. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
  - 1. Submit Samples on representative samples of actual wood substrates, 8 inches square or 8 inches long.

2. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.
3. VOC content.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Stains and Transparent Finishes: 5 percent, but not less than 1 unopened gal. of each material and color applied.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

#### 1.7 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Behr Process Corporation.
2. PPG Architectural Finishes, Inc.
3. Pratt & Lambert.
4. Sherwin-Williams; Paint Stores Group.

Field Cod

Field Cod

Field Cod

Field Cod

Field Cod

## 2.2 MATERIALS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  - 1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
  - 2. Shellacs, Clear: VOC not more than 730 g/L.
  - 3. Stains: VOC not more than 250 g/L.
  - 4. Primers, Sealers, and Undercoaters: 200 g/L.
- D. Stain Colors: As selected by Architect from manufacturer's full range.

## 2.3 WOOD FILLERS

- A. Wood Filler Paste: MPI #91.

## 2.4 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
  - 1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  - 2. Testing agency will perform tests for compliance with product requirements.
  - 3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Maximum Moisture Content of Interior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with finish application only after unsatisfactory conditions have been corrected.
  - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
  - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
  - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Exterior Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Prime edges, ends, faces, undersides, and backsides of wood.
    - a. For solid hide stained wood, stain edges and ends after priming.
    - b. For varnish coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
  - 3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.
- E. Interior Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
  - 3. Sand surfaces that will be exposed to view and dust off.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

## 3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  - 1. Use applicators and techniques suited for finish and substrate indicated.
  - 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
  - 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

## 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

## 3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood substrates, nontraffic surfaces, including wood trim and exposed beams.
  - 1. Clear, Two-Component Polyurethane Varnish System:
    - a. Prime Coat: Varnish, aliphatic polyurethane, two-component, matching topcoat.
    - b. Intermediate Coat: Varnish, aliphatic polyurethane, two-component, matching topcoat.
    - c. Topcoat: Varnish, aliphatic polyurethane, two-component (Gloss Level 6 or 7), MPI #78.

## 3.6 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood substrates, nontraffic surfaces, including wood trim, architectural woodwork, exposed beams.
  - 1. Moisture-Cured Clear Polyurethane System:
    - a. Prime Coat: Moisture-cured polyurethane matching topcoat.
    - b. Intermediate Coat: Moisture-cured polyurethane matching topcoat.
    - c. Topcoat: Varnish, polyurethane, moisture-cured, gloss (Gloss Level 6)[, MPI #31].

**END OF SECTION 099300**



**SECTION 101423 - PANEL SIGNAGE****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. Room-identification signs.

## 1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

## 1.4 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

## 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For panel signs.
  - 1. Include fabrication and installation details and attachments to other work.
  - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
  - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
  - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
  - 1. Room-Identification Signs: Full-size Sample.
- E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For special warranty.

## 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

## 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

## 1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Deterioration of finishes beyond normal weathering.
    - b. Deterioration of embedded graphic image.
    - c. Separation or delamination of sheet materials and components.
  - 2. Warranty Period: Five years from date of Substantial Completion.

**PART 2 - PRODUCTS**

## 2.1 SIGNS

- A. Products: Subject to compliance with requirements, provide one of the following:
  - 1. APCO Graphics, Inc.
  - 2. ASI Sign Systems, Inc.
  - 3. Best Sign Systems, Inc.
  - 4. Mohawk Sign Systems, Inc. (Series 200; Basis of Design)
  - 5. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to acrylic backing sheet to produce composite sheet.
    - a. Composite-Sheet Thickness: 0.25 inch.
    - b. Surface-Applied Graphics: 1/32" thick dimensional letters in Black or White that are chemically welded to backing.
    - c. Color(s): As selected by Architect from manufacturer's full range.
  - 6. Sign-Panel Perimeter: Finish edges smooth.
    - a. Edge Condition: Beveled.
    - b. Corner Condition in Elevation: Square.

7. Mounting: Surface mounted to wall with adhesive or for exterior applications, fasteners as specified.
8. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range and variable content as scheduled. Finish raised characters to contrast with background color, and finish Braille to match background color.

## 2.2 PANEL-SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

## 2.3 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
  1. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
  2. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
    - b. Fastener Heads: For nonstructural connections, use oval countersunk screws and bolts with tamper-resistant one-way-head slots unless otherwise indicated.
- B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 2.4 FABRICATION

- A. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:
  1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.

## 2.5 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

**PART 3 - EXECUTION**

## 3.1 EXAMINATION

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

## 3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
  - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Room-Identification Signs: Install in locations on walls as directed..
- C. Mounting Methods:
  - 1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
  - 2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
- D. Signs Mounted on Glass: Provide opaque sheet matching sign material and finish onto opposite side of glass to conceal back of sign.

## 3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

## 3.4 ROOM SIGN SCHEDULE

## A. Panel Sign Schedule:

1. PS #1: Room Identification Sign with Braille.
  - a. Sign Size: 6"x6"x 1/4".
  - b. Message Panel Material: Interior Panel Sign, Series 200.
  - c. Text/Message: Room #.
  - d. Location: As directed in the field by Architect.
  - e. Quantity: Provide one per room and suite entrance unless noted otherwise.
  
2. PS #2: Room Identification Sign with Braille and Changeable Message Insert.
  - a. Sign Size: 6"x6"x 1/4".
  - b. Message Panel Material: Interior Panel Sign, Series 200 w/changeable message insert..
  - c. Text/Message: Room #.
  - d. Location: As directed in the field by Architect.
  - e. Quantity: Provide one per office.
  
3. PS #3: Room Identification Sign with pictograms and Braille.
  - a. Sign Size: 6"x8"x 1/4".
  - b. Message Panel Material: Interior Panel Sign, Series 200 w/male or female pictogram and accessibility symbol.
  - c. Text/Message: Male or Female.
  - d. Location: As directed in the field by Architect.
  - e. Quantity: one per toilet room, gender as indicated by room name.
  
4. PS #5: Room Identification Sign with Braille- Exterior:
  - a. Sign Size: 6"x6"x 1/4".
  - b. Message Panel Material: Exterior Panel Sign, Series 300.
  - c. Text/Message: Room #.
  - d. Location: As directed in the field by Architect.
  - e. Quantity: Provide one at each mechanical or electrical room exterior door.

## B.

**END OF SECTION 101423**

**SECTION 102113 - PLASTIC TOILET COMPARTMENTS****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-plastic toilet compartments configured as toilet enclosures.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
  - 1. Include plans, elevations, sections, details, and attachment details.
  - 2. Show locations of cutouts for compartment-mounted toilet accessories.
  - 3. Show locations of centerlines of toilet fixtures.
  - 4. Show locations of floor drains.
- C. Samples for Initial Selection: For each type of toilet compartment material indicated.
  - 1. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
  - 1. Each type of material, color, and finish required for toilet compartments, prepared on **6-inch-square** Samples of same thickness and material indicated for Work.
  - 2. Each type of hardware and accessory.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

## 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

**PART 2 - PRODUCTS**

## 2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: 75 or less.
  2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

## 2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
  1. Accurate Partitions Corporation (Tough Texture TT).
  2. Partition Systems Incorporated of South Carolina.
  3. Scranton Products (Basis of Design, EX Texture)
- B. Toilet-Enclosure Style: Overhead braced.
- C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than **1 inch** thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.
  1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
  2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless-steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
  3. Color and Pattern: One color and pattern in each room as indicated by manufacturer's designations.
- D. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; stainless steel.
- E. Brackets (Fittings):
  1. Stirrup Type: Ear or U-brackets, stainless steel.
  2. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

- F. Overhead Cross Bracing for Ceiling-Hung Units: As recommended by manufacturer and fabricated from solid polymer.

### 2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty operating hardware and accessories.
  1. Hinges: Manufacturer's minimum **0.062-inch-** thick stainless-steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
  2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless-steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
  3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless-steel hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories. Mount with through-bolts.
  4. Door Bumper: Manufacturer's heavy-duty rubber-tipped cast-stainless-steel bumper at out-swinging doors. Mount with through-bolts.
  5. Door Pull: Manufacturer's heavy-duty cast-stainless-steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

### 2.4 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- B. Stainless-Steel Castings: ASTM A 743/A 743M.

### 2.5 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. 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.
- C. Door Size and Swings: Unless otherwise indicated, provide **24-inch-** wide, in-swinging doors for standard toilet compartments and **36-inch-** wide, out-swinging doors with a minimum **32-inch-** wide, clear opening for compartments designated as accessible.



**PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
  - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 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.
  - 1. Maximum Clearances:
    - a. Pilasters and Panels: **1/2 inch.**
    - b. Panels and Walls: **1 inch.**
  - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
    - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

## 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 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

**END OF SECTION 102113**

**SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Public-use washroom accessories.
  - 2. Private-use bathroom accessories.
  - 3. Childcare accessories.
  - 4. Underlavatory guards.
  - 5. Custodial accessories.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify products using designations indicated.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

## 1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

## 1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

## 2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

## 2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Products: Subject to compliance with requirements, provide one of the following:
  - 1. A&J Washroom Accessories, Inc.

2. American Specialties, Inc.; ASI Group.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.

B. Grab Bar:

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch thick.
  - a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
3. Outside Diameter: 1-1/2 inches.
4. Configuration and Length: As indicated on Drawings.

C. Mirror Unit:

1. Frame: Stainless-steel angle, 0.05 inch thick.
  - a. Corners: Welded and ground smooth.
2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
  - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
  - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
3. Size: As indicated on Drawings.

## 2.3 PRIVATE-USE BATHROOM ACCESSORIES

A. Products: Subject to compliance with requirements, provide one of the following:

1. Bobrick Washroom Equipment, Inc.
2. GAMCO; a division of Bobrick.
3. Seachrome Corporation.
4. Accessories: Integral chrome-plated brass glide hooks.

B. Robe Hook:

1. Description: Single-prong unit.
2. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Towel Bar:

1. Description: 3/4-inch- square tube with rectangular end brackets.
2. Mounting: Flanges with concealed fasteners.
3. Length: 18 inches.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

## 2.4 CHILDCARE ACCESSORIES

A. Products: Subject to compliance with requirements, provide one of the following:

1. American Specialties, Inc.; ASI Group.
2. Diaper Deck & Company, Inc.
3. GAMCO; a division of Bobrick.
4. Koala Kare Products.
  - a. Engineered to support a minimum of 250-lb static load when opened.
5. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
6. Operation: By pneumatic shock-absorbing mechanism.
7. Material and Finish: HDPE in manufacturer's standard color.
8. Liner Dispenser: Built in.

## 2.5 UNDERLAVATORY GUARDS

### A. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

## 2.6 CUSTODIAL ACCESSORIES

### A. Products: Subject to compliance with requirements, provide one of the following:

1. A&J Washroom Accessories, Inc.
2. American Specialties, Inc.; ASI Group.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.

### B. Mop and Broom Holder:

1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
2. Length: 36 inches.
3. Hooks: Three.
4. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, No. 4 finish (satin).
  - a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
  - b. Rod: Approximately 1/4-inch- diameter stainless steel.

## 2.7 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

**PART 3 - EXECUTION**

## 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

## 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**END OF SECTION 102800**

**SECTION 104413 - FIRE PROTECTION CABINETS****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. Fire-protection cabinets for the following:
    - a. Portable fire extinguishers.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed, semi-recessed, or surface-mounting method and relationships of box and trim to surrounding construction.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Samples for Initial Selection: For each type of exposed finish required.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

## 1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

## 1.6 SEQUENCING

- A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

**PART 2 - PRODUCTS**

## 2.1 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. American Specialties, Inc.; ASI Group.
  - 2. Guardian Fire Equipment, Inc.
  - 3. JL Industries, Inc.; a division of the Activar Construction Products Group.
  - 4. Kidde Residential and Commercial Division.
  - 5. Larsens Manufacturing Company.
- C. Semi-recessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
  - 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.
- D. Cabinet Trim Material: Stainless-steel sheet.
- E. Door Material: Stainless-steel sheet.
- F. Door Style: Vertical duo panel with frame.
- G. Door Glazing: Tempered break glass.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
  - 1. Provide recessed door pull and friction latch.
  - 2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- I. Accessories:
  - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
  - 2. Door Lock: Cylinder lock, keyed alike to other cabinets.
  - 3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
      - 1) Location: Applied to cabinet door.
      - 2) Application Process: Pressure-sensitive vinyl letters.
      - 3) Lettering Color: Red.
      - 4) Orientation: Vertical.
- J. Materials:
  - 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.



- a. Finish: Baked enamel or powder coat.
  - b. Color: As selected by Architect from full range of industry colors and color densities.
2. Stainless Steel: ASTM A 666, Type 304.
- a. Finish: No. 4 directional satin finish.
3. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

## 2.2 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
- 1. Weld joints and grind smooth.
  - 2. Provide factory-drilled mounting holes.
  - 3. Prepare doors and frames to receive locks.
  - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
- 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
  - 2. Fabricate door frames of one-piece construction with edges flanged.
  - 3. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

## 2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

### 3.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
  - 1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
  - 2. Provide inside latch and lock for break-glass panels.
  - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
- C. Identification: Apply vinyl lettering at locations indicated.

### 3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 104413**

## SECTION 104416 - FIRE EXTINGUISHERS

### 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 portable, hand-carried fire extinguishers for fire extinguishers.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

#### 1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

## 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.
  - 1. Valves: Manufacturer's standard.
  - 2. Handles and Levers: Manufacturer's standard.
  - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type: UL-rated **3-A:40-B:C, 6-lb** nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

**END OF SECTION 104416**

**SECTION 105113 - METAL LOCKERS****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. Welded lockers.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.

- B. Shop Drawings: For metal lockers.

- 1. Include plans, elevations, sections, details, and attachments to other work.
- 2. Show locker trim and accessories.
- 3. Include locker identification system and numbering sequence.

- C. Samples: For each color specified, in manufacturer's standard size.

- D. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available.

- E. Samples for Verification: For the following products, in manufacturer's standard size:

- 1. Lockers and equipment.

## 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

## 1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

## 1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

## 1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Faulty operation of latches and other door hardware.
  - 2. Damage from deliberate destruction and vandalism is excluded.
  - 3. Warranty Period for Welded Metal Lockers: 10 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

## 2.3 WELDED CORRIDOR LOCKERS

- A. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Olympus Lockers & Storage Products, Inc.; Hercules.
  - 2. Penco Products, Inc; All-Welded.
  - 3. Republic Storage Systems, LLC; All-Welded Ventilated.
- B. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
  - 1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.

2. Door Style: Vented panel as follows:
  - a. Perforated Vents: Manufacturer's standard shape and configuration.
- C. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
  1. Tops, Bottoms, and Sides: 0.060-inch nominal thickness.
  2. Backs: 0.048-inch nominal thickness.
  3. Shelves: 0.060-inch nominal thickness, with double bend at front and single bend at sides and back.
- D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
  1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
- E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
  1. Continuous Hinges: Manufacturer's standard, steel, full height.
- F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.
  1. Single-Point Latching: Nonmoving latch hook with steel padlock loop that projects through recessed cup and is finished to match metal locker body.
    - a. Latch Hook: Equip each door with one latch hook, fabricated from 0.120-inch nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.
- G. Identification Plates: Manufacturer's standard, etched, embossed, or stamped plastic plates, with numbers and letters at least 3/8 inch high.
- H. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.
- I. Coat Rods: Manufacturer's standard.
- J. Continuous Zee Base: Fabricated from, 0.075-inch nominal-thickness steel sheet.
  1. Height: 4 inches.
- K. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.
  1. Closures: Vertical-end type.
- L. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
- M. Materials:
  1. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.

- N. Finish: Baked enamel or powder coat.
  - 1. Color: As selected by Architect from manufacturer's full range.

## 2.4 FABRICATION

- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
  - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
  - 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
  - 1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
  - 2. Coat Rods: For each compartment of each locker.
- D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.
- E. Accessible Lockers: Fabricate as follows:
  - 1. Locate bottom shelf no lower than 15 inches above the floor.
  - 2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
- F. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.
- G. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
- H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

## 2.5 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.
  - 1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
  - 2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.



**PART 3 - EXECUTION**

## 3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
  - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
  - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
- B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.
- C. Equipment:
  - 1. Attach hooks with at least two fasteners.
  - 2. Attach door locks on doors using security-type fasteners.
  - 3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
    - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
  - 1. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
  - 2. Attach sloping-top units to metal lockers, with closures at exposed ends.
  - 3. Attach boxed end panels using concealed fasteners to conceal exposed ends of nonrecessed metal lockers.

## 3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

## 3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

**SECTION 107516 - GROUND-SET FLAGPOLES****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 ground-set flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles.
  - 1. Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
  - 2. Include section, and details of foundation system.
- C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.
- D. Delegated-Design Submittal: For flagpoles.

## 1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

**PART 2 - PRODUCTS**

## 2.1 MANUFACTURERS

- A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.
- B. Seismic Performance: Flagpole assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
  - 1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 115 MPH.
  - 2. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

## 2.3 ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Entasis-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. American Flagpole.
  - 2. Concord Industries, Inc.
  - 3. Pole-Tech Company Inc.
  - 4. U.S. Flag & Flagpole Supply, LP.
- C. Exposed Height: 30 feet with 8' log arm assembly.
- D. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
  - 1. Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
  - 2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- E. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.
  - 1. Flashing Collar: Same material and finish as flagpole.

## 2.4 FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
  - 1. 0.063-inch spun aluminum with gold anodic finish.
- B. External Halyard: Ball-bearing, nonfouling, revolving truck assembly of cast metal with continuous 5/16-inch-diameter, braided polypropylene halyard and 9-inch cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.
  - 1. Halyards and Cleats: Three at each flagpole.
  - 2. Cleat Covers: Cast metal, finished to match flagpole, secured with cylinder locks.

3. Halyard Covers: 2-inch channel, 60 inches long, finished to match flagpole.
4. Halyard Flag Snaps: Stainless-steel swivel snap hooks. Furnish two per halyard.

## 2.5 MISCELLANEOUS MATERIALS

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.
- B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- C. Sand: ASTM C 33/C 33M, fine aggregate.
- D. Elastomeric Joint Sealant: Single-component nonsag urethane joint sealant complying with requirements in Section 079200 "Joint Sealants."
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

## 2.6 ALUMINUM FINISHES

- A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A31.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.
- D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- E. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.
- F. Anchor Bolts: Locate and secure anchor bolts in forms with templates and by tying to reinforcement.
- G. Place concrete, as specified in Section 033000 "Cast-in-Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.
- H. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

## 3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.
- C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

**END OF SECTION 107516**

**SECTION 123661 - SIMULATED STONE COUNTERTOPS****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-surface-material countertops and backsplashes.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples for Initial Selection: For each type of material exposed to view.
- D. Samples for Verification: For the following products:
  - 1. Countertop material, 6 inches square.

## 1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

## 1.5 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

**PART 2 - PRODUCTS**

## 2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

- A. Configuration: Provide countertops with the following front and backsplash style:
  - 1. Front: 3/4-inch bullnose.
  - 2. Backsplash: Straight, slightly eased at corner.
  - 3. Endsplash: Matching backsplash.

- B. Countertops: 3/4-inch- thick, solid surface material with front edge built up with same material.
- C. Backsplashes: 3/4-inch- thick, solid surface material.
- D. Fabrication: Fabricate tops in one piece with shop-applied edges unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  - 1. Fabricate with loose backsplashes for field assembly.
  - 2. Install integral sink bowls in countertops in the shop.

## 2.2 COUNTERTOP MATERIALS

- A. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- B. Adhesives: Adhesives shall not contain urea formaldehyde.
- C. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
- D. Products: Subject to compliance with requirements, provide one of the following:
  - 1. E. I. du Pont de Nemours and Company.
  - 2. Formica Corporation.
  - 3. LG Chemical, Ltd.
  - 4. Wilsonart International Holdings, Inc.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  - 1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  - 2. Seal edges of cutouts in particleboard subtops by saturating with varnish.

## END OF SECTION 123661



**SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES****PART 1 - GENERAL**

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient entrance mats.
  - 2. Recessed frames.

## 1.3 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

## 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.
- B. Shop Drawings:
  - 1. Items penetrating floor mats and frames, including door control devices.
  - 2. Divisions between mat sections.
  - 3. Perimeter floor moldings.
  - 4. Custom Graphics: Scale drawing indicating colors.
- C. Samples: For the following products, in manufacturer's standard sizes:
  - 1. Floor Mat: Assembled sections of floor mat.
  - 2. Tread Rail: Sample of each type and color.
  - 3. Frame Members: Sample of each type and color.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

## 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Resilient-Tile Entrance Mats: Full-size tile units equal to 2 percent of amount installed, but no fewer than 10 units.

## **PART 2 - PRODUCTS**

### 2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:
  1. Uniform floor load of 300 lbf/sq. ft..
  2. Wheel load of 350 lb per wheel.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 and the 2012 NC Building Code.

### 2.2 RESILIENT ENTRANCE MATS

- A. Products: Subject to compliance with requirements, provide one of the following:
  1. Balco, Inc.
  2. C/S Group.
  3. JL Industries, Inc.; a division of the Activar Construction Products Group.
- B. Rubber or Vinyl Mats: 1/4-inch- thick mats; with beveled edges for surface applications and with standard wide-wale corrugated top profile, and low-rib, narrow-wale corrugated bottom surface.
  1. Color: As selected by Architect from full range of industry colors.
  2. Mat Size: As indicated.

### 2.3 FRAMES

- A. Recessed Frames: Manufacturer's standard extrusion.
  1. Extruded Aluminum: ASTM B 221, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
    - a. Color: Clear.

### 2.4 CONCRETE FILL AND GROUT MATERIALS

- A. Provide concrete fill and grout equivalent in strength to cast-in-place concrete slabs for recessed mats and frames. Use aggregate no larger than one-third fill thickness.

### 2.5 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space

symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.

- B. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
  - 1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

## 2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.
  - 1. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.
  - 2. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

### 3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

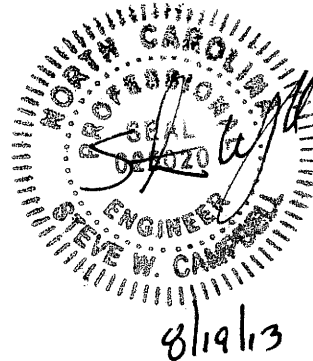
## END OF SECTION 124813

## INTRODUCTION TO DIVISION 22 - PLUMBING

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The Specification Sections applying to the Plumbing Work for the New NCDOT - Currituck Welcome Center in Currituck County, North Carolina are as follows:

SECTION	TITLE	PAGES
22 01 01	Plumbing General Provisions	8
22 02 00	Plumbing Coordination Drawings	2
22 05 01	Division of Work	2
22 05 23	Valves (Domestic Supply)	2
22 05 29	Pipe Hangers and Supports – Plumbing	2
22 05 63	Electrical Work	2
22 05 79	Unsuitable Backfill Material	2
22 07 19	Pipe Insulation (Domestic Water Supply)	2
22 11 16	Domestic Water Pipe and Fittings	2
22 11 19	Piping Specialties (Domestic Supply and Sanitary)	2
22 13 16	Sanitary Waste and Vent Pipe and Fittings	2
22 16 13	Pipe and Pipe Fittings (Gas)	4
22 16 15	Pipe and Pipe Fittings (Gas – Below Ground)	2
22 42 00	Plumbing Fixtures	4





**SECTION 22 01 01 – PLUMBING GENERAL PROVISIONS**

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## A. GENERAL

## 1. Scope of Work

- a. The Contractor shall provide all materials, equipment and labor necessary to install and set into operation a complete plumbing system as shown on the Engineering Drawings and as specified herein.

## 2. Quality Assurance

- a. See the General and Supplementary General Conditions.
- b. All work shall be in accordance with State Code and third party agency accredited by the NCBCC. Where noted, items shall conform to the specific agency standards or shall conform to comparable standards established by the aforementioned third party agency. Minimum requirements shall be the North Carolina State Plumbing Code.
- c. The Contractor shall be responsible for obtaining all permits and paying all fees related to his portion of the contract in accordance with Article 10 of the General Conditions.
- d. Wherever the words "Approved", "Approval", or "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- e. "Provide" as used herein, shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- f. All material and equipment that the Contractor proposes to substitute in lieu of those specified, shall be submitted to the Engineer twenty (20) days after the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified.

## 3. Substitutions

- a. Products are specified for use on this project by the following:

- 1) Reference Standards and Description: Any products meeting the Reference Standards and Description will be acceptable (i.e., waste and vent pipe and fittings).
- 2) Naming of a product as an example to denote the quality standard of the product desired, in which case three or more brands will be denoted (where applicable) to establish equivalent designs. Naming of a product does not restrict Bidders to a specific brand (i.e., fixtures, valves, etc.).

Requests for approval of manufacturer's or substitutions which have not been pre-approved shall be made by using the forms at the end of this section.

- b. During bidding period: Submitted written requests from Bidders Only, using the forms herein, will be considered if received ten (10) calendar days prior to the date of receipt of bids to allow for proper evaluation. Requests from suppliers or subcontractors will not be considered.

Substitutions will be considered when a product becomes unavailable through no fault of the Contractor. A request constitutes a representation that the Bidder/Contractor:

- 1) Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product and is suitable for use in the Work.

- 2) Will provide the same warranty for the substitution as for the specified product.
- 3) Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to the Owner.
- 4) Waives claims for additional cost or time extension which may subsequently become apparent.
- 5) Has included a list of similar projects on which this product has been used with names and telephone numbers for verification.
- 6) Has written verification from the product manufacturer that this product has been in use a minimum of two (2) years on a project similar to this work.

Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

c. Architect/Engineer Review

- 1) Review and approval will rely on manufacturer's literature and other data as outlined herein.
- 2) Inadequacies in such submittals that fail to identify unsuitability is the responsibility of the parties making submittal.

d. Substitution Procedure

- 1) Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
- 2) Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
- 3) Submit listing of similar projects.
- 4) Submit manufacturer's written verification that product has been in use a minimum of two (2) years at similar projects.
- 5) The Architect/Engineer will notify Contractor, in writing, of decision to accept or reject request.
- 6) Products bid or incorporated in the work that are not specified and without written approval of the Architect/Engineer may not be acceptable, and if not, the Contractor will be required to furnish and install the products specified.
- 7) The Architect/Engineer will issue written approvals of product substitutions to all Bidders. Substitutions are not approved without written approval.

Forms: Copy forms incorporated at the end of this section and use for all product substitution requests.

4. Submittals

- a. See General and Supplementary General Conditions.
- b. After notification of the award of the Contract and written notice to begin work, the Contractor shall submit to the Architect/Engineer, within the time frame specified by the Architect, for approval a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time.
- c. The Contractor shall provide six (6) sets of submittal data bound in a 3-ring binder. The 3-ring binder shall contain complete submittal data on **all** products, methods, etc. proposed for use on the project. Permission shall be obtained from the Engineer to submit data outside of the 3-ring binder, such as submittal data requiring early review for special ordering purposes
- d. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the Specifications as well as space limitations

and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number, and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitutions for specified items. Acceptance for approval shall be in writing from the Engineer.

- e. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent upon receipt of these as-built plans.
- f. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions as outlined in Paragraph C, Item #7.
- g. The Contractor shall submit to the Owner all certificates required for operating the system in compliance with the Plans and Specifications.
- h. The Contractor shall furnish in a glass frame, boiler operating certificates for the hot water heater.

#### 5. Product Delivery, Storage and Handling

- a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- b. The Contractor shall protect all material and equipment from breakage, theft, or weather damage. No material or equipment shall be stored on the ground.
- c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

#### 6. Work Conditions and Coordination

- a. The Contractor shall review the Electrical Plans to establish points of connection and the extent of electrical work to be provided in his Contract. All electrical work shall be performed by a licensed electrician.
- b. This Contractor shall be responsible for the final electrical connection to all equipment installed as part of his Contract. Unless otherwise noted, this Contractor shall wire from his equipment to disconnect switches, junction boxes, or panelboard circuit breakers as provided by the Electrical Contractor.
- c. Electrical work shall be in accordance with State codes, and as specified in Division 26 contained herein.
- d. Pipe, conduit and duct chases required for the installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
- e. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be at the Contractor's expense at no extra cost to the Owner.

#### 7. Guarantee

- a. See the General and Supplementary General Conditions.

Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Owner.



**B. PRODUCT**

1. Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.
2. The Contractor shall provide nameplates for identification of all equipment, switches, panels, etc. The nameplates shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/4" minimum) etched into the white core. Information shall include equipment identification, control, electrical ratings, and date of installation. Nameplates shall be fastened with pan head tapping screws.

**C. EXECUTION**

1. Inspection
  - a. This Contractor shall examine the areas of completed work and shall insure that no defects or errors are present which would result in the poor application or installation of subsequent work.
2. Installation
  - a. All work shall be performed in a manner indicating proficiency in the trade.
  - b. All conduit, pipes, ducts, etc. shall be either parallel to the building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
  - c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
  - d. All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.
  - e. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish all sleeves to the General Contractor for openings through poured masonry floors or walls above grade, required for passage of all conduits, pipes or ducts required to support his equipment.
  - f. All fixtures shall be accurately roughed in according to the manufacturer's installation dimensions so that no offset adapters, flexible connections or other improvisations are necessary. All incorrect work shall be torn out and corrected and walls and floors patched.
  - g. Horizontal drainage and waste piping, 2 1/2" diameter or less shall have a minimum slope or fall of 1/4 inch per foot. Piping greater than 2 1/2" diameter shall have a minimum slope of 1/8" per foot. All change of horizontal direction in soil waste pipe shall be made with long radius fittings with "Y" branches and 1/8 and 1/16 bends.
  - h. All fixtures, floor drains, flush valves and traps shall be set plumb and level.
  - i. Connections to cold water, soil and waste lines shall be made at locations shown on the Drawings.
  - j. All material and equipment shall be installed following the manufacturer's installation directions.

3. Performance
  - a. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.
  - b. Rock excavation shall be defined in Division 31. Unless specifically stated in Division 01 or Division 22, neither rock excavation nor a unit price for rock excavation shall be required in the bid.
4. Erection
  - a. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.
5. Field Quality Control
  - a. The Contractor shall conform to the requirements of Division 03 for concrete testing.
  - b. All testing required for compliance with the contract shall be as stated in subsequent sections.
6. Adjust and Clean
  - a. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
  - b. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for the intended service. In no event shall nameplates be painted.
  - c. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract.
7. Maintenance and Operating Manual
  - a. The Contractor shall prepare four (4) copies of a manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data intended for dimension or design purposes (although these may be included), but shall be prepared to describe this particular job. This manual shall include the following:
    - 1) Data on all equipment as listed on the fixture and equipment schedules on the plans.
    - 2) A check list for periodic maintenance of all equipment.
    - 3) A check list for seasonal shut-down.
    - 4) Maintenance and spare parts data for all equipment.
    - 5) As-Built wiring and control diagrams for equipment containing these.
  - b. The manuals shall be bound, indexed, dated and signed by the Contractor when completed.
  - c. The operating and maintenance manuals shall be submitted to the Engineer for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.

SUBSTITUTION AND PRODUCT OPTIONS

TO: PROGRESSIVE DESIGN COLLABORATIVE, LTD.  
Post Office Box 61249  
Raleigh, North Carolina 27661-61249

PROJECT NAME: \_\_\_\_\_

The undersigned requests that the following product be considered for substitution in lieu of the specified item in Project Manual Section \_\_\_\_\_ Page \_\_\_\_\_ Paragraph \_\_\_\_\_ Description of Item: \_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

The undersigned certifies that the following statements are correct, unless modified on an attachment:

1. The proposed substitution is equal or better in appearance, function and quality to the specified item, in all respects and is suitable for inclusion in the Work.
2. Attached are 4 copies of the Manufacturers Product Description, Specifications, Data Sheets, Photographs, Test Data and Color Charts.
3. We will furnish a physical sample, if requested by the Architect/Engineer.
4. Every variation of this product is to be listed and clearly delineated on the submission.
5. This substitution will require no dimensional changes to the drawings and will have no effect on other trades, the construction schedule or warranty requirements.
6. List of similar type project in which product is used.
7. Verification from manufacturer that product has been in use a minimum of two (2) years at similar projects.

SUBSTITUTIONS AND PRODUCT OPTIONS:

MANUFACTURER OR REPRESENTATIVE

Submitted by:

Name: \_\_\_\_\_

Firm: \_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

CONTRACTOR OR BIDDER

Submitted by:

Name: \_\_\_\_\_

Firm: \_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

By approving and submitting shop drawings, product data and samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the work and of the Contract Documents.

The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect/Engineer's approval of shop drawings, product data or samples unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submission and the Architect/Engineer has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the shop drawings, product data or samples by the Architect's approval.

Architect's Reply:

- APPROVED
- APPROVED AS CORRECTED
- REVISE AND RESUBMIT
- NOT APPROVED

ARCHITECT

\_\_\_\_\_

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

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Engineer's Reply:

- APPROVED
- APPROVED AS CORRECTED
- REVISE AND RESUBMIT
- NOT APPROVED

ENGINEER

PROGRESSIVE DESIGN COLLABORATIVE

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

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

END OF SECTION 22 01 01



**SECTION 22 02 00 – PLUMBING COORDINATION DRAWINGS**

---

**A. GENERAL**

1. The Plumbing Contractor shall be responsible for providing ¼ scale drawings to the Mechanical Contractor, in Autocad R14 or above, for the entire project.

**B. PRODUCT**

1. The Plumbing Contractor shall obtain architectural base plans from the Architect. The drawings will be Autocad R14 or higher.
2. The Plumbing Contractor shall then produce plumbing coordination drawings. Indicate all piping and plumbing equipment. The drawings shall be to scale, dimensioned and clearly identified. The drawings shall indicate bottom of pipe (or centerline) for all equipment.
3. The drawing files shall be forwarded to the Mechanical Contractor for incorporation into the overall coordination drawings.
4. The Plumbing Contractor shall be responsible for coordinating any conflicts with the Mechanical Contractor. In addition, the Plumbing Contractor is responsible for attending any required coordination meetings at the job site.

**C. EXECUTION**

1. The final overall coordination drawings must be completed prior to any plumbing, mechanical and electrical work starting on the job.
2. The Plumbing Contractor is responsible for purchasing his final overall coordination drawings from the printer.

END OF SECTION 22 02 00



**SECTION 22 05 01 – DIVISION OF WORK**

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- A. This section delineates the division of work between Divisions 22/23 and Division 26.
- B. All other work necessary for the operation of Division 22 and Division 23 equipment shall be performed under Divisions 22 and 23.
- C. All individual motor starters and drives for mechanical equipment (fans, pumps, etc.) shall be furnished and installed under Divisions 22 and 23 unless indicated as a part of a motor control center. Motor starters for mechanical equipment provided in motor control centers shall be furnished under Divisions 22 and 23.
- D. Equipment less than 110 volt, all relays, actuators, timers, seven-day clocks, alternators, pressure, vacuum, float, flow, pneumatic-electric, and electric-pneumatic switches, aquastats, freezestats, line and low voltage thermostats, thermals, remote selector switches, remote push-button stations, emergency break-glass stations, interlocking, disconnect switches, beyond termination point, and other appurtenances under Divisions 22/23 shall be furnished, installed and wired under Divisions 22/23 in accordance with Division 26.
- E. All wiring required for controls and instrumentation not indicated on the drawings shall be furnished and installed by Divisions 22/23.
- F. Roof exhaust fans with built-in disconnects provided under Division 23 shall be wired under Division 26 to the line side of the disconnect switch. A disconnect switch shall be provided under Division 26 if the fan is not provided with a built-in disconnect switch. In this case, wiring from the switch to the fan shall be under Divisions 22/23.

END OF SECTION 22 05 01





**SECTION 22 05 23 – VALVES (DOMESTIC SUPPLY)**

---

**A. GENERAL**

1. Insofar as possible, all valves shall be by the same manufacturer.
2. All valves stored on project site shall have ports closed.
3. The Plumbing Contractor may choose to use screwed end, solder end, or flanged end valves as required.
4. Valves shall comply with United States Safe Drinking Water Act (Sec. 1417) amended 1-4-2011.

**B. PRODUCT**

1. Screwed Ends, Screw-in Bonnet Gate; Globe with Union Bonnet Composition or Teflon as scheduled; and Two-piece, Full-port Ball Valves. All valves 2" and smaller shall be certified lead-free. Bronze valves shall be based on Nibco models listed below or equals by Hammond, Milwaukee, Red and White, Apollo, Watts or Kitz.
  - a. Gates 125# WSP
    - 1) Up to 2": Nibco T-113-LF.
    - 2) Larger than 2": Nibco T-113.
  - b. Checks 125# WSP
    - 1) Up to 2": Nibco T-413-Y-LF.
    - 2) Larger than 2": Nibco T-413-B.
  - c. Ball 150# WSP
    - 1) Up to 2": Nibco T-585-66-LF.
    - 2) Larger than 2": Nibco T-585-70-66.
  - d. Globes 150# WSP all sizes: Nibco T-235-Y.
2. Solder Ends, Screw-in Bonnet Gates, Globes with Teflon Discs, Two-Piece Full Port Balls. All valves 2" and smaller shall be certified lead-free. Bronze valves shall be based on Nibco models listed below or equals by Hammond, Milwaukee, Red and White, Apollo, Watts or Kitz.
  - a. Gates 125# WSP
    - 1) Up to 2": Nibco S-113-LF.
    - 2) Larger than 2": Nibco S-113.
  - b. Checks 125# WSP
    - 1) Up to 2": Nibco S-413-Y-LF.
    - 2) Larger than 2": Nibco S-413-B.
  - c. Ball 150# WSP
    - 1) Up to 2": Nibco S-585-66-LF.
    - 2) Larger than 2": Nibco S-585-70-66.
  - d. Globes 150# WSP all sizes: Nibco S-235-Y.
3. Flanged ends, Bolted Bonnet, Solid Wedge, Bronze Mounted Gates; Globes and checks with Renewable Seat and Disk; Full Port, Stainless Steel Ball and Stem, Non-Shock Ball Valves. Iron

valves shall be based on Watts models listed below or equals by Hammond, Nibco, Milwaukee, Red and White, Apollo or Kitz.

- a. Gates 125# WSP all sizes: Watts F-503.
  - b. Checks 125# WSP all sizes: Watts F-511.
  - c. Ball 150# WSP all sizes: Watts G-4000.
  - d. Globes 150# WSP all sizes: Watts F-501.
4. Balancing valves shall be B & G Model #CB-3/4S Circuit Setters or approved equivalent by Taco, Tour and Anderson (Victaulic) or Armstrong. Valves shall serve dual function as shut-off and balancing valves. Valves shall have an adjustable setpoint with locking mechanism, which will permit closing of the valve and reopening of the valve to the previously determined setpoint.
  5. Water shut-off valves 3" and smaller shall be ball type 400 PSI WOG cold non-shock type with bronze body and ball, TFE seats, two-piece construction, full port opening. (Remove body while soldering.)
  6. The following are reference standards for valves specified in this section:
    - a. MSS SP-67 Butterfly Valves.
    - b. MSS SP-70 Cast-Iron Gate Valves, Flanged and Threaded Ends.
    - c. MSS SP-71 Cast Iron Swing Check Valves, Flanged and Threaded Ends.
    - d. MSS SP-72 Ball Valves with Flanged or Butt-welded Ends for General Service.
    - e. MSS SP-78 Cast Iron Plug Valves, Flanged and Threaded Ends.
    - f. MSS SP-80 Bronzed Gate, Globe, Angle and Check Valves.
    - g. MSS SP85 Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.
    - h. MSS Sp-110 Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
    - i. ASME B16.10 Face to Face End to End Dimensions of Valves.
    - j. ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings.

### C. EXECUTION

1. All flanged connections shall be gasketed.
2. In no case shall raised face flanges be bolted to flat face flanges.
3. All valve stems shall be accessible and in no case shall valve stems be installed below horizontal.
4. The Contractor shall set in service all valves to operating conditions as part of his Contract. Return lines shall be calibrated for a balanced flow.
5. Provide dot on ceiling grid where valves are located above lay-in ceiling. Dot may be metal ceiling tack with a 3/4" diameter color-coded head or may be adhesive backed. Coordinate color(s) with other trades' marking devices.
6. Provide access panel, minimum 12" x 24" or 18" square where valves are located above gypsum board ceiling. Access panel shall have fire rating to match ceiling rating, if ceiling is rated. Access panel shall be painted to match ceiling.
7. Provide brass or stainless steel valve tags on all valves.
8. Provide the Owner with a valve chart indicating location, valve number, size, manufacturer, purpose, etc. Frame valve chart under glass.

END OF SECTION 22 05 23

**SECTION 22 05 29 – PIPE HANGERS AND SUPPORTS – PLUMBING**

---

**A. GENERAL**

1. This section includes all hangers and supports, etc., as may be required to provide a complete piping system.
2. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.

**B. PRODUCT**

1. Piping shall be as stated in Piping Section(s).
2. Hangers and supports shall be as follows:
  - Concrete Inserts – Fig. B2500
  - Hanger Rod – Fig. B3205
  - Riser Clamp – Fig. B3373
  - Hanger – Fig. B3100
  - Pipe Saddles – Fig. B3160
  - Insulating Protector – Fig. B3151
  - Rod Ceiling Plate – Fig. B3199
  - Beam Clamps – Fig. 3050
  - Offset Clamps – Fig. B351L
  - Roller Hanger – Fig. B3110
  - Sway Bracing – Fig. B2400, B3140, or B3373 with suitable B-Line Channel and B3234, B3248, as required.

Figure numbers given above are devices as manufactured by B-Line systems, Inc. PHD Manufacturing, Empire, Modern Support Devices, or Michigan Hanger Company are acceptable equals.

3. All hanger rods, supports, clamps, or any hardware device shall be galvanized or zinc-plated.

**C. EXECUTION**

1. In no case shall this Contractor be allowed to cut or reduce the specified covering to allow the application of a smaller hanger than required.
2. Hangers supporting vertical and horizontal copper piping, sized 1 ½" in diameter and larger, shall be spaced on not more than 10-foot centers and 30" of each change or direction.
3. Hangers supporting vertical and horizontal copper piping, sized 1 ¼" in diameter and smaller, shall be spaced on not more than 6-foot centers and 30" of each change of direction.
4. Hangers supporting vertical and horizontal PVC piping of any size shall be spaced on not more than 4-foot centers and 30" of each change of direction.
5. Hangers supporting vertical and horizontal CPVC piping 1 ¼" in diameter and larger shall be spaced on not more than 4-foot centers and 30" of each change of direction.
6. Hangers supporting vertical and horizontal CPVC piping 1" in diameter and smaller shall be spaced on not more than 3-foot centers and 30" of each direction.

7. Hangers supporting horizontal cast iron piping of any size shall be spaced not more than 5-foot centers and 30" of each change of direction, with a minimum of two hangers per section.
8. Hangers supporting vertical cast iron piping of any size shall be spaced on not more than 10-foot centers and 30" of each change of direction, with a minimum of two hangers per section.
9. Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees for all pipe sizes 4" and larger.
10. Vertical risers shall be supported at each floor, 5-feet on center, and/or at changes in direction of pipe.
11. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall be Schedule 40, black steel,  $\frac{1}{2}$ " in diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves in exterior walls shall be caulked and made watertight.

END OF SECTION 22 05 29

**SECTION 22 05 63 – ELECTRICAL WORK**

---

**A. GENERAL**

1. This Contractor shall be responsible for the final electrical and the entire control connections and wiring to all equipment installed as part of his contract.
2. Contractor shall review the electrical plans, where applicable, to establish points of connection and the extent of his electrical work to be provided in his contract.
3. Unless otherwise noted, this Contractor shall wire from his equipment to disconnect switches, junction boxes, or panelboard circuit breakers as provided by the Plumbing Contractor or as required by the existing conditions.
4. All power and control wiring shall be in conduits. Refer to electrical specifications for conduit and conduit fittings.
5. All electrical work shall be performed by a licensed electrician.
6. All electrical work shall be in accordance with the State Building Code and all its supplements, the latest edition of the National Electrical Code and the electrical specifications.

**B. PRODUCT**

1. All motor starters, disconnects, switches, relays, conduits, conductors, etc. that are required for a complete electrical power and/or control system shall conform to the requirements set forth by NEC.
2. All motors shall be premium efficiency rate according to NEMA Standard Publication MG 1-2006 Revision 1-2007. NEMA premium efficiency rating shall be stamped on the nameplate.
3. Refer to the plans for the type, size and electrical characteristics of the starters, disconnects, switches, relays, conductor and conduits.
4. All conductors and conduits shall be sized as noted on the plans or as required per NEC.
5. All individual motor starters for plumbing equipment (i.e., fans, pumps, etc.) shall be furnished and installed under Division 22.
6. All relays, actuators, timers, seven-day clocks, alternators, pressure, vacuum, float, flow, pneumatic-electric, and electric-pneumatic switches, aquastats, freezestats, line and low voltage thermostats, thermals, remote selector switches, remote push-button stations, emergency break-glass stations, interlocking, disconnect switches beyond termination point, and other appurtenances associated with equipment under Division 22 shall be furnished, installed and wired under Division 22.
7. "Built-in" disconnect switches shall be installed in a NEMA 3R enclosure, it must be appropriately horsepower rated, and it must be third-party listed for the application.

**C. EXECUTION**

1. All motor starters, disconnects, and switches shall be installed on or as close to the equipment they are serving as possible, or where shown on the plans.

2. Electrical connection to equipment subject to vibration which develops objectionable noises shall be made from the conduit system with short lengths of flexible "Liquid-Tite" conduit. Connection to other equipment shall be made with rigid conduit.
3. Conduits shall be run in a concealed space such as wall cavities, ceiling cavities, etc. except in the mechanical rooms where conduit may be run exposed.

END OF SECTION 22 05 63

**SECTION 22 05 79 – UNSUITABLE BACKFILL MATERIAL**

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- A. Where the material excavated from the trench is unsuitable for backfill material, it shall be hauled off and disposed of and selected material hauled in for backfilling the trench at no additional cost to the Owner.

END OF SECTION 22 05 79





**SECTION 22 07 19 – PIPE INSULATION (DOMESTIC WATER SUPPLY)**

---

**A. GENERAL**

1. The Contractor shall insulate hot water supply and return, cold water and waste piping as specified below.
2. All insulation, linings, coverings and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50, when tested in accordance with ASTM E84, except for exposed outside piping.

**B. PRODUCT**

1. All hot water piping shall be insulated with 1" thick sectional insulation or fibrous glass materials with factory applied cover. All cold water piping shall be insulated with 1/2" thick sectional insulation or fibrous glass materials with factory applied cover. Cover shall be embossed vapor barrier, laminated with pressure sealing cap adhesive.
2. All horizontal waste piping above slab, including traps and floor drain bodies, except in a crawl space, shall be insulated as specified above.
3. Closed cell insulation, 1/2" thick Armstrong/Armaflex II, or equal by IMCOA, may be used in lieu of fiberglass on all cold water pipes. Rigid urethane foam insulation, 1" thick Armstrong/Armalok II, or equal by IMCOA, may be used in lieu of fiberglass on all hot water pipes. Insulation shall be finished with a fire retardant coating to attain proper fire rating.
4. All exposed piping in finished areas and equipment spaces shall be covered with eight-ounce canvas jacket, pasted in place and glue sized twice for painting. Canvas shall be coated twice with Foster fireproof lagging to assure flame and smoke spread ratings.

**C. EXECUTION**

1. Fiberglass insulation shall be held in place with soft copper wire 12" on center.
2. Where insulation is concealed in the wall, crawl space or ceiling construction, omit the eight-ounce canvas jacket.
3. Closed cell insulation shall be installed in strict accordance with the manufacturer's installation instructions.
4. Pipe covering protection saddles shall be used at all supports for insulated piping. Metal shields shall be 20 gauge, one-half the circumference of the insulation and a minimum of 12" long.
5. All exposed piping surfaces, supports, etc. shall be painted with one prime and one finish coat of rust resistant paint. Finish coat shall be black unless otherwise noted on the plans.
6. Insulate fittings and valves with a skim coat of insulating cement, where necessary. Cover with fiberglass tape embedded between two coats of fire-retardant mastic to the level of adjacent insulation, extending 2" onto the adjacent pipe covering, prior to placing the jacket in place with lagging glue over a resin sized paper, and apply one heavy coat of glue size for painting. In lieu of insulating cement mastic compound, pre-fabricated fitting covers may be used.

END OF SECTION 22 07 19



**SECTION 22 11 16 – DOMESTIC WATER PIPE AND FITTINGS (HOT AND COLD WATER)**

---

**A. GENERAL**

1. Provide water piping, supports and hangers as required for a complete plumbing system.
2. Testing of all piping shall be made in the presence of the Engineer or a designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved.
3. The arrangement of the piping shall follow the general locations shown on the drawings, such that clearances, line drainages, etc., shall be maintained.
4. All wetted components of system shall comply with United States Safe Drinking Water Act (Sec.1417) amended 1-4-2011.

**B. PRODUCT**

1. Water piping above grade shall be Type "L" hard drawn copper. Water piping below grade shall be Type "K" soft drawn. Pipe shall conform to ASTM B-88 Specification.
2. Water piping fittings shall be sweat type wrought copper conforming to ANSI-B16.22 Specification.
3. Use 95-5 solder (95% tin - 5% antimony) on all water piping joints smaller than 2". Use silver solder on piping 2" or larger.
4. Hot and cold water piping shall be supported with auto-grip "Insul-Speed" hangers, or equal by B-line (Ruff In) or Hold Rite, maximum seven feet on centers, and at each change in direction.

**C. EXECUTION**

1. Copper tubing which is out of round will not be acceptable.
2. No notching or mitering of copper tubing will be permitted.
3. Joints in Type "K" copper tubing will not be permitted underfloor.
5. In pipe chases, the Contractor shall provide for suspension of all piping from the structure. Do not allow piping to rub against masonry when expanding and contracting.
6. Close and protect open ends of piping until final connections are made. Such closing shall be made with fittings which cannot be easily removed. Caps or plugs shall be made with fittings which cannot be easily removed. Caps or plugs shall be required at all times during construction so that no pipes are left open at the end of any day's work, even though continuation is expected the next day.
7. Copper pipe ends shall be reamed, sanded and deburred before soldering. Non-corrosive flux shall be used.
8. Any leaky joints shall be remade with new materials. Caulking to make joints tight is absolutely prohibited.
9. Sleeves shall be provided wherever pipes pass through walls, floors, and ceilings. Sleeves shall be Schedule 40, black steel, 1/2 inch in diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves installed in exterior walls shall be caulked and made water-tight.

10. Pipe joint compound shall be LACO, Hercules, Oatey, or Rector Seal.
11. All water piping shall be hydrostatically tested at 150 PSIG for a period of one hour.
12. All piping and equipment installed under this Contract shall be tested in the presence of the Engineer and the proper Plumbing Inspector, and proved tight for the periods stated above, or longer if required by the Inspector.
13. The test shall be administered in sections if deemed advisable.
14. No plumbing system or part thereof shall be covered or concealed until after it has been tested and approved.
15. If such work has been covered or concealed before testing, it shall be exposed for testing.
16. Sterilizing and Flushing:
  - a. All water piping shall be sterilized with chlorine, 50 milligrams per liter, and held for a 24 hour period, after which the system shall be flushed prior to being put into service.
  - b. During the flushing of the system, all flush valves shall be thoroughly flushed out to insure the removal of sediment, pipe dope, etc., from water lines and flush valves, removing such working parts of the flush valves as may be deemed necessary. The system shall be drained and flushed sufficiently to provide chlorine residue of 0.2 ppm or less.
  - c. After flushing of the system has been completed, the Contractor shall have water samples taken and delivered to an independent laboratory for testing to show that the water is suitable for drinking. Copies of the laboratory report shall be provided to the Owner and the Engineer. If the State Construction Office is involved, provide form "Water Test Report for Use".

END OF SECTION 22 11 16

**SECTION 22 11 19 – PIPING SPECIALTIES (DOMESTIC SUPPLY AND SANITARY)**

---

**A. GENERAL**

1. This Section includes miscellaneous items required for a complete plumbing system.

**B. PRODUCT**

1. Escutcheons shall be chrome plated, spring type, on all pipes passing through walls and ceilings in finished areas. Floor escutcheons shall be cast brass, chrome plated, with set screw.
2. Stops shall be compression type, chrome plated, angle or straight way pattern on all fixtures, hot and cold water supply. On service sinks and mop receptors, use bronze ball valve as specified and provide check valves on hot and cold water supplies.
3. Flashing for vents through the roof shall be two-piece type, 16 ounce copper counter flashing and base flashing, or a two-piece type, 4 pound lead counter flashing and base flashing. The base flashing shall be installed by the General Contractor with the roof system.
4. Pipe anchors for rough-in use shall be "Ruff-in" by B-Line Systems, Inc., or equal by Hold Rite" as manufactured by Hubbard Enterprises or Insul-Speed. Use for anchoring rough-in of all hot and cold water connections for all lavatories, sinks and other wall connected fixtures.
5. Dielectric waterway fittings shall have electroplated steel or brass nipple with an inert and non-corrosive thermoplastic lining.
6. Shock absorbers shall be of all stainless steel construction and in conformance with P. D. I. Standard WH201 by Zurn, J. R. Smith, or Wade. Shock absorbers shall be installed as noted at the locations shown on the plans and shall be totally accessible. Where there are no shock absorbers noted or shown on the plans, 18 inch air chamber type shock absorbers shall be installed at the hot and cold water supply to each fixture.
7. Unions shall be bronze body with packless brass ground joints. Wrought iron pipe unions shall be malleable iron, ground joint with bronze to iron seat.

**C. EXECUTION**

1. Escutcheons shall be of sufficient size to cover outside diameter of the pipe or the insulation of the pipe.
2. Vent flashing shall extend down at least 4 inches from the top of the pipe. Flashing shall extend at least 12 inches in all directions from the pipe and shall be parallel to the roof line.
3. Pipe anchors for rough-in use shall be installed to hold pipes securely in alignment, according to the manufacturer's rough-in dimensions. Remove these devices after the wall is built around the pipes.
4. Unions shall be installed as shown on the plans, and where required, to disconnect piping for future replacement or repairs.
5. Dielectric unions shall be installed at hot water heaters and at any junction of dissimilar metal pipes.

END OF SECTION 22 11 19



**SECTION 22 13 16 – SANITARY WASTE AND VENT PIPE AND FITTINGS**

---

**A. GENERAL**

1. Provide soil, waste and vent piping, supports and hangers as required for a complete plumbing system.
2. Testing of all piping shall be made in the presence of the Engineer or a designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved.
3. The arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainages, etc. shall be maintained.

**B. PRODUCT**

1. Underground building sanitary sewer lines, exterior and interior, shall be service weight cast iron soil pipe and fittings, hub and spigot type with Neoprene "Charlotte" Seal. No waste or vent lines less than 2" shall be installed underground.
2. Soil and waste lines above ground shall be no-hub cast iron pipe and fittings with neoprene gasket and stainless steel clamps. Installation shall be in strict accordance with C.I.S.P. Standard #301-75.
3. Vent piping shall be the same as waste and soil pipe, except 2" and smaller may be galvanized steel with galvanized malleable drainage fittings, except where installed underground.
4. Soil, waste and vent piping shall be supported with Elcen Figure 12, adjustable clevis type hangers, maximum ten feet on centers, and at each change in direction.
5. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.
6. All couplings for hubless cast iron soil pipe shall conform to CISPI 310 and be certified by NSF International or where indicated shall be "Heavy-Duty" type and conform to ASTM C 1540.

**C. EXECUTION**

1. "T" branches shall not be used in drainage piping, and sanitary fittings shall not be used in vent stack.
2. In pipe chases, the Contractor shall provide for suspension of all piping from structure. Do not allow piping to rub against masonry when expanding and contracting.
3. Close and protect open ends of piping until final connections are made. Such closing shall be made with fittings that cannot be easily removed. Caps and plugs shall be required at all times during construction so that no pipes are left open at the end of any day's work, even though continuation is expected the next day.
4. Any leaky joints shall be remade with new materials.
5. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall be Schedule 40, black steel, 1/2" in diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall be caulked and made watertight.



6. Pipe joint compound shall be LACO or equal.
7. Waste and vent piping shall be hydrostatically tested at each floor. A test tee will be installed below each floor and pipe will be filled with water for a height of 10' above finished floor. The pipe shall be gas and water tight. Water shall stand in the system for a period of 30 minutes without evidence of leakage. After the waste and vent piping has been hydrostatically tested for the entire system the piping shall be smoke tested using smoke bombs. The contractor shall plug waste line where it exits building, fill all of the traps with water and test the waste and vent piping by using a smoke bomb in a wall or floor cleanout. He shall install a plug on the cleanout once the smoke bomb has been dropped into the cleanout. The smoke bomb test shall be held for thirty minutes without evidence of leakage in the piping. The smoke bombs for this testing shall be furnished by the contractor. Once the testing of the piping has been completed, the contractor shall flush all of the smoke bombs from the waste piping system.
8. All piping and equipment installed under this Contract shall be tested in the presence of the Engineer and the proper Plumbing Inspector, and proved tight for the periods stated above, or longer if required by the Inspector.
9. The test shall be administered in sections if deemed advisable.
10. No plumbing system or part thereof shall be covered or concealed until after it has been tested and approved.
11. If such work has been covered or concealed before testing, it shall be exposed for testing.

END OF SECTION 22 13 16

## SECTION 22 16 13 – PIPE AND PIPE FITTINGS (GAS)

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### A. GENERAL

1. This section includes all pipe, pipe fittings, hangers, and supports, etc. as may be required to provide a complete gas piping system.
2. Testing of all piping shall be made in the presence of the Engineer or a designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved.
3. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.

### B. PRODUCT

1. Piping shall be standard weight, Schedule 40, black steel pipe conforming to ASTM Specification A-53, A-501 and A-589; and Federal Specification WW-P404.
2. Standard weight welding fittings shall be used and shall conform to ASTM A-234.
3. Screwed fittings shall be malleable iron, 150 lb. S.W.P., with banded pattern conforming to ANSI B16.3.
4. Piping shall be Type K soft copper tubing conforming to ASTM B88 where gas line is shown on plans to be run in hollow walls or partitions. No joints shall be allowed within wall. Approved fittings shall be used to make transition from steel to copper piping.
5. Hangers and supports shall be as follows:
 

· Concrete Inserts	B-2500
· Hanger Rod	B-3205
· Riser Clamp	B-3373
· Hanger	B-3100
· Pipe Saddles	B-3160
· Insulating Protector	B-3151
· Rod Ceiling Plate	B-3199
· Beam Clamps	B-3050
· Offset Clamps	B-351L

Numbers given above are devices as manufactured by B-Line Systems, Inc.; PHD Manufacturing; Empire; or Modern Support Devices are acceptable equals.

6. Pipe threads shall conform to ANSI B1.20.1.
7. Encasement piping for underground gas piping shall be solid schedule 40 PVC-DWV, ASTM D-2665, D-1784 and D-1785 pipe and fittings with solvent weld joints.
8. Gas Cocks (3/4" to 2" pipe) shall be UL Listed for fuel gas service, cast iron/ductile iron/carbon steel/stainless steel body with threaded ends (flanged ends for 5 psi or greater system pressure), non-lubricated straight-through flow design, 80% port opening, resilient faced eccentric plug to assure lasting "dead-tight" shut-off to 275 psi, heavy duty stainless steel bearings, welded in corrosion resistant seats, square operator head, 125 psi working pressure (air tested) to 300 degrees F; like DeZurik Eccentric Plug Valve (PEC), Homestead, or Val-Matic. Provide one operator wrench for each ten (10) gas cocks per size of operator wrench, with a minimum of one operator wrench per size/per project.

Gas cocks (2-1/2" and larger pipe) shall be UL Listed UL Listed for fuel gas service, cast iron/ductile iron/carbon steel/stainless steel body with flanged ends, non-lubricated straight-through flow design, 80% port opening, resilient faced eccentric plug to assure lasting "dead-tight" shut-off to 275 psi, heavy duty stainless steel bearings, welded in corrosion resistant seats, square operator head, 125 psi working pressure (air tested) to 300 degrees F; like DeZurik Eccentric Plug Valve (PEC), Homestead, or Val-Matic. Provide one operator wrench for each ten (10) gas cocks per size of operator wrench, with a minimum of one operator wrench per size/per project.

9. Provide ferrous bodied pressure regulators for individual service lines, capable of reducing distribution line pressure to pressures required for users. Provide regulators where gas will be distributed at pressures in excess of 10 inches of water column, with pressure relief set at a lower pressure than would cause unsafe operation of any connected user.

Provide regulator(s) having a single port with orifice diameter no greater than that recommended by the manufacturer for the maximum gas pressure at the regulator inlet. Provide regulator valve vent of resilient materials designed to withstand flow conditions when pressed against the valve port, capable of regulating downstream pressure within limits of accuracy and limiting the build-up of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Provide a self contained service regulator by Maxitrol, Fisher, or Bryan Donkin.

### C. EXECUTION

1. Pipe 2" and smaller shall have screwed joints.
2. Pipe 2 1/2" and larger shall be welded.
3. Welding tees or weldolets shall be used.
4. No "Stub-In" shall be permitted.
5. All piping run below grade shall be Teflon-coated, Schedule 40 black steel piping, as manufactured by Republic (X-Tru Coat), Entec, or approved equal.
6. In no case shall this Contractor be allowed to cut or reduce the specified covering to allow the application of a smaller hanger than required.
7. Hanger supporting horizontal piping shall be spaced as follows:
  - 1/2"                      6 feet on centers minimum
  - 3/4" and 1"            8 feet on centers minimum
  - 1 1/4" and larger    10 feet on centers minimum
8. Hangers shall be provided at each change in direction. Vertical risers shall be supported at each floor.
9. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall also be used where copper tubing is concealed in a hollow wall or partition, wherever vertical tubing passes through a structural element and for the full length of horizontal piping. Sleeves shall be Schedule 40, black steel, 1/2" in diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves in exterior walls shall be caulked and made watertight.
10. All exposed gas piping surfaces, including rooftop, supports, etc., shall be painted with one prime and one finish coat of rust resistant paint. Finish coat shall be yellow according to OSHA Standards, and labeled "GAS" according to ANSI A13.1, unless otherwise noted on the plans.

11. All gas piping having greater than 1 psi pressure shall be identified by a yellow label with black letters indicating the piping system pressure at each end and at intervals of not more than 5 feet along the entire length of the pipe.
12. Each drop to serve an individual piece of equipment shall be provided with a union, a gas cock, and a dirt leg a minimum of 6" long the same size as the pipe drop.
13. Gas piping systems above ground and within the building shall be electrically grounded, as defined in NFPA 70, and the latest versions of the National Electrical Code and the North Carolina Fuel Gas Code.
14. Testing
  - a. All gas piping systems shall be tested in strict accordance with the National Fire Protection Association's National Fuel Gas Code NFPA54, and the State Building Code.
  - b. All gas piping system shall be air tested at 50 psi for a period of not less than one (1) hour without loss of pressure. Any leaks that occur shall be repaired and another test started. All joints shall be checked for leaks with a water-soap solution. Where leaks are found, the joint shall be re-made.

END OF SECTION 22 16 13



**SECTION 22 16 15 – PIPE AND PIPE FITTINGS (GAS – BELOW GROUND)**

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**A. GENERAL**

1. This section includes all pipe, pipe fittings, hangers, supports, etc. as may be required to provide a complete gas piping system.
2. Testing of all piping shall be made in the presence of the Engineer or a designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved.
3. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.
4. All gas piping installation shall comply with current version of the North Carolina State Building Code: Fuel Gas Code, and with NFPA 58, "Liquefied Petroleum Gas Code".

**B. PRODUCT**

1. All gas piping and fittings, below grade, shall be extra high molecular weight polyethylene gas pressure pipe joined by electrical resistance fusion.
2. All joints shall be made according to the manufacturer's recommendations.
3. Materials shall conform to ASTM D2513.
4. Joints between polyethylene pipe and fittings and any other piping materials shall be with proper adapters and according to manufacturer's recommendations.

**C. EXECUTION**

1. Close and protect open ends of piping until final connections are made. Such closing shall be made with fittings which cannot be easily removed. Caps and plugs shall be required at all times during construction so that no pipes are left open at the end of any day's work, even though continuation is expected the next day.
2. Any leaky joints shall be remade with new materials.
3. Backfilling and trenching shall be installed in accordance with the manufacturer's recommendations.
4. Testing
  - a. All gas piping systems shall be tested in strict accordance with the National Fire Protection Association's National Fuel Gas Code NFPA54, and the State Building Code.
  - b. All gas piping systems shall be air tested at 50 psi for a period of not less than one (1) hour without loss of pressure. Any leaks that occur shall be repaired and another test started. All joints shall be checked for leaks with a water/soap solution. Where leaks are found, the joint shall be re-made.
  - c. All piping and equipment installed under this Contract shall be tested in the presence of the Engineer and the proper Plumbing Inspector, and proved tight for the periods stated above, or longer if required by the Inspector.
  - d. The test shall be administered in sections, if deemed advisable.

- e. No plumbing system or part thereof shall be covered or concealed until after it has been tested and approved.
- f. If such work has been covered or concealed before testing, it shall be exposed for testing.

END OF SECTION 22 16 15

**SECTION 22 42 00 – PLUMBING FIXTURES**

---

## A. GENERAL

1. All work of this section shall fully comply with ANSI A117.1.
2. All handicapped fixtures and trim shall be installed in accordance with the North Carolina State Building Code, Accessibility Code, latest edition.
3. All wetted components of system shall comply with United States Safe Drinking Water Act (Sec.1417) amended 1-4-2011.
4. Provide plumbing fixtures as scheduled on the drawings.
5. All fixtures of each product classification listed below shall be by one manufacturer insofar as possible. Some products listed in Section B below may not be required for this project.
6. Submit shop drawings on the following:
  - a. Fixtures
  - b. Floor drains, cleanouts and hydrants
  - c. Trim
  - d. Water Coolers
  - e. Water Heaters
  - f. Pumps
  - g. Backflow Preventers
  - h. Shower Valves
7. Quality Assurance
  - a. ANSI Z124.1 – Gel-coated Glass-Fiber Reinforced Polyester Resin Bathtub Units
  - b. ANSI Z124.2 – Gel-coated Glass-Fiber Reinforced Polyester Resin Shower Receptor and Shower Stall Units
  - c. ANSI Z358.1 – Emergency Eyewash and Shower Equipment
  - d. ARI 1010 – Drinking Fountains and Self-contained Mechanically Refrigerated Drinking Water Coolers
  - e. ASME A112.6.1 – Supports for Off-the-Floor Plumbing Fixtures for Public Use
  - f. ASME A112.18.1 – Finished and Rough Brass Plumbing Fixture Fittings
  - g. ASME A112.19.1 – Enameled Cast Iron Plumbing Fixtures
  - h. ASME A112.19.2 – Vitreous China Plumbing Fixtures
  - i. ASME A112.19.3 – Stainless Steel Plumbing Fixtures (Designed for Residential Use)
  - j. ASME A112.19.4 – Porcelain Enameled Formed Steel Plumbing Fixtures
  - k. ASME A112.19.5 – Trim for Water-Closet Bowls, Tanks, and Urinals
  - l. NFPA 70 – National Electrical Code



## B. PRODUCT

1. Manufacturers pre-approved for use on this project shall be as listed in the Fixture Schedule and as follows:

## a. Fixtures

## 1) Commercial

## a) Water Closets – Urinals – Lavatories – Service Sinks

- Kohler
- American Standard
- Zurn
- Crane
- Commercial Enameling Company
- Eljer
- Sloan

## b) Sinks

- Just
- Elkay
- Kohler
- Moen
- Advance Tabco

## c) Emergency Equipment

- Haws
- Bradley
- Guardian
- Speakman

## d) Mop Receptor

- Stern-Williams
- Florestone
- Kohler
- Oberon
- Acorn
- Crane
- Fiat

## e) Shower Stalls

- Aquarius
- Aqua Glass
- Maxx
- Fiat
- Kohler
- Clarion

## f) Wash Fountains

- Intersan
- Acorn
- Bradley
- Willoughby Industries

b. Roof Drains, Floor Drains, Carriers, Cleanouts, Hydrants, Trap Primers: Zurn, Josam, Smith, Wade, Precision Plumbing Products, Inc., Mifab, or Watts Drainage.

## c. Trim

## 1) Commercial

## a) Faucets

- Moen
- Zurn
- American Standard
- Kohler
- Speakman
- Delta
- Chicago Faucets / Geberit
- Cambridge Brass
- T & S Brass and Bronze
- Symmons

## b) Supplies – Traps - Tailpiece

- McGuire
- Brasscraft
- Kohler
- Engineered Brass Company
- Zurn

## c) Metering Faucets

- Moen
- Symmons
- Delta
- Bradley
- Chicago Faucets / Geberit
- Zurn

## d) Flush Valves

- Sloan
- Delaney
- Zurn

## e) Electronic Flush Valves

- Sloan
- Delaney
- Toto

## f) Electronic Faucets

- Zurn
- Sloan
- Chicago Faucets / Geberit
- Kohler

## g) Toilet Seats

- Church
- Beneke
- Centoco
- Bemis
- Olsonite

d. Water Coolers/Drinking Fountains: Sunroc, Halsey Taylor, Elkay, Oasis, Haws, Murdock.

- e. Water Heaters: Pressure Vessels, Inc.; State; A. O. Smith; Ruud; Rheem; Bock; Bradford-White.
- f. Backflow Preventers: Watts, Wilkins, Ames, Conbraco, Hersey, Febco, Rainbird.
- g. Shower Valves: Symmons, Chicago Faucets, Leonard.
- h. Interceptors: Mifab, Rockford, Zurn, Josam, Smith, Wade.
- i. Access Panels: Karp, Mifab, Elmdoor.
- j. Mixing Valves: Symmons, Chicago Faucets, Leonard.
- k. Safety Covers for Traps and Supplies: McGuire, Truebro, and Keeney.

C. EXECUTION

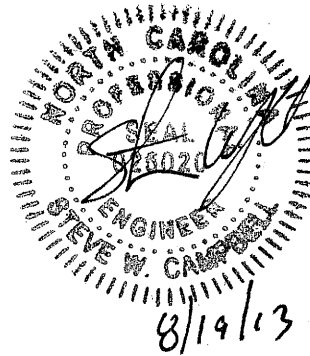
1. Fixtures and carriers shall be installed in accordance with the manufacturer's recommendations.
2. All fixtures, drains, traps, etc. shall be set plumb and level.
3. Protect products from damage while transporting, handling, or in storage. Only factory-packaged products shall be accepted on site and shall be inspected for damage. Once fixtures are installed, protect them from damage by securing the areas and leaving factory packaging in place. Use by Contractors is not permitted.
4. All plumbing fixtures shall be neatly caulked with silicone caulking compound where the fixture meets the wall or floor. Countertop lavatories shall be caulked watertight.
5. Review millwork shop drawings. Confirm location and size of fixture and openings before rough-in and installation. Notify Engineer of any problems.
6. All plumbing fixtures and equipment shall be thoroughly cleaned.

END OF SECTION 22 42 00

**INTRODUCTION TO DIVISION 23 - HVAC**

The Specification Sections applying to the HVAC Work for the New NCDOT - Currituck Welcome Center in Currituck County, North Carolina are as follows:

SECTION	TITLE	PAGES
23 01 01	HVAC General Provisions	8
23 05 01	Division of Work	2
23 05 11	Electrical Work	2
23 05 13	Motors and Motor Starters	2
23 05 29	Pipe Hangers and Supports	2
23 05 53	Mechanical Identification	4
23 05 95	Testing, Adjusting and Balancing - Air Only	6
23 07 15	Insulation (Wrapped Ductwork)	2
23 07 23	Pipe Insulation (Refrigerant)	2
23 11 23	Pipe and Pipe Fittings (Gas)	2
23 23 13	Pipe and Pipe Fittings (Refrigerant)	2
23 23 16	Piping Specialties (Refrigerant)	2
23 31 13	Ductwork	2
23 31 16	Spiral Ductwork	2
23 33 12	Louvers	2
23 33 47	Flexible Ductwork (Low Pressure)	2
23 33 53	Duct Liner	2
23 34 16	Fans	2
23 37 13	Air Distribution Outlets	2
23 51 23	Flue Piping (Gas)	2
23 54 13.1	Gas-Fired Warm Air Furnace (Variable Speed Inducer)	2
23 81 27	Split System Condensing Unit	2
23 82 14	Direct Expansion Evaporator Coil	2





**SECTION 23 01 01 – HVAC GENERAL PROVISIONS**

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## A. GENERAL

## 1. Scope of Work

- a. The Contractor shall provide all materials, equipment and labor necessary to install and set into operation the heating and air conditioning equipment as shown on the Engineering Drawings and as contained herein.

## 2. Quality Assurance

- a. See the General and Supplementary General Conditions.
- b. All work shall conform to applicable Underwriters' Laboratories, or third party agency credited by the NCBCC, State Building Code requirements and regulations, as amplified herein, and in accordance with the requirements of and subject to the acceptance of the North Carolina Fire Insurance Rating Bureau. All fabricated assemblies of electrically-operated equipment furnished under this contract shall have Underwriters' Laboratories approval, third party agency accredited by the NCBCC, or UL Re- examination Listing for the particular type of materials or devices in question.  

American Society of Mechanical Engineers Code: Unfired Pressure Vessels shall be adhered to.

National Board of Fire Underwriters' Pamphlets: No. 90A - Air Conditioning Systems (1995)

National Board of Fire Underwriters' Standard.
- c. Permits refer to General Conditions Article 10.
- d. Wherever the words "Approved", "Approval", or "Approved Equal" appear, it is intended that items other than the model number specified shall be subject to the approval of the Engineer.
- e. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- f. All material and equipment that the Contractor proposes to substitute in lieu of those specified, shall be submitted to the Engineer within twenty (20) days after the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Article 8 of the General Conditions will be followed for substitutions after award of Contract.
- g. Boiler Inspection Certificate - It shall be the responsibility of the Contractor to complete the installation of fired or unfired pressure vessels and their safety devices in accordance with the requirements of the latest edition of the North Carolina Department of Labor, "Boiler Inspection Law, Rules and Regulations". The Contractor shall be responsible for notifying the Bureau of Boiler Inspection in writing at least two weeks prior to the date of completion of all equipment requiring inspection. Certificates furnished by the Bureau of Boiler Inspection shall be in a frame having a removable glass cover and posted near the pressure vessel. Certificates shall be installed before requesting final inspection of the completed project. The pressure vessel is **NOT** to be operated before it is inspected and approved.

### 3. Substitutions

a. Products are specified for use on this project by one of the following:

- 1) Reference Standards and Description: Any products meeting the Reference Standards and Description will be acceptable (i.e., piping).
- 2) Naming of a product as an example to denote the quality standard of the product is desired, in which case three or more brands will be denoted (where applicable) to establish equivalent designs. Naming of a product does not restrict Bidders to a specific brand (i.e., fixtures, valves, etc.).

Requests for approval of manufacturer's or substitutions which have not been pre-approved shall be made by using the forms at the end of this section.

b. During bidding period: Submitted written requests from bidders only using the forms

Herein, will be considered if received at least ten (10) calendar days prior to the date of receipt of bids to allow for proper evaluation. Requests from suppliers or subcontractors will not be considered.

Substitutions will be considered when a product becomes unavailable through no fault of the Contractor. A request constitutes a representation that the Bidder/Contractor:

- 1) Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product and is suitable for use in the Work.
- 2) Will provide the same warranty for the substitution as for the specified product.
- 3) Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to the Owner.
- 4) Waives claims for additional cost or time extension which may subsequently become apparent.
- 5) Has included a list of similar projects on which this product has been used with names and telephone numbers for verification.
- 6) Has written verification from the product manufacturer that this product has been in use a minimum of two (2) years on a project similar to this work.

Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

c. Architect/Engineer Review

- 1) Review and approval will rely on manufacturer's literature and other data as outlined herein.
- 2) Inadequacies in such submittals that fail to identify unsuitability are the responsibility of the parties making submittal.

d. Substitution Procedure

- 1) Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
- 2) Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
- 3) Submit listing of similar projects.

- 4) Submit manufacturer's written verification that product has been in use a minimum of two (2) years at similar projects.
- 5) The Architect/Engineer will notify Contractor, in writing, of decision to accept or reject request.
- 6) Products bid or incorporated in the work that are not specified and without written approval of the Architect/Engineer may not be acceptable, and if not, the Contractor will be required to furnish and install the products specified.
- 7) The Architect/Engineer will issue written approvals of product substitutions to all Bidders. Substitutions are not approved without written approval.

**FORMS:** Copy forms incorporated at the end of this section and use for all product substitutions.

#### 4. Submittals

- a. See General and Supplementary General Conditions.
- b. After notification of the award of the contract and written notice to begin work, the Contractor shall submit to the Architect/Engineer, within the time frame specified by the Architect, for approval a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time.
- c. The Contractor shall provide six (6) sets of submittal data bound in a 3-ring binder. The 3-ring binder shall contain complete submittal data on all products, methods, etc. proposed for use on the project. Permission shall be obtained from the Engineer to submit data outside of the 3-ring binder, such as submittal data requiring early review for special ordering purposes.
- d. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number, and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitutions for specified items. Acceptance for approval shall be in writing from the Engineer.
- e. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these as-built plans.
- f. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions, as outlined in Paragraph C, Item #6.
- g. The Contractor shall submit to the Owner all certificates required for operating system in compliance with the plans and specifications.

#### 5. Product Delivery, Storage and Handling

- a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- b. The Contractor shall protect all material and equipment from breakage, theft, or weather damage. No material or equipment shall be stored on the ground.
- c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner. No partial acceptance of the work will be permitted.



## 6. Work Conditions and Coordination

- a. The Contractor shall review the electrical plans to establish points of connection and the extent of electrical work to be provided in his contract. All electrical work shall be performed by a licensed electrician.
- b. All individual motor starters, disconnects and junction boxes for mechanical equipment (fans, pumps, etc) shall be furnished and installed under Division 23 unless indicated as a part of a motor control center. Refer to Electrical Section 28 26 16 – Disconnects for information. Motor starters for mechanical equipment provided in motor control centers shall be furnished under Division 26. Under Division 26, power wiring shall be provided up to a termination point consisting of a junction box, trough, starter, variable frequency drive, or disconnect switch. Under Division 26, line side terminations shall be provided. Wiring from termination point to the mechanical equipment, including final connections, shall be provided under Division 23. The Mechanical Contractor shall be responsible for the proper direction of rotation for all three phase equipment. The Mechanical Contractor shall furnish and install all control circuitry
- c. This Contractor shall be responsible for the final electrical connections to all equipment installed as part of his Contract. Unless otherwise noted, this Contractor shall wire from his equipment to disconnect switches, junction boxes, or panelboard circuit breakers as provided by the Electrical Contractor.
- d. Electrical work shall be in accordance with all State codes.
- e. Pipe, conduit and duct chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
- f. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be at the Contractor's expense at no extra cost to the Owner.

## 7. Guarantee

- a. See the General and Supplementary General Conditions.
- b. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary contract documents to validate these warranties as required by the manufacturer and present them to the Architect/Engineer.
- c. The Contractor shall include in his bid a full warranty and guarantee for a five (5) year period on the compressor for the refrigeration equipment, including all chillers. This warranty does not include labor following the first year's Labor and Material Warranty.

## B. PRODUCT

1. Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections.
2. The Contractor shall provide name plates for identification of all equipment, switches, panels, etc.
3. The name plates shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/4" minimum) etched into the white core. Name plates shall be fastened with sheet metal screws.

## C. EXECUTION

### 1. Inspection

- a. This Contractor shall examine the areas of completed work and shall insure that no defects or errors are present which would result in the poor application or installation of subsequent work.
- b. All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- d. All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.
- e. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish all sleeves to the General Contractor for openings through poured masonry floors or walls above grade required for passage of all conduits, pipes, or ducts installed by him. The Contractor shall provide all inserts and hangers required to support his equipment.

### 2. Performance

- a. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.
- b. Rock excavation shall be defined in the Supplementary General Conditions, Division 1 or Division 2. If rock excavation is not defined under these sections, neither rock excavation nor a unit price for rock excavation shall be required in the bid.

### 3. Erection

- a. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

### 4. Adjust and Clean

- a. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- b. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for intended service. In no event shall name plates be painted.
- c. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract.
- d. Equipment with filter media shall be run for a period of two (2) weeks after completion of work at which time a new filter media shall be installed with one change of filter media provided the Owner for future replacement.

## 5. Diagrams

- a. The Contractor shall provide as-built temperature control diagram in framed glass and turn them over to the Owner.

## 6. Operator's Manual

- a. The Contractor shall prepare in (4) copies a manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data intended for dimension or design purposes (although these may be included), but shall be prepared to describe this particular job. This manual shall include the following:
  - (1) A checklist for periodic maintenance of all equipment.
  - (2) Suggested setting of all controls and switches for normal operation, with description of control and its location.
  - (3) A checklist for seasonal shutdown.
  - (4) Maintenance and spare parts data for each major piece of equipment.
  - (5) As-built wiring, interlock and control diagrams for equipment with color coding shown on wiring and interlock diagrams.
  - (6) Air and Water Balance Reports.
- b. The manuals shall be bound, indexed, dated and signed by the Contractor when complete.
- c. The operating and maintenance manuals shall be submitted to the Engineer for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.

SUBSTITUTION AND PRODUCT OPTIONS

TO: PROGRESSIVE DESIGN COLLABORATIVE, LTD.  
Post Office Box 61249  
Raleigh, North Carolina 27661-61249

PROJECT NAME: \_\_\_\_\_

The undersigned requests that the following product be considered for substitution in lieu of the specified item in Project Manual Section \_\_\_\_\_ Page \_\_\_\_\_ Paragraph \_\_\_\_\_ Description of Item: \_\_\_\_\_

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

Proposed Substitution: \_\_\_\_\_  
\_\_\_\_\_

The undersigned certifies that the following statements are correct, unless modified on an attachment:

1. The proposed substitution is equal or better in appearance, function and quality to the specified item, in all respects and is suitable for inclusion in the Work.
2. Attached are 4 copies of the Manufacturers Product Description, Specifications, Data Sheets, Photographs, Test Data and Color Charts.
3. We will furnish a physical sample, if requested by the Architect/Engineer.
4. Every variation of this product is to be listed and clearly delineated on the submission.
5. This substitution will require no dimensional changes to the drawings and will have no effect on other trades, the construction schedule or warranty requirements.
6. List of similar type project in which product is used.
7. Verification from manufacturer that product has been in use a minimum of two (2) years at similar projects.

SUBSTITUTIONS AND PRODUCT OPTIONS:

MANUFACTURER OR REPRESENTATIVE

CONTRACTOR OR BIDDER

Submitted by:

Submitted by:

Name: \_\_\_\_\_

Name: \_\_\_\_\_

Firm: \_\_\_\_\_

Firm: \_\_\_\_\_

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

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_

Phone No.: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

By approving and submitting shop drawings, product data and samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related hereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the work and of the Contract Documents.

The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect/Engineer's approval of shop drawings, product data or samples unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submission and the Architect/Engineer has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the shop drawings, product data or samples by the Architect's approval.

Architect's Reply:

Engineer's Reply:

- ( ) APPROVED
- ( ) APPROVED AS CORRECTED
- ( ) REVISE AND RESUBMIT
- ( ) NOT APPROVED

- ( ) APPROVED
- ( ) APPROVED AS CORRECTED
- ( ) REVISE AND RESUBMIT
- ( ) NOT APPROVED

ARCHITECT:

ENGINEER:

\_\_\_\_\_

PROGRESSIVE DESIGN COLLABORATIVE

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

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

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

END OF SECTION 23 01 01

## **SECTION 23 05 01 – DIVISION OF WORK**

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- A. This section delineates the division of work between Divisions 22/23 and Division 26.
- B. All other work necessary for the operation of Division 22 and Division 23 equipment shall be performed under Divisions 22 and 23.
- C. All individual motor starters and drives for mechanical equipment (fans, pumps, etc.) shall be furnished and installed under Divisions 22 and 23 unless indicated as a part of a motor control center. Motor starters for mechanical equipment provided in motor control centers shall be furnished under Divisions 22 and 23.
- D. Equipment less than 110 volt, all relays, actuators, timers, seven-day clocks, alternators, pressure, vacuum, float, flow, pneumatic-electric, and electric-pneumatic switches, aquastats, freezestats, line and low voltage thermostats, thermals, remote selector switches, remote push-button stations, emergency break-glass stations, interlocking, disconnect switches, beyond termination point, and other appurtenances under Divisions 22/23 shall be furnished, installed and wired under Divisions 22/23.
- E. All wiring required for controls and instrumentation not indicated on the drawings shall be furnished and installed by Divisions 22/23.
- F. Roof exhaust fans with built-in disconnects provided under Division 23 shall be wired under Division 26 to the line side of the disconnect switch. A disconnect switch shall be provided under Division 26 if the fan is not provided with a built-in disconnect switch. In this case, wiring from the switch to the fan shall be under Divisions 22/23.

END OF SECTION 23 05 01



**SECTION 23 05 11 – ELECTRICAL WORK**

---

**A. GENERAL**

1. This Contractor shall be responsible for the final electrical and the entire control connections and wiring to all equipment installed as part of his contract.
2. Contractor shall review the electrical plans, where applicable, to establish points of connection and the extent of his electrical work to be provided in his contract.
3. Unless otherwise noted, this Contractor shall wire from his equipment to disconnect switches, junction boxes, or panelboard circuit breakers as provided by the Mechanical Contractor or as required by the existing conditions.
4. All power and control wiring shall be in conduits. Refer to electrical specifications for conduit and conduit fittings.
5. All electrical work shall be performed by a licensed electrician.
6. All electrical work shall be in accordance with the State Building Code and all its supplements, the latest edition of the National Electrical Code and the electrical specifications.

**B. PRODUCT**

1. All motor starters, disconnects, switches, relays, conduits, conductors, etc. that are required for a complete electrical power and/or control system shall conform to the requirements set forth by NEC.
2. Refer to the plans for the type, size and electrical characteristics of the starters, disconnects, switches, relays, conductor and conduits.
3. All conductors and conduits shall be sized as noted on the plans or As required per NEC.
4. All individual motor starters for mechanical equipment (i.e., fans, pumps, etc.) shall be furnished and installed under Division 23.
5. All relays, actuators, timers, seven-day clocks, alternators, pressure, vacuum, float, flow, pneumatic-electric, and electric-pneumatic switches, aquastats, freezestats, line and low voltage thermostats, thermals, remote selector switches, remote push-button stations, emergency break-glass stations, interlocking, disconnect switches beyond termination point, and other appurtenances associated with equipment under Division 23 shall be furnished, installed and wired under Division 23.

**C. EXECUTION**

1. All motor starters, disconnects, and switches shall be installed on or as close to the equipment they are serving as possible, or where shown on the plans.
2. Electrical connection to equipment subject to vibration which develops objectionable noises shall be made from the conduit system with short lengths of flexible "Liquid-Tite" conduit. Connection to other equipment shall be made with rigid conduit.
3. Conduits shall be run in a concealed space such as wall cavities, ceiling cavities, etc. except in the mechanical rooms where conduit may be run exposed.

END OF SECTION 23 05 11





**SECTION 23 05 13 – MOTORS AND MOTOR STARTERS**

---

**A. GENERAL**

1. Motors and motor starters shall be provided as required or as indicated on the Drawings.

**B. PRODUCT**

1. All motor sizes shall be as specified in the Equipment Schedule and shall be manufactured by Westinghouse, Wagner Electric, General Electric, or Baldor.
2. All motors shall have thermal overload protection. Three-phase motors shall have overload protection in each phase.
3. Motor starters shall be sized to match the motor served and shall be manufactured by Square D Company, Furnas or General Electric.
4. Motors shall be designed to operate at 40 degrees C temperature rise.
5. Motors shall have housing suitable for ambient conditions. Motors one-half (1/2) HP and larger shall have hand operated grease cups or self-lubricating fittings. Motors operated outdoors shall have all-weather enclosure.
6. All motors shall be premium efficiency and meet or exceed the requirement of ASHRAE Standard 90.1 and the North Carolina Energy Code.
7. All motor starters shall have H/O/A switches unless otherwise noted on the plans. All starters shall have phase reversal, over current, under current, and phase loss protection.

**C. EXECUTION**

1. Motors shall be installed as required by the equipment manufacturer.
2. Motors with belt drives shall have adjustable motor mountings. Motor mounts shall have adjustable locking device for fixing motor position.
3. It is the responsibility of the Contractor providing the motor to ascertain any conditions that would have any bearing upon the selection of motors and/or their enclosures.
4. Motor starters shall be installed as close to the motors they are serving as possible.
5. Motor starters shall be installed at locations and heights to meet all State requirements and National Electric Code.

END OF SECTION 23 05 13



**SECTION 23 05 29 – PIPE HANGERS AND SUPPORTS**

---

**A. GENERAL**

1. This Section includes all hangers and supports, etc. as may be required to provide a complete piping system.
2. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.

**B. PRODUCT**

1. Piping shall be as stated in Piping Section(s).
2. Hangers and supports shall be as follows:
  - Concrete Inserts – Fig. B2500
  - Hanger Rod – Fig. B3205
  - Riser Clamp – Fig. B3373
  - Hanger – Fig. B3100
  - Pipe Saddles – Fig. B3160
  - Insulating Protector – Fig. B3151
  - Rod Ceiling Plate – Fig. B3199
  - Beam Clamps – Fig. 3050
  - Offset Clamps – Fig. B351L
  - Roller Hanger – Fig. B3110

Figure numbers given above are devices as manufactured by B-Line Systems, Inc., PHD Manufacturing, Empire, Modern Support Devices, or Michigan Hanger Company are acceptable equals.

3. All hanger rods, supports, clamps, or any hardware device shall be galvanized or zinc plated.

**C. EXECUTION**

1. In no case shall this Contractor be allowed to cut or reduce the specified covering to allow the application of a smaller hanger than required.
2. Hangers supporting horizontal piping shall be spaced on not more than 10-foot centers and within 30" of each change of direction, except that piping 1 1/4" size and smaller shall be supported on no more than 8-foot centers. Cast iron drain piping shall have a minimum of two (2) hangers per section.
3. Vertical risers shall be supported at each floor, 5 feet on center, and/or at changes in direction of pipe.
4. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall be Schedule 40, black steel, 1/2" in diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves in exterior walls shall be caulked and made watertight.

END OF SECTION 23 05 29



**SECTION 23 05 53 – MECHANICAL IDENTIFICATION**

---

**A. GENERAL**

## 1. Scope

- a. Nameplates
- b. Tags
- c. Stencils
- d. Pipe Markers

## 3. Submittals

Require the following:

- a. Submit list of wording, symbols, letter size and color coding for mechanical identification.
- b. Submit list of valves and schedule, including valve label information, location, function and valve manufacturer's name and model number.
- c. Product Data: Provide manufacturer's catalog literature for each product required.
- d. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- e. Samples of valve and device markers.

**B. PRODUCT**

## 1. Nameplates

## a. Manufacturers

- 1) Seton Name Plate Co.
- 2) W. H. Brady Co.
- 3) Preferred Utilities Mfg. Corp.

- b. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

## 2. Tags

- a. Install a label on the valve or device and on the ceiling grid in proximity to the valve or device. Indicate type of valve or device and associated service on label. (e.g. "Shutoff Valve – HW", "VAV-2-1")
- b. Provide custom printed labels, either of vinyl suitable for indoor/outdoor applications or of polypropylene for each device. Utilize portable printer equal to Brady HandiMark Portable Industrial Labeling System.
- c. Maximum height of label is one inch. Lettering shall be 12 font or larger. Black lettering on white tape.
- d. Provide a list in the O & M Manual indicating the identical information indicated on the valve or device label.
- e. Submit samples of markings on three different devices for review by Engineer and Owner.

## 3. Stencils

## a. Manufacturers:

- 1) Seton Name Plate Co.
- 2) W.H. Brady Co.
- 3) Marsh Co.

- b. Stencils: with clean cut symbols and letters of following size:
  - 1) 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
  - 2) 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
  - 3) 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1-/4 inch high letters.
  - 4) 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
  - 5) Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
  - 6) Ductwork and Equipment: 2-1/2 inch high letters.
- c. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors shall conform to standard colors for selected mechanical piping. See Sheet M-1 or attached at end of Section.

#### 4. Pipe Markers for Underground Piping

- a. Manufacturers:
  - 1) Seton Nameplate Co.
  - 2) W.H.BradyCo.
  - 3) Carlton Industries, Inc.
- b. Color: Standard colors for selected mechanical piping, attached at end of Section.
- c. Plastic Pipe Markers shall not be installed in buildings.
- d. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mils thick, manufactured for direct burial service. All plastic piping installed underground shall have a metallic tracer.

#### 5. CEILING MARKERS

- a. Install label on ceiling grid in proximity to device above ceiling. Indicate type of device and associated service on label. (e.g "Shutoff Valve — HW", "VAV-2-1 ")
- b. Provide custom printed labels, either of vinyl suitable for indoor/outdoor applications or of polypropylene for each device. Utilize portable printer equal to Brady HandiMark Portable Industrial Labeling System.
- c. Maximum height of label is one inch. Black lettering on white tape. Font size 18.

### C. EXECUTION

#### 1. PREPARATION

- a. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- b. Install tags with corrosion resistant chain.
- c. All exposed mechanical piping in mechanical rooms, boiler rooms, on and above mezzanine levels, both insulated and uninsulated, shall be either painted or color coded using .030" pvc jacketing by the HVAC Contractor and labeled by the Contractor. HVAC Contractor shall apply stencil painting in accordance with Section 09 90 00 or pipe markers in accordance with this Section.

- d. Install plastic pipe markers in accordance with manufacturer's instructions.
- e. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- f. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- g. Identify air handling units, with plastic nameplates. Small devices may be identified with tags.
- h. Identify control panels, manual motor starters, combination motor starters, disconnects, boiler override switches, boiler emergency switches and major control components outside panels with plastic nameplates.
- i. Identify thermostats or temperature sensors relating to air handling units or valves with nameplates.
- j. Identify valves in main and branch piping with valve labels.
- k. Tag automatic controls, instruments, and relays. Key to control schematic.
- l. Identify piping, concealed or exposed, with plastic pipe markers, plastic tape pipe markers or stencilled painting. Use tags on piping 3/4 inch diameter and smaller. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 30 feet apart on straight runs including risers and drops, adjacent to each valve, elbow and tee, at each side of penetration of structure or enclosure, and at each obstruction.
- m. Identify ductwork with plastic nameplates or stencilled painting. Identify with air handling unit identification number, area served and service (supply, return, exhaust, outside air, etc). Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- n. Identify air handling units with plastic nameplates indicating unit number, area served, OEM and external static pressure, based on actual equipment submittal data, number and size of filters, and number and size of belts.
- o. Identify pumps with plastic nameplates indicating pump number, system served, GPM and feet of head.
- p. Provide ceiling track markers to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment. Markers shall be installed prior to request for above ceiling inspection.
- q. Standard Color Identification for Mechanical Piping:
  - Chilled Water Light Blue
  - Hot Water Light Red
  - Make-Up Water Dark Blue
  - Gas Lines Yellow
  - Stencil Paint Lettering Black on Light Color Coded Piping
  - Stencil Paint Lettering White on Dark Color Coded Piping

END OF SECTION 23 05 53





**SECTION 23 05 95 – TESTING, ADJUSTING AND BALANCING – AIR ONLY**

---

## A. GENERAL

## 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.
- b. This work should be completed by an independent Balancing Contractor. The price of this work should be included in the bid.
- c. The Test and Balance Report should be completed two weeks prior to the final inspection with the Owner. The report should be submitted to the Engineer for review. A copy should be available at the final inspection and test equipment should be available at the final inspection for spot checking by the Engineer.
- d. The Test and Balance Contractor should be at the final inspection to spot check the air balance with the Engineer.

## 2. Summary

- a. This Section specified the requirements and procedures for total mechanical systems testing, adjusting, balancing, and recording and reporting the results.
- b. Test, adjust, and balance the following mechanical systems:
  - 1) Supply air systems
  - 2) Return air systems
  - 3) Exhaust air systems
  - 4) Verify temperature control system operation.
- c. Test systems for proper sound and vibration levels.
- d. This Section does not include:
  - 1) Specifications for materials for patching mechanical systems
  - 2) Specifications for materials and installation of adjusting and balancing, refer to the respective system sections for materials and installation requirements
  - 3) Requirements and procedures for ductwork systems leakage tests.

## 3. Definitions

- a. Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
  - 1) The balance of air distribution
  - 2) Adjustment of total system to provide design quantities
  - 3) Electrical measurements
  - 4) Verification of performance of all equipment and automatic controls
  - 5) Sound and vibration measurements
- b. Test: To determine quantitative performance of equipment.
- c. Adjust: To regulate the specified flow rate and air patterns at the terminal equipment (e. g., reduce fan speed, throttling).

- d. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.
  - e. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.
  - f. Report forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required for future testing, adjusting, and balancing.
  - g. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply outlets on air terminals and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.
  - h. Main: Duct containing the system's major or entire fluid flow.
  - i. Submain: Duct containing part of the system's capacity and serving two or more main branches.
  - j. Branch Main: Duct serving two or more terminals.
  - k. Branch: Duct serving a single terminal.
4. Submittals
- a. Agency Data:
    - 1) Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.
  - b. Engineer and Technicians Data:
    - 1) Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.
  - c. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.
  - d. Maintenance Data: Submit maintenance and operating data that includes how to test, adjust, and balance the building systems. Include this information in maintenance data.
  - e. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC or NEBB are proposed.
  - f. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:
    - 1) Draft Reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate and legible. Organize and format draft reports in the same

manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.

- 2) Final Report: Upon verification and approval of draft reports, prepare type written final reports. The Final Report is to be placed in and become a part of the Maintenance and Operations Manuals (4 copies).
  - 3) Report contents: Provide the following minimum information, forms and data:
    - a) General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name, address telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.
    - b) The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by AABC or NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.
  - g. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.
5. Quality Assurance
- a. Test and Balance Engineer's Qualifications: A Professional Engineer (independent consultant), registered in the State in which the services are to be performed, and having at least 3-years of successful testing, adjusting, and balancing experience on projects with testing and balancing requirements similar to those required for this project.
  - b. Agency Qualifications:
    - 1) Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.
    - 2) An independent testing, adjusting, and balancing agency certified by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project, and having at least one Professional Engineer registered in the State in which the services are to be performed, certified by AABC or NEBB as a Test and Balance Engineer.
  - c. Codes and Standards:
    - 1) ASBC: "National Standards for Total System Balance".
    - 2) ASHRAE: ASHRAE handbook, 1999 Applications Volume, Chapter 34, Testing , Adjusting, and Balancing.
  - d. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Engineer and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting and balancing.

## 6. Project Conditions

- a. Systems Operation: Systems shall be fully operational prior to beginning procedures.

## B. PRODUCT (Not Applicable)

## C. EXECUTION

### 1. Preliminary procedures for Air System Balancing

- a. Before operating the system, perform these steps:

- 1) Obtain design drawings and specifications and become thoroughly acquainted with the design intent. (By Contractor).
- 2) Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams. (By Contractor)
- 3) Compare design to installed equipment and field installations.
- 4) Walk the system to determine variations of installation from design.
- 5) Check filters for cleanliness.
- 6) Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
- 7) Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross-check with required fan volumes.
- 8) Determine best locations in main and branch ductwork for most accurate duct traverses.
- 9) Place outlet dampers in the full open position.
- 10) Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
- 11) Lubricate all motors and bearings.
- 12) Check fan belt tension.
- 13) Check fan rotation.

### 2. Measurements:

- a. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
- b. Provide instruments meeting the specifications of the referenced standards.
- c. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
- d. Apply instrument as recommended by the manufacturer.

- e. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.
  - f. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
  - g. Take all readings with the eye at the level of the indicated value to prevent parallax.
  - h. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
  - i. Take measurements in the system where best suited to the task.
3. Performing Testing, Adjusting, and Balancing:
- a. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
  - b. Cut insulation and ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
  - c. Patch insulation, ductwork, and housings, using materials identical to those removed.
  - d. Seal ducts and piping, and test for and repair leaks.
  - e. Seal insulation to re-establish integrity of the vapor barrier.
  - f. Mark equipment settings, including damper control positions, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
  - g. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.
  - h. Belts, pulleys and sheaves shall be replaced as needed, at no additional cost, to obtain the indicated quantities.
4. Testing for Sound and Vibration
- a. Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.
5. Record and Report Data
- a. Record all data obtained during testing, adjusting, and balancing in accordance with and on the forms recommended by the referenced standards, and as approved on the sample report forms.
  - b. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.
6. Demonstration
- a. Training
    - 1) Train the Owner's maintenance personnel on troubleshooting procedures and testing, adjusting, and balancing procedures. Review with the Owner's personnel, the information

contained in the Operating and Maintenance Data specified in Division 1 and **Section 23 01 00 - HVAC General Provisions**.

- 2) Schedule training with the Owner through the Engineer with at least 7 days prior notice.

END OF SECTION 23 05 95

**SECTION 23 07 15 – INSULATION (WRAPPED DUCTWORK)**

---

**A. GENERAL**

1. The Contractor shall insulate all ductwork as outlined below.
2. All insulation, coverings and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50.

**B. PRODUCT**

1. All supply and return air ductwork shall be completely insulated, unless otherwise noted on the plans. Insulation shall completely cover flexible duct connections.
2. Ductwork shall be wrapped on all sides with 2" thick fiberglass insulation with reinforced aluminum foil vapor barrier. Joints shall be wrapped with a minimum of 6" wide band of insulation to prevent any possible leakage and condensation.
3. Exhaust air ductwork does not require insulation unless otherwise noted on the plans.
4. All insulation inside the building, except in the attic, shall have a minimum R-value of 6.0 based on installed thickness. If any insulation wrap or board is installed outside of the building or in an attic, then it shall have a minimum R-value of 8.0 based on installed thickness.
5. The insulation shall be the product of Owens-Corning, Knauf, Johns-Manville or approved equivalent.

**C. EXECUTION**

1. Insulation shall be installed according to the manufacturer's recommendations.
2. Duct sizes shown on the Drawings are actual sheet metal dimensions. Duct insulation thickness shall be added to this dimension for final duct size.
3. Equipment and ducts in Equipment Rooms, Boiler/Pump Rooms, Mechanical Rooms and Lofts and exposed areas should be insulated with 2" thick fiberglass duct board and finished with one coat of eight ounce pasted canvas. Paint with two coats of paint.

END OF SECTION 23 07 15





**SECTION 23 07 23 – PIPE INSULATION (REFRIGERANT)**

---

**A. GENERAL**

1. The Contractor shall insulate all refrigerant piping as outlined below.
2. All insulation, linings, coverings and adhesives shall have a flame spread classification of 25 or less and a smoke developed rating of not more than 50, except exposed exterior piping.

**B. PRODUCT**

1. Refrigerant piping shall be insulated with one (1) inch thick insulation, Armstrong Armaflex II or approved equal by Owens-Corning, Schuller.
2. Condensate lines shall be insulated with ½" closed cell insulation with a 25/50 rating.

**C. EXECUTION**

1. Insulation shall be installed in strict accordance with manufacturer's recommendations.
2. Insulation shall be held in place with an adhesive approved by the insulation manufacturer and shall be provided with a vapor proof seal in accordance with manufacturer's recommendations.
3. Valves and fittings shall be insulated with miter-cut pieces of insulation.
4. All piping insulation exposed to atmospheric conditions shall be coated with two coats of manufacturer's recommended coating and two coats of solar reflective paint.

END OF SECTION 23 07 23



**SECTION 23 11 23 – PIPE AND PIPE FITTINGS (GAS)**

---

**A. GENERAL**

1. This section includes all pipe, pipe fittings, hangers, and supports, etc. as may be required to provide a complete gas piping system.
2. Testing of all piping shall be made in the presence of the Engineer or a designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved.
3. The actual arrangement of the piping shall follow the general locations shown on the Drawings, such that clearances, line drainage, etc. shall be maintained.

**B. PRODUCT**

1. Piping shall be standard weight, Schedule 40, black steel pipe conforming to ASTM Specification A-53, A-501 and A-589; and Federal Specification WW-P404.
2. Standard weight welding fittings shall be used and shall conform to ASTM A-234.
3. Screwed fittings shall be malleable iron, 150 lb. S.W.P., with banded pattern conforming to ANSI B16.3.
4. Piping shall be Type K soft copper tubing conforming to ASTM B88 where gas line is shown on plans to be run in hollow walls or partitions. No joints shall be allowed within wall. Approved fittings shall be used to make transition from steel to copper piping.
5. Hangers and supports shall be as follows:
 

· Concrete Inserts	B-2500
· Hanger Rod	B-3205
· Riser Clamp	B-3373
· Hanger	B-3100
· Pipe Saddles	B-3160
· Insulating Protector	B-3151
· Rod Ceiling Plate	B-3199
· Beam Clamps	B-3050
· Offset Clamps	B-351L

Numbers given above are devices as manufactured by B-Line Systems, Inc.; PHD Manufacturing; Empire; or Modern Support Devices are acceptable equals.

6. Pipe threads shall conform to ANSI B1.20.1.

**C. EXECUTION**

1. Pipe 2" and smaller shall have screwed joints.
2. Pipe 2 ½" and larger shall be welded.
3. Welding tees or weldolets shall be used.
4. No "Stub-In" shall be permitted.

5. All piping run below grade shall be Teflon-coated, Schedule 40 black steel piping, as manufactured by Republic (X-Tru Coat), Entec, or approved equal.
6. In no case shall this Contractor be allowed to cut or reduce the specified covering to allow the application of a smaller hanger than required.
7. Hanger supporting horizontal piping shall be spaced as follows:
  - ½" 6 feet on centers minimum
  - ¾" and 1" 8 feet on centers minimum
  - 1 ¼" and larger 10 feet on centers minimum
8. Hangers shall be provided at each change in direction. Vertical risers shall be supported at each floor, 5 feet on center and/or at changes in direction of pipe.
9. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall also be used where copper tubing is concealed in a hollow wall or partition, wherever vertical tubing passes through a structural element and for the full length of horizontal piping. Sleeves shall be Schedule 40, black steel, ½" in diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves in exterior walls shall be caulked and made watertight.
10. All exposed gas piping surfaces, supports, etc., shall be painted with one prime and one finish coat of rust resistant paint. Finish coat shall be yellow according to OSHA Standards, and labeled "GAS" according to ANSI A13.1, unless otherwise noted on the plans.
11. All gas piping having greater than 1 psi pressure shall be identified by a yellow label with black letters indicating the piping system pressure at each end and at intervals of not more than 5 feet along the entire length of the pipe
12. Each drop to serve an individual piece of equipment shall be provided with a union, a gas cock, and a dirt leg a minimum of 6" long the same size as the pipe drop.
13. Gas piping systems above ground and within the building shall be electrically grounded, as defined in NFPA 70.
14. Testing
  - a. All gas piping systems shall be tested in strict accordance with the National Fire Protection Association's National Fuel Gas Code NFPA54, and the State Building Code.
  - b. All gas piping system shall be air tested at 50 psi for a period of not less than one (1) hour without loss of pressure. Any leaks that occur shall be repaired and another test started. All joints shall be checked for leaks with a water-soap solution. Where leaks are found, the joint shall be re-made.

END OF SECTION 23 11 23

**SECTION 23 23 13 – PIPE AND PIPE FITTINGS (REFRIGERANT)**

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**A. GENERAL**

1. This section includes all pipe, pipe fittings, hangers and supports, etc., as may be required to provide a complete refrigerant piping system.
2. Testing of all piping shall be made in the presence of the Engineer or a designated representative of the Owner. No piping shall be covered or put into operation before such testing has been approved.
3. The actual arrangement of the piping shall follow the general locations shown on the drawings such that clearances, line drainage, etc. shall be maintained.

**B. PRODUCT**

1. Piping
  - a. Refrigerant piping shall be Type "ACR" hard drawn copper conforming to ANSI B-31.5 or ASTM B280.
  - b. Condensate drain piping shall be Type "L" hard drawn copper conforming to ASTM B-88.
2. Piping Fittings
  - a. Copper pipe fittings shall be wrought metal solder joint type conforming to ANSI B16.22.

**C. EXECUTION**

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. Expansion, drainage and maintenance of installed piping shall be possible.
  - b. All piping shall be reamed to remove all burrs, fins and foreign material. Pipe shall be thoroughly cleaned before soldering.
  - c. "Sil-Fos" of silver solder shall be used with non-corrosive flux. During the soldering operation, the pipe shall be purged with nitrogen.
  - d. Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall be Schedule 40, black steel, one-half inch in diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves through exterior walls shall be caulked and made watertight.
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, three times the diameter of the pipe and minimum of twelve inches long.

### 3. Testing

- a. All refrigerant equipment not tested at the factory shall be shut off from the rest of the system and tested under a vacuum with no evidence of leakage. Piping systems shall be tested after installation, 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 psi on low side and at 300 psi on high side per ASA Standard B9.1. System shall be tested with an inert gas of dry nitrogen or dry carbon dioxide. Pressure limiting or pressure reducing valves and gauges on outlet side of tanks shall be used to reduce the tank pressure of the inert gas to the pressure specified above. Pressure shall be maintained for 30 minutes without loss of pressure. If loss of pressure occurs during this time, system shall be checked with halide torch and any leaks repaired. Test shall then be rerun for another 30 minute period. Testing and repair shall continue until there is no loss of pressure. After a satisfactory pressure test, high vacuum pumps (DO NOT USE COMPRESSOR) shall be connected to the system and the system evacuated to a pressure of 0.20 inches of mercury with the system ambient temperature at not less than 36 degrees Fahrenheit. After this has been attained, the vacuum pump shall be valved off from the system for a period of not less than twelve hours. The vacuum shall be broken by charging system with the refrigerant vapor as soon as possible.

END OF SECTION 23 23 13

**SECTION 23 23 16 – PIPING SPECIALTIES (REFRIGERANT)**

---

**A. GENERAL**

1. This section includes the expansion valve, solenoid valve, filter drier and miscellaneous items required for a complete refrigeration system.

**B. PRODUCT**

1. Strainer: Refrigerant strainer shall be T-Type, 80 mesh Monel screen, solder connections, UL listed, Henry Model 896-S or approved equal by Alco, Cash.
2. Expansion Valve: Expansion valves shall be diaphragm actuated, external equalizer, adjustable, suitable for refrigerant and capacity specified, replaceable thermostatic element, UL listed, soldered connections, Henry 629 Series or approved equal by Alco, Cash.
3. Solenoid Valve: Solenoid valve shall be Series A, soldered connections, suitable for refrigerant and capacity specified, rated for electrical voltage available, UL listed, Henry or approved equal by Alco, Cash. Install in liquid line.
4. Sight Glass: Sight glass shall be single port, soldered connections, positive color contrast, factory assembled, self-contained, removable cap, polished optical glass, protected moisture element, Henry type M1-30-S or approved equal by Alco, Cash. Line size.
5. Filter Drier: Filter drier shall be factory assembled, sealed, UL listed, suitable for refrigerant and capacity specified, soldered connections, Henry "H" Series, or approved equal by Alco, Cash. One per solenoid valve.

**C. EXECUTION**

1. All refrigerant piping specialty items shall be installed per manufacturer's recommendations.
2. Gauges or other instruments shall not be installed until piping has been cleaned and tested.

END OF SECTION 23 23 16





**SECTION 23 31 13 – DUCTWORK**

---

**A. GENERAL**

1. This Section includes low-pressure ductwork, splitter dampers, balancing dampers, air deflection devices, etc. required for a complete system.
2. The Drawings are intended to indicate, with reasonable accuracy, the location of components and the general arrangement of the system. All offsets, bends, fittings and other devices, not shown but required for the full operation of the system, shall be provided.

**B. PRODUCT**

1. Ductwork shall be fabricated from the best quality galvanized sheet steel, unless noted otherwise on the plans.
2. Splitter dampers, balancing dampers, turning vanes and air deflection devices shall be installed as shown on the plans and/or where required for the proper control of airflow.
3. At all take-offs to diffusers, butterfly dampers with locking quadrant shall be installed. Provide insulation stand-offs on quadrant and spray paint damper handle for easy identification.
4. Round and rectangular ductwork shall be of gauges and construction methods as indicated in the latest ASHRAE Guide and SMACNA Standards.
5. If there are any locations where dampers will be inaccessible during balancing, then the Contractor shall provide a remote way of adjusting the damper. The remote adjustment system shall be comprised of Bowden cable controls, compatible damper, ceiling box, and a ceiling coverplate/cap to conceal controls. Coordinate location of ceiling boxes with Engineer.

**C. EXECUTION**

1. Turning vanes shall be installed in square elbows for all ductwork.
2. Duct transitions, splitter dampers, and balancing dampers shall be constructed of gauges and materials as indicated in ASHRAE Guide and SMACNA Standards.
3. Hangers and supports for ductwork shall be of metal bands, angles and rods as indicated in ASHRAE Guide and SMACNA Standards. The minimum bandwidth shall be 1", 16 gauge, galvanized steel.
4. Where ductwork passes through floors and walls, the space around the ducts shall be sealed in an approved manner with mineral wool, and/or proper fire seal material approved by the State.
5. In exposed areas and mechanical rooms, ductwork openings shall be finished with a metal collar.
6. Ductwork shall be cross-braced and reinforced properly with galvanized steel angles as recommended by SMACNA Standards.
7. Where ductwork behind grilles, diffusers, or louvers is visible, it shall be painted with two coats of flat, black base, fire retardant paint.
8. Duct connections to outside air louvers shall be pitched to drain outside and shall be soldered watertight.

9. Tape all joints and seams with Hardcast or approved equal for completely air tight system. Do not Hardcast when below manufacturer's recommended temperature range.
10. All ducts shall be airtight, rigid and free from vibration and noise.
11. Duct dimensions shown on the Drawings are Actual Sheet Metal Dimensions unless noted otherwise on the drawings.
12. Ductwork shall be lined only for the first 5'-0" on the supply and return side from air handlers. Increase the sheet metal sizes by 2" to accommodate the flexible fiberglass acoustics material weighing not less than one and one-half pound (1 ½ lb.) per cubic foot with a smoke-fire rating not less than 25/50.
13. The lining shall be secured to the ductwork with a suitable adhesive and with mechanical fasteners 12" on center. Liner shall be cut such that adjacent sections of insulation butt together and are sealed with Foster 30-02 at joints.
14. All duct connections to and from all centrifugal fans or cabinets containing fans, shall be made with fabric equal to "Ventfab" as made by Ventfabrics, Inc., not less than four inches (4") long, secured by peripheral iron straps holding fabric in formed channel iron or angles. Strap and channels shall be galvanized iron, except as otherwise noted.
15. Vertical ducts shall be supported at each floor level by means of an angle iron frame riveted to the ductwork on at least two (2) sides. Horizontal runs of ductwork shall be supported on not more than 8'-0" centers and as required.
16. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

END OF SECTION 23 31 13

**SECTION 23 31 16 - SPIRAL DUCTWORK**

---

**A. GENERAL**

1. This section includes all exposed double walled spiral ductwork.
2. Submit manufacturer's technical product data and installation instructions for spiral round ductwork and materials.
3. Contractor shall submit scaled layout drawings of metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between ductwork and proximate equipment. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced.
4. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Minimize end damage and prevent dirt and moisture from entering ducts and fittings.
5. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.
6. Ductwork shall be manufactured by Hamlin, United McGill, Monroe, R. V. Money, Spiral Pipe of Texas, Metal Connectors, Dixie Sheet Metal, Eastern Sheet Metal, or a pre-approved equal.

**B. PRODUCT**

1. All ductwork shall be double walled and insulated with 1" fiberglass insulation. All duct dimensions are inside duct dimensions, unless otherwise noted on the drawings.
2. All ductwork shall be galvaneal finished sheetmetal and suitable for immediate painting without further treating other than normal cleaning.
3. Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork systems requirements including proper connection of ductwork and equipment.
4. Provide radius type elbow fittings fabricated of multiple sections with maximum 22 ½ degree change of direction per section. Die stamped elbows are acceptable through 10 inch diameter. Unless specifically detailed otherwise, use 45 degree laterals and 45 degree elbows, 90 degree conical type fittings for branch connections.
5. Non-hardening migrating mastic or liquid neoprene based cement, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.
6. Except as otherwise indicated, provide rust resistant fasteners, anchors, rods straps, trim and angles for support of ductwork.
7. Fabricate round ductwork in 4, 8, 10 or 12 feet lengths, unless otherwise indicated or required to complete runs as shown on approved shop drawings. Match-mark sections for assembly and coordinated installation.

## 8. Round Duct Gauge Selection - Galvanized:

Duct Diameter In inches Maximum 2" w.g. Static Positive	Spiral Seam Gauge	Longitudinal Seam Gauge
3 thru 8	28	28
9 thru 14	28	26
15 thru 26	26	24
27 thru 36	24	22
37 thru 50	22	20
51 thru 60	20	18
61 thru 84	18	16

Fittings shall be of wall thickness not less than that specified above for longitudinal seam straight ducts. See Field Quality Control for sealing requirements.

9. Coordinate routing of ductwork with other disciplines.
10. Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheetmetal flanges of same gauge as duct. Overlap opening on four sides by at least 1 ½". Fasten to duct and substrate.
11. Turning vanes shall be installed in square elbows.
12. Provide balancing valve at all take-offs.
13. Duct transitions, splitter dampers, and balancing dampers shall be constructed of gauges and materials as indicated in ASHRAE Guide and SMACNA Standards.
14. Hangers and supports for ductwork shall be of metal bands, angles and rods as indicated in ASHRAE Guide and SMACNA Standards. The minimum band width shall be 1", 16 gauge, galvanized steel.
15. Ductwork shall be cross braced and reinforced properly with galvanized steel angles as recommended by SMACNA Standards.
16. Vertical ducts shall be supported at each floor level by means of an angle iron frame riveted to the ductwork on at least two (2) sides. Horizontal runs of ductwork shall be supported on not more than 8'-0" centers and as required.
17. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

END OF SECTION 23 31 16

**SECTION 23 33 12 – LOUVERS**

---

A. GENERAL

1. Louvers shall be as sized on drawings and shall be approved by the Engineer.

B. PRODUCT

1. Louvers to be drainable blade style designed to divert water along blade troughs, then down vertical openings at the jambs rather than down face of louvers.
2. Louvers to have 4" frame constructed of .081 extruded aluminum with .081 extruded aluminum blades on 3" centers set at 37.5 degree angle. Aluminum birdscreens to be provided in removable frame on interior of louver.
3. Finish to be mill aluminum unless noted differently on plans. Louvers shall be Greenheck, or approved equivalent by Ruskin, Ventex, Carnes Louvers & Dampers, Tuttle & Bailey, United Air, Reliable, Arrow United Industries, Safeair-Dowco/Air Balance Inc., or Vent Products.
4. Louvers shall be AMCA rated for air performance and water penetration.

C. EXECUTION

1. Provide louvers with frame and sill styles which are compatible with job site construction.
2. Install louvers in accordance with manufacturer's written instructions and recognized industry practices.
3. Coordinate with other trades required for proper installation of louvers.

END OF SECTION 23 33 12



**SECTION 23 33 47 – FLEXIBLE DUCTWORK (LOW PRESSURE)**

---

## A. GENERAL

1. This section includes low pressure flexible duct with insulation required for a complete system.
2. The drawings are intended to indicate, with reasonable accuracy, the location of components and the general arrangement of the system.
3. Flexible ducts shall be by Clevaflex, or approved equivalent by Genflex or Metalflex.

## B. PRODUCT

1. Ducts shall be one-ply flexible ducts with low friction.
2. All flexible ducts shall have a factory installed 1" thick fiberglass insulation with a seamless foil vapor barrier.
3. Length of flexible duct shall not exceed 5 feet.

## C. EXECUTION

1. All flexible duct connections to main trunk duct and grilles or diffusers shall be made with approved fittings and shall be taped air tight.
2. All ductwork shall be installed where shown on the plans and according to the manufacturer's recommendations.
3. Flexible duct dimensions shown on the plans are Net Inside Dimensions.
4. During construction, provide temporary closure of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

END OF SECTION 23 33 47





**SECTION 23 33 53 – DUCT LINER**

---

**A. GENERAL**

1. All parts of insulation system shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50.
2. Contractor shall be responsible for keeping the material clean and dry prior to installation.

**B. PRODUCT**

1. Ductwork shall be lined where noted on the plans.
2. Duct liner shall be one inch thick, 0.8 pound per cubic foot density flexible polyimide foam coated with an acrylic polymer by Evonik or approved equivalent.
3. Liner shall have durable, resilient coating that will prevent deterioration of liner up to 5,000 fpm and 250°F.

**C. EXECUTION**

1. Insulation shall be installed in accordance with the NAIMA Fibrous Glass Duct Liner standard or SMACNA HVAC Duct Construction standards.
2. Adhesive that conforms to ASTM C 916 shall be provided over at least 90% of the sheet metal surface. Coat ("butter") with adhesive any edge that is not factory buttered and any minor cuts or tears in the coating.
3. Mechanical fasteners shall be provided in accordance with NAIMA or SMACNA standards and shall not compress the liner thickness more than 10%.
4. At corners of duct, the liner shall either be folded, or lapped and buttered along the full length of the longitudinal joint.
5. Metal nosings shall be securely installed over transversely oriented liner edges facing air stream at fan discharge and at any interval of lined duct preceded by unlined duct.
6. Duct dimensions shown on the plans are inside clear dimensions.

END OF SECTION 23 33 53



**SECTION 23 34 16 – FANS**

---

A. GENERAL

1. Provide all fans, roof caps, etc., as indicated on the Drawings.
2. Fans, roof caps, curbs, etc., shall be by the same manufacturer.
3. The fans shall be by Carnes, Greenheck, Loren Cook, ILG, American Cool-Air, Power Line, Acme, Breidert, Penn Ventilation, or approved equivalent.
4. All fans shall be AMCA rated.

B. PRODUCT

1. All fans, roof caps, etc., shall be as scheduled on the Drawings.
2. All fans shall be equipped with 1/2" mesh birdscreen, gravity damper.
3. All fan motors shall have vibration isolators, motor housing shall be grounded, and motor overload protection shall be provided.
4. All curbs shall be of the pre-fab insulated type.
5. All fans with belt drives shall be furnished with belt guards.

C. EXECUTION

1. Fans and roof caps shall be installed as shown on the plans.
2. Roof openings and locations are to be coordinated with the other trades.

END OF SECTION 23 34 16



**SECTION 23 37 13 – AIR DISTRIBUTION OUTLETS**

---

A. GENERAL

1. Furnish and install air distribution devices of the type, size, and configuration indicated on the drawings.
2. Refer to Architectural Reflected Ceiling Plan and Schedule for types of ceilings specified, and provide compatible frames on air distribution devices.

B. PRODUCT

1. Surface mounted air distribution devices shall have sponge gaskets.
2. Air distribution devices shall have baked on enamel finish suitable for painting if required.
3. All air distribution outlets shall be by Krueger, Carnes, Tuttle & Bailey, J & J, E. H. Price, Nailor Industries, or Metalaire.
4. All surfaces visible through air distribution devices should be painted flat black.

C. EXECUTION

1. Air distribution devices shall be mounted level, straight and flush with walls or ceilings.
2. Color shall be as indicated on drawings, or as selected by the Architect/Engineer.
3. Locations of all air distribution devices shall be coordinated with ceiling and lighting work.

END OF SECTION 23 37 13



## SECTION 23 51 23 – FLUE PIPING (GAS)

---

### A. GENERAL

1. This section covers flue vent piping, fittings and accessories.
2. Materials shall be Metalbestos Type `PS', Ampco, Van-Packer, The Schebler Company, or approved equivalent.

### B. PRODUCT

1. The flue piping shall be factory-built, tested, and listed by the Underwriters Laboratories, Inc. for use with liquid fuels as described in NFPA 211. The stack shall be double wall with the outer jacket made of 304 stainless steel with a nominal thickness of .025". There shall be a minimum 1" air space between the walls. The inner wall shall be type 304 stainless steel with a nominal thickness of .35". All pipe joints shall be sealed with a sealant approved for this application.

### C. EXECUTION

1. Flue vent system shall be installed in strict accordance with manufacturer's installation instructions.

END OF SECTION 23 51 23





**SECTION 23 54 13.1 – GAS-FIRED WARM AIR FURNACE (Variable Speed Inducer)**

---

**A. GENERAL**

1. Furnish and install a gas-fired upflow, direct vent, variable speed warm air furnace with 2 stage heat of the type and capacities shown on the plans.
2. Unit shall be completely factory assembled and pretested.
3. Unit shall be A.G.A. certified and UL approved.
4. Trane, Carrier, McQuay or approved equivalent.

**B. PRODUCT**

1. Unit casing shall be of 22 gauge steel with baked enamel finish.
2. The furnace design shall be certified to ANSI 221.471 CSA 2.3, with limits set by ANSI Standards.
3. The unit shall have an integrated system control with solid state devices, which continuously monitor for presence of flame, when the system is in the heating mode of operation. Dual solenoid combination gas valve and regulator shall provide extra safety.
4. Provide with a durable, cycle tested, heavy gauge aluminized steel heat exchanger which shall quickly transfer heat to provide warm conditioned air to the structure, with low energy power vent blower to increase efficiency and provide a positive discharge of gas fumes to the outside.
5. Provide with multiport inshot burners which shall give quiet and efficient service. Unit shall be capable of being converted to LP gas without changing burners.
6. An integrated system control operational program shall provide total control of furnace limit sensors, blowers, gas valve, flame control and include self diagnostics for ease of service. Also shall contain connection points for an E.A.C./Humidifier.
7. Air delivery from the variable speed blower motor shall have sufficient airflow for heating and cooling requirements which shall switch from heating to cooling speeds on demand from room thermostat. The blower door safety switch shall prevent or terminate furnace operation when the blower door is removed.
8. The secondary heat exchanger shall be constructed of 29-4C stainless steel. The secondary heat exchanger shall reclaim heat from flue gases which would normally be exhausted to atmosphere.
9. The high efficiency gas furnace shall employ an adaptive heat up silicon nitride hot surface ignition system which eliminates the waste of a constant burning pilot. The integrated system control shall light the main burners upon a demand for heat from the room thermostat. Unit shall have complete front service access.
  - a. Low energy power venter
  - b. Vent proving pressure switch

**C. EXECUTION**

1. Unit shall be installed as shown on the plans.
2. All piping and wiring shall be in accordance with the manufacturer's installation instructions.

END OF SECTION 23 54 13.1



**SECTION 23 81 27 – SPLIT SYSTEM CONDENSING UNIT**

---

**A. GENERAL**

1. Furnish and install an air-cooled split system outdoor unit, with capacities as indicated on the plans.
2. Unit shall be completely factory assembled and pretested.
3. Unit shall be Trane, McQuay, York, Carrier or approved equivalent.

**B. PRODUCT**

1. Unit casing shall be galvanized steel, zinc phosphatized, baked enamel finish and fully weatherproof.
2. Condenser coil shall be of non-ferrous construction, aluminum plate fins, mechanically bonded to seamless copper tube, subcooling circuitry.
3. Condenser fans and motors shall be direct drive, propeller type fins, Class B motor insulation, inherent protection, permanently lubricated, resiliently mounted; fans shall have safety guard.
4. Compressor shall be a hermetically sealed, high efficiency compressor with special lubrication system, bearing surfaces and motor installation, internal over-current, over-temperature and over-pressure protection and crankcase heater. The compressors shall have a five (5) year warranty.
5. A wire guard shall be provided over the condenser coils for protection from physical damage. The wire guard shall be either factory mounted or field erected.
6. Accessories shall be as indicated on the drawings.

**C. EXECUTION**

1. Unit shall be mounted as shown on the plans.
2. Controls shall be as indicated on the plans, or as specified herein.

END OF SECTION 23 81 27



**SECTION 23 82 14 – DIRECT EXPANSION EVAPORATOR COIL**

---

A. GENERAL

1. Furnish and install a direct expansion cooling with capacities as shown on the plans.
2. Trane or approved equivalent by McQuay, York, or Carrier.

B. PRODUCT

1. Coil shall be by the same manufacturer as the furnace.
2. Coil casing shall be constructed of Galvanneal steel, bonderized with baked enamel finish.
3. Casing shall be insulated with fire retardant insulation in accordance with NFPA 90A. Insulation shall be secured to casing with waterproof cement and permanent fasteners.
4. Coil shall be constructed with aluminum plate fins mechanically bonded on copper tube.

C. EXECUTION

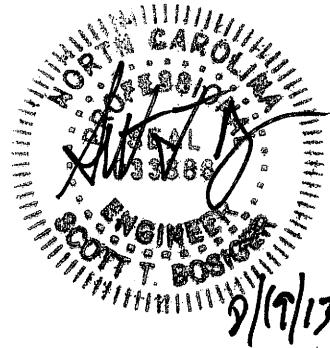
1. Evaporator coil shall be installed in the location and manner as shown on the plans.

END OF SECTION 23 82 14

## INTRODUCTION TO DIVISIONS 26, 27 & 28 – ELECTRICAL, COMMUNICATION & FIRE ALARM

The Specification Sections applying to the Electrical and Fire Alarm Work for the New NCDOT - Currituck Welcome Center in Currituck County, North Carolina are as follows:

SECTION	TITLE	PAGES
26 01 01	Electrical General Provisions	10
26 05 19	Wires and Cables	4
26 05 33	Conduit and Conduit Fittings	6
26 05 34	Boxes and Cabinets	2
26 09 23	Occupancy Sensors	8
26 24 16	Panelboards and Circuit Breakers	4
26 27 26	Wiring Devices	2
26 28 16	Disconnects	2
26 36 00	Automatic Transfer Switch	4
26 43 13	Transient Voltage Surge Suppressor (TVSS)	6
26 51 13	Lighting Fixtures	4
27 00 00	Voice, Data, CATV Cabling Infrastructure	12
28 31 10	Addressable Analog Fire Alarm System	24







**SECTION 26 01 01 – ELECTRICAL GENERAL PROVISIONS**

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## A. GENERAL

1. Scope of Work: This Contractor shall provide all materials, equipment and labor necessary to install and set into operation the electrical equipment as shown on the Engineering Drawings and as contained herein.
2. Quality Assurance
  - a. See the General and Supplementary General Conditions.
  - b. All work shall be in accordance with the North Carolina State Building Code, which includes the latest edition of the National Electrical Code.
  - c. Wherever the words "Approved", "Approval", and "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
  - d. "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
  - e. All material and equipment that the Contractor proposes to substitute in lieu of those specified shall be submitted to the Engineer ten (10) days prior to the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Items that are submitted for approval after this date will not be accepted.
  - f. The electrical contractor shall notify the state electrical inspector with the Department of Administration for state-owned projects, and notify the local inspector for community college and county-owned buildings, to schedule required inspections.
  - g. This project shall meet or exceed requirements of the Electrical Guidelines and Policies - 2011, Fire Alarm Guidelines and Policies - 2011, STS-1000 State Telecommunication Wiring Standards, and the State Construction Office Manual.
3. Substitutions
  - a. Products are specified for use on this project by the following:
    - 1) Reference Standards and Description: All products shall meet the Reference Standards and Description (i.e., conduit and conduit fittings).
    - 2) Naming of a product as an example to denote the quality standard of the product desired, in which case three or more brands will be denoted (where applicable) to establish equivalent designs.
    - 3) Naming of a product does not restrict Bidders to a specific brand (i.e., fixtures, devices, etc.). Requests for approval of manufacturer's or substitutions which have not been pre-approved shall be made by using the forms at the end of this section.
  - b. During bidding period: Submitted written requests from Bidders Only, using the forms herein, will be considered if received ten (10) calendar days prior to the date of receipt of bids to allow for proper evaluation. Requests from suppliers or subcontractors will not be considered. Substitutions will be considered when a product becomes unavailable through no fault of the Contractor.

A request constitutes a representation that the Bidder/Contractor:

- 1) Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product and is suitable for use in the Work.
- 2) Will provide the same warranty for the substitution as for the specified product.
- 3) Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to the Owner.
- 4) Waives claims for additional cost or time extension which may subsequently become apparent.
- 5) Has included a list of similar projects on which this product has been used with names and telephone numbers for verification.
- 6) Has written verification from the product manufacturer that this product has been in use a minimum of two (2) years on a project similar to this work.

Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

c. Architect/Engineer Review

- 1) Review and approval will rely on manufacturer's literature and other data as outlined herein.
- 2) Inadequacies in such submittals that fail to identify unsuitability are the responsibility of the parties making submittal.

d. Substitution Procedure

- 1) Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
- 2) Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
- 3) Submit listing of similar projects.
- 4) Submit manufacturer's written verification that product has been in use a minimum of two (2) years at similar projects.
- 5) The Architect/Engineer will notify Contractor, in writing, of decision to accept or reject request.
- 6) Products bid or incorporated in the work that are not specified and without written approval of the Architect/Engineer may not be acceptable, and if not, the Contractor will be required to furnish and install the products specified.
- 7) The Architect/Engineer will issue written approvals of product substitutions to all Bidders. Substitutions are not approved without written approval.

4. Submittals

- a. See General and Supplementary General Conditions and Division 1.
- b. After notification of the award of the Contract and written notice to begin work, the Contractor shall submit for approval to the Architect/Engineer, within the time frame specified by the Architect, a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time.
- c. The Contractor shall provide six (6) sets of submittal data bound in a 3-ring binder. The 3-ring binder shall contain complete submittal data on all products, methods, etc. proposed for use

on the project. Permission shall be obtained from the Engineer to submit data outside of the 3-ring binder, such as submittal data requiring early review for special ordering purposes.

- d. Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitution for specified items. Acceptance for approval shall be in writing from the Engineer.
  - e. The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these as-built plans.
  - f. The Contractor shall furnish four (4) bound sets of maintenance and operating instructions as outlined in Paragraph C, Execution, Item #7, of this specification section.
  - g. The Contractor shall submit to the Engineer a duplicate set of final electrical inspection certificates prior to final payment.
5. Product Delivery, Storage and Handling
- a. All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
  - b. The Contractor shall protect all material and equipment from breakage, theft or weather damage. No material or equipment shall be stored on the ground.
  - c. The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.
6. Work conditions and Coordination
- a. The Contractor shall review the mechanical plans to establish points of connection and the extent of electrical work to be provided in his Contract.
  - b. This Contractor shall be responsible for all electrical work and make final connections to equipment installed in his Contract.  
  
Unless otherwise noted, this Contractor shall wire to disconnect switches, junction boxes, or circuit breakers as provided in his Contract.
  - c. Pipe, conduit and duct chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
  - d. All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be approved by Architect/Engineer and shall be at the Contractor's expense with no extra cost to the Owner.
7. Guarantee
- a. See the General and Supplementary General Conditions.
  - b. Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Architect/Engineer.

## B. PRODUCT

1. Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the Contractor's expense.
2. The Contractor shall furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project for identification. The nameplate shall identify equipment name and number, voltage, phases, and where fed from, etc. Nameplates shall be securely attached to equipment with self-tapping stainless steel screws. If the screws sharp end is protected, then screws are acceptable. Otherwise, use rivets when mounting. Letter shall be approximately 1/2 inch high minimum. Embossed, self-adhesive plastic tape is not acceptable for marking equipment. Nameplate material colors shall be:
  - Blue surface with white core for 120/208 volt equipment.
  - Black surface with white core for 277/480 volt equipment.
  - Bright red surface with white core for all equipment related to Fire Alarm system.
  - Dark red (burgundy) surface with white core for all equipment related to Security.
  - Green surface with white core for all equipment related to "Emergency" systems.
  - Orange surface with white core for all equipment related to Telephone systems.
  - Brown surface with white core for all equipment related to Data systems.
  - White surface with black core for all equipment related to Paging systems.
  - Purple surface with white core for all equipment related to TV systems.
3. 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 tags with string or wire attached to conduit or outlet.
4. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface scheme outlined above. This includes covers on boxes above lift-out and other type accessible ceilings.
5. All materials and equipment shall be approved and labeled by a third party agency accredited by the NCBCC. Where noted, items shall conform to the specific agency standards or shall conform to comparable standards established by the aforementioned third party agency.

## C. EXECUTION

1. Inspection
  - a. If any part of this Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, the Contractor shall examine and measure such contiguous work and report to the Architect or Engineer in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the Contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible for any defects in this work consequent thereon and will not be relieved of the obligation of any guarantee because of any such imperfection or condition.
2. Installation
  - a. All work shall be performed in a manner indicating proficiency in the trade.
  - b. All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.

- c. Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
  - d. All patching shall be done in such a manner as to restore the areas or surfaces as to match existing finishes.
  - e. The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish and install all sleeves or openings through poured masonry floors or walls above grade required for passage of all conduits, pipes or duct installed by him. The Contractor shall furnish and install all inserts and hangers required to support his equipment.
  - f. Grounding and Bonding
    - 1) Grounding conductors, where installed, shall be colored solid green. Conductors intended as neutral shall be colored solid white on 120/208 volt circuits and natural gray on 277/480 volt circuits.
    - 2) The raceway system shall not be relied on for ground continuity. A green grounding conductor, properly sized per NEC 250-122, shall be run in all raceways except for telecommunications, data, and audio systems.
    - 3) Grounding electrode conductor #4 and larger shall be installed in raceway system.
    - 4) Transformer grounding requirements - Refer to transformer detail on plans.
    - 5) Generator and ATS grounding requirements – Refer to detail on plans.
    - 6) The electrical service shall be grounded by three (3) means:
      - a) To the metallic cold water pipe as per NEC 250-52.
      - b) To the steel frame of the building, provided the building frame is effectively grounded.
      - c) To ground rod(s). Ground rod(s) shall be 10-feet long and 3/4-inch in diameter, and shall be of copper-clad steel construction. All ground connections shall be accessible.
    - 7) Boxes with concentric, eccentric, or oversized knockouts shall be provided with bonding bushing and jumpers. The jumper shall be sized per NEC 250-122 and lugged to the box.
    - 8) Where one building is feeding another building and a grounding conductor is run with the ungrounded conductors, a metallic conduit shall be provided between the buildings to establish an improved grounding system.
    - 9) The gas piping system shall be bonded to the equipment ground as required by the Gas Code section 309.1.
    - 10) Identify each grounding electrode connected to a common ground bus. The height and the thickness of the common ground bus shall not be less than 2-inches high and 1/4-inch thick minimum.
    - 11) Upon completion of installation of the electrical grounding and bonding system, the ground resistance shall be tested with a ground resistance tester. Where test show resistance-to-ground is over 25 ohms, appropriate action should be taken to reduce the resistance to 25 ohms, or less, by driving additional ground rods. (The compliance should be demonstrated by retesting.)
    - 12) The ground system shall be tested with an "Earth Megger" and the test report submitted to the Engineer and to the State Construction Office. Maximum resistance shall be 25 ohm per NEC.
3. Performance
- a. The Contractor shall perform all excavation and backfill operations necessary for installation of his work.

- b. Rock excavation shall be defined in the Supplementary General Conditions, Division 1 or Division 2. Unless specifically stated, neither rock excavation nor a unit price for rock excavation shall be required in the bid.

#### 4. Erection

- a. All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

#### 5. Field Quality Control

- a. The Contractor shall conform to the requirements of Division 3 for concrete testing.
- b. The Contractor shall test his entire installation and shall furnish the labor and materials required for these tests. Tests shall be performed in accordance with the requirements of the particular section of the specifications and in accordance with the requirements of the State Ordinances and Codes, and the National Electrical Code. The Contractor shall notify the Engineer, Office of the State Electrical Inspector, and Department of Insurance of his readiness for such test. Final inspections by the N.C. Department of Insurance and N.C. Department of Administration (State Construction Office) are required, as State Inspectors' Certificates are required, prior to authorization of final payment.
- c. Testing required for compliance with the Contract shall be stated in subsequent sections.

#### 6. Electrical Testing

- a. 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:
  - 1) 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 AWG wire or larger, between conductors and between conductor and the grounding conductor.
  - 2) After all fixtures, 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 this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The contractor shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
  - 3) At final inspection, the contractor shall furnish a megger and show the engineers and State Construction Office representatives that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and voltmeter to take current and voltage readings as directed by the representatives.
- b. Circuit Breaker Tests: For services 1000 amperes and larger, the following tests should be performed on the service circuit breaker and the distribution circuit breakers. Testing shall be performed by a qualified factory technician at the job site. All reading shall be tabulated:
  - 1) Phase tripping tolerance (within 20% of U/L requirements).
  - 2) Trip time (per phase) in seconds.
  - 3) Instantaneous trip (amps) per phase.
  - 4) Insulation resistance (in megohms) at 100 volts (phase to phase, and line to load).

- c. Ground Fault Protection System: The ground fault protection on the new circuit breakers (if provided) shall be performance tested in the field and properly calibrated and set in accordance with coordination study.
  - d. Documentation
    - 1) All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information.
    - 2) All required documentation of readings indicated above shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.
7. Adjust and Clean
- a. All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
  - b. Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for the intended service. In no event shall nameplates be painted.
  - c. At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract (in the presence of the Engineer).
  - d. The Contractor shall provide to the Owner, at no additional cost, a video recording (VHS format) of all training sessions held to train the Owner in the operation and maintenance of all fire alarm systems, sound systems, security systems, lighting control systems, integrated communication systems, CCTV, MATV, CATV, and all other electrical systems requiring training.
8. Maintenance and Operating Manual
- a. The Contractor shall prepare four (4) copies of a manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data intended for dimension or design purposes (although these may be included), but shall be prepared to describe this particular job. This manual shall include the following:
    - 1) Data on all equipment as listed on the fixture and equipment schedules on the plans. Also data on all fire alarm, telephone system, public address system, security system, lighting control systems, CCTV, MATV, CATV, generator, battery backup system, etc. that are applicable for the project.
    - 2) A checklist for period maintenance of all equipment requiring maintenance (i.e., fire alarm system, security system, generator, battery backup system, etc.)
    - 3) Maintenance and spare parts data for all equipment.
    - 4) As-Built wiring for equipment containing field wired systems. (i.e., fire alarm, security, data system, CATV, telephone, public address, etc.)
    - 5) The Operations and Maintenance Manuals shall include, located at the back of the manuals, one set of keys for each manual. These keys shall be located in a three-ring plastic divided sheet, with each compartment labeled as to the device that the key operates. These keys shall be provided in addition to the standard requirement of keys located elsewhere in the specifications.
    - 6) The manuals shall be bound, indexed, dated and signed by the Contractor when completed.
  - b. The operating and maintenance manuals shall be submitted to the Engineer for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.

SUBSTITUTION AND PRODUCT OPTIONS

TO: PROGRESSIVE DESIGN COLLABORATIVE, LTD.  
Post Office Box 61249  
Raleigh, North Carolina 27661-61249

PROJECT NAME: \_\_\_\_\_

The undersigned requests that the following product be considered for substitution in lieu of the specified

item in Project Manual Section \_\_\_\_\_ Page \_\_\_\_\_ Paragraph \_\_\_\_\_ Description of

Item: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Proposed Substitution: \_\_\_\_\_

\_\_\_\_\_

The undersigned certifies that the following statements are correct, unless modified on an attachment:

1. The proposed substitution is equal or better in appearance, function and quality to the specified item, in all respects and is suitable for inclusion in the Work.
2. Attached are 4 copies of the Manufacturers Product Description, Specifications, Data Sheets, Photographs, Test Data and Color Charts.
3. We will furnish a physical sample, if requested by the Architect/Engineer.
4. Every variation of this product is to be listed and clearly delineated on the submission.
5. This substitution will require no dimensional changes to the drawings and will have no effect on other trades, the construction schedule or warranty requirements.
6. List of similar type project in which product is used.
7. Verification from manufacturer that product has been in use a minimum of two (2) years at similar projects.



SUBSTITUTIONS AND PRODUCT OPTIONS:

MANUFACTURER OR REPRESENTATIVE

CONTRACTOR OR BIDDER

Submitted by:

Submitted by:

Name: \_\_\_\_\_

Name: \_\_\_\_\_

Firm: \_\_\_\_\_

Firm: \_\_\_\_\_

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

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_

Phone No.: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

By approving and submitting shop drawings, product data and samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related hereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the work and of the Contract Documents.

The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect/Engineer's approval of shop drawings, product data or samples unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submission and the Architect/Engineer has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the shop drawings, product data or samples by the Architect's approval.

Architect's Reply:

Engineer's Reply:

- ( ) APPROVED
- ( ) APPROVED AS CORRECTED
- ( ) REVISE AND RESUBMIT
- ( ) NOT APPROVED

- ( ) APPROVED
- ( ) APPROVED AS CORRECTED
- ( ) REVISE AND RESUBMIT
- ( ) NOT APPROVED

ARCHITECT:

ENGINEER:

\_\_\_\_\_

PROGRESSIVE DESIGN COLLABORATIVE

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

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

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

END OF SECTION 26 01 01



**SECTION 26 05 19 – WIRES AND CABLES**

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**A. GENERAL**

1. All conductors shall be properly marked showing manufacturer's name, insulation type, voltage rating and wire size. All insulation is to be rated for minimum of 600 volts.
2. Wire sizes shall be as shown. No wire smaller than No. 12 AWG shall be used. The maximum wire size shall be 500 kcmil.
3. No. 10 AWG conductors shall be used for 20 ampere branch circuit home runs exceeding 50 feet to the junction point. 20 ampere branch circuit wiring shall be No. 10 AWG throughout if the circuit is longer than 100 feet in total length.
4. Conductors shall be manufactured by Triangle, Okonite, Houston Wire and Cable, or approved equivalents. All wiring and cable shall be listed by an "approved" third party testing agency.
5. Fire alarm and control wiring shall have stranded conductors. Refer to fire alarm specification 28 31 10 and fire alarm guidelines on the State Construction Office website.

**B. PRODUCT**

1. All conductors shall be copper and shall conform to Underwriters' Standards. Wires No. 10 and smaller shall be solid. Wires 8 and larger shall be Class B stranded.
2. All wire shall be labeled two (2) feet on centers giving size, type voltage, rating, and manufacturer's name. Wire No. 6 and smaller shall be factory color coded. Wire larger than No. 6 may be color coded with Okonite 2000 volt colored tape at all terminals of the run, and at all junctions.
3. Where applicable, all wire shall be color coded as follows, or approved by the Engineer:
  - a. 277/480 volt system:
    - 1) Phase A - Brown
    - 2) Phase B - Orange
    - 3) Phase C - Yellow
    - 4) Neutral - Natural Gray
    - 5) Ground - Green
  - b. 120/208 volt system:
    - 1) Phase A - Black
    - 2) Phase B - Red
    - 3) Phase C - Blue
    - 4) Neutral - White
    - 5) Ground - Green
  - c. 120/240 volt, single phase system:
    - 1) Phase A - Black
    - 2) Phase C - Blue
    - 3) Neutral - White
    - 4) Ground - Green
  - d. 120/240 volt, 3 phase (high leg) system:
    - 1) Phase A - Black
    - 2) Phase B - Orange (high leg)

- 3) Phase C - Blue
  - 4) Neutral - White
  - 5) Ground - Green
4. Insulation type shall be labeled for the appropriate type of use and temperature. Insulation types are as follows:
    - a. Type THWN/THHN or XHHW for feeders and branch circuit conductors.
    - b. Branch circuit wire in fluorescent fixture channels shall be type THHN, or type XHHW with cross-linked polyethylene insulation.

### C. EXECUTION

1. Conductors, in all cases, shall be run in conduit and shall be continuous from outlet to outlet. Splices will not be permitted except within accessible outlet or junction boxes, troughs, or gutters.
2. Solid conductors shall be spliced by using Ideal "wing-nuts", 3M Company's "Scotchlok", or T and B connectors in junction boxes, outlet boxes and lighting fixtures. Sta-Kon or Crimp connectors will not be allowed for branch circuit splicing.
3. Joints in stranded conductors shall be spliced by approved mechanical connectors and gum rubber tape or friction tape. Solderless mechanical connectors for splices and taps, provided with UL approved insulating covers, may be used instead of mechanical connectors plus tape.
4. All conductors in any conduit shall be at one specific voltage. Conductors of different voltages shall be run in separate conduits.
5. Neutral conductors shall be properly installed as to prevent grounding of the neutrals in any conduit.
  - a. Full size neutral conductors shall be provided for each service panel and sub-panel.
  - b. Minimum of full size individual neutral wire shall be provided for each circuit; in other words, no sharing of the neutral between circuits is allowed.
6. Neatly train and lace wiring inside boxes, equipment, and panelboards.
7. Make conductor lengths for parallel circuits equal.
8. Pull all conductors into a raceway at the same time. Use listed wire pulling lubricant for pulling #4 AWG and larger wires.
9. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
10. Prior to energizing feeders, sub-feeders and service conductor cables shall be tested for electrical continuity and short circuits. A copy of these tests shall be sent to the State Construction Office, the engineer of record, and the owner.
11. 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:
  - a. 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 AWG wire or larger, between conducts and between conductor and the grounding conductor.
  - b. After all fixtures, 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 this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The Contractor shall correct troubles, reconnect and retest until at 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
- c. 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.
  - d. At final inspection, The Contractor shall furnish a megger and show the Engineer's representatives that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and voltmeter to take current and voltage readings as directed by the representatives.
12. Use of split bolts is not allowed.
  13. A green grounding conductor, sized in accordance with the latest issue of the NEC, shall be installed in all conduits with circuit conductors.
  14. Upon completion of installation of the electrical grounding and bonding systems, the ground resistance shall be tested with a ground resistance tester. Where tests show resistance-to-ground is over 25 ohms, appropriate action should be taken to reduce the resistance to 25 ohms, or less, by driving additional ground rods. (The compliance should be demonstrated by retesting.)
  15. All exposed wiring shall be contained in a minimum of ½" conduit or surface mounted raceway. This shall include, but not be limited to, fire alarm, security, power distribution, intercom, telephone and communication wiring. Wiring located above a ceiling or inside walls shall not be considered exposed.
  16. Conductors for branch circuits shall be sized to prevent a voltage drop exceeding three percent (3%) at the farthest outlet of power, heating and lighting loads, or any combination of such loads. The maximum total voltage drop on both feeders and branch circuits to the farthest outlet shall not exceed five percent (5%).
    - a. Where the conductor length from the panel to the first outlet on a 277 volt circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG.
    - b. Where the conductor length from the panel to the first outlet on a 120 volt circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG.
  17. All tests specified shall be completely documented indicating time of day, date, temperature and all pertinent test information. 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 26 05 19



**SECTION 26 05 33 – CONDUIT AND CONDUIT FITTINGS**

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## A. GENERAL

1. Conduit shall be delivered to the project site in bundles of full length pipes, each length marked with the trademark of the manufacturer and a third party agency accredited by the NCBCC stamp. Each conduit length shall be straight, true and free from scales, blisters, burrs and other imperfections.
2. Within the building perimeters and above the floor slab, the rigid steel conduit specified shall be used unless specifically noted otherwise.
3. Conduit size for control wiring shall be a minimum of one-half (1/2) inch conduit. All branch circuit conduit shall be a minimum of one-half (1/2) inch.
4. All conduit located exterior to the building shall be as "suitable for direct burial" and be three-fourths (3/4) inch minimum size.
5. All conduit shall be installed in accordance with the National Electrical Code.
6. Conduit shall be manufactured by Triangle, G.E. or Allied.
7. Conduit fittings shall be manufactured by Rayco, T & B, or Appleton.
8. Abandoned conduit/boxes shall have all electrical wiring removed completely and not just made "safe". Conduit/boxes shall be removed where practical without creating additional demolition/restitution work for other trades.
9. Surface mounted raceway shall be used as noted on the plans in lieu of exposed conduit. Surface mounted raceway shall be metallic and manufactured by Wiremold or approved equivalents. A separate ground wire shall be run in the surface mounted raceway.
10. Raceways run external to the building foundation walls (with the exception of branch circuits) shall be encased with a minimum of three (3) inches of concrete on all sides. Encased raceways shall be of a type approved by NEC as "suitable for concrete encasement".
11. Underground conduit must be buried a minimum of twenty-four (24) inches below grade, except for circuits over 600 volts, which must be buried a minimum of thirty (30) inches below grade.
12. All underground conduit shall be identified by underground line marking tape located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compounded for direct burial not less than 6" wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.
13. Use of the conduit system for equipment grounding shall not be acceptable. A separate green ground conductor, properly sized per NEC 250-122, shall be run in all raceways except for telecommunications, data, and audio systems.
14. Where conduit passes from an unconditioned space to a conditioned interior building space, raceways shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type "FSK" thru-wall fittings with "FSKA" membrane clamp adapter if required.
15. Non-metallic conduit described in this specification shall be a minimum of Schedule 40 unless specifically noted otherwise.

16. In all areas where fire rated walls, floors, and ceilings are installed, all penetrations of electrical conduits or other related electrical material shall be properly sealed with approved fire rated materials to maintain the rating of the building construction. See fire-stop system details.

## B. PRODUCT

### 1. Thin Wall Conduit and Fittings

- a. Electrical metallic tubing (EMT) shall be cold-rolled steel tubing with zinc coating on the outside and protected on the inside by a zinc, enamel or equivalent corrosion-resistant coating conforming to the latest requirements of ANSI. Conduit shall meet the Rigid Conduit Association Standards.
- b. Electrical metallic tubing fittings shall be all steel plated hexagonal threaded compression type. No pot metal setscrews or indenter fittings shall be used. EMT connectors shall have insulated throats.

### 2. Rigid Steel Conduit and Fittings

- a. Rigid steel conduit, including elbows and nipples, shall be standard weight, mild steel pipe, hot dipped galvanized, sherardised or zinc-coated conforming to the requirements of ANSI C80.1, 1966 or later edition. Rigid steel conduit shall also meet the latest requirements of a third party agency accredited by the NCBCC Standards for Rigid Metallic Conduit.
- b. Fittings shall be of approved types, made of malleable iron hot dipped galvanized.

### 3. Flexible Metal Conduit and Fittings

- a. Flexible metal conduit shall be of the best grade interlocking spiral strip steel. The interlocking spiral strip construction shall be such as to permit bending of the conduit to a radius of four (4) times its internal diameter without distorting at any point. The interior and the exterior of the flexible conduit shall be smooth and free of burrs, sharp edges, or other defects, which could damage the wire.
- b. All connectors shall be steel compression fittings with insulated throats.
- c. Where water tight flexible conduit is required (Sealtite), it shall have an outer sheath of material similar to PVC and be listed as a grounding path.

### 4. Non-metallic Conduit and Fittings

- a. Non-metallic conduit shall be listed, for its particular application. It shall be resistant to sunlight and chemical and moisture atmospheres, and rated for use with 90 degrees Celsius conductors.
- b. The installation and usage of rigid non-metallic conduit shall comply with Article 352 of the National Electrical Code, along with any related or referenced sections.

## C. EXECUTION

### 1. General

- a. Conduit installed on the interior of exterior walls shall be spaced off the wall surface a minimum of ¼" using "clamp-backs" or struts. At other locations, conduit shall be run tight to walls, columns or ceilings.



- b. The conduit shall bend cold 90 degrees about a radius equal to ten (10) times its own diameter without signs of flaw or fracture in either pipe or protective coverings. All bends and offsets shall be made on a forming tool to prevent the conduit or its coating from being damaged in the bending.
- c. Where conduits join any couplings or threaded fittings, the ends shall be made watertight.
- d. All conduits shall be carefully cleaned before and after erection. After cleaning, all ends of conduits shall be free from burrs and inside surfaces shall be free from imperfections likely to injure the wires or cables.
- e. In every instance, conduit shall be installed in such a manner that the conductors may readily and easily be drawn or pulled in without strain or damage to the insulation; and, also, so that defective conductors may be readily and easily withdrawn and replaced by new conductors. Long radius bends and a sufficient number of approved pull and junction boxes shall be approved for this purpose, and as may be directed by the Engineer. All conduit shall be securely supported and grounded as approved by the NEC.
- f. Conduit, exposed and concealed (except in slab), shall be neatly installed parallel to, or at right angles to beams, walls and floors of buildings. Turns shall be made with galvanized outlet boxes, junction boxes, factory fittings and/or symmetrical bends. Locknuts and bushings shall be employed to provide full grounding and adequate protection of insulation.
- g. Support for all conduit shall be in accordance with the National Electrical Code. Conduit shall be supported by approved pipe straps or clamps. Pipe straps and clamps shall be secured by means of: a) toggle bolts on hollow masonry; b) metal expansion shields and machine screws or standard pre-set inserts on concrete or solid masonry; c) machine screws or bolts on metal surfaces, and wood screws on wood construction. Powder actuated fasteners are not allowed.
- h. All empty conduit systems shall be capped or terminated in a junction box and shall be provided with nylon pull cord inside for future use.
- i. Conduit terminating below grade shall be provided with means to prevent entry of dirt or moisture. Depth of burial shall not be less than two (2) feet below grade. All termination points shall be accurately marked and dimensioned on the As-Built Plans.
- j. The use of conduit fittings (LB, LR, LL, etc.) shall be limited where possible. Where necessary to use conduit fittings sized above 2", mogul units shall be installed.
- k. Flexible metal conduit and watertight ("Sealtite") (minimum ½" size) can only be used as "fixture whip" and related type equipment connection in lengths up to 6'-0" only. A separate green ground wire shall be provided and installed as per NEC. EMT conduit and rigid conduit shall be used inside the building as outlined in this specification section.
- l. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the stub-up out of the slab or earth shall be of rigid steel.
- m. The raceway system shall not be relied on for grounding continuity. A separate ground conductor, properly sized per NEC 250-122, shall be run in all raceways except for telecommunications, data, and audio systems.
- n. EMT conduit provided below roof deck shall be installed 1½ inches away from the deck to allow for screws not to penetrate the EMT conduit during re-roofing.
- o. Conduits, junction boxes, troughs, and any enclosure when mounted outside on the walls, shall be off the walls by one inch.

## 2. Thin Wall Conduit

- a. Except for service and feeder conduits, electrical metallic tubing and fittings may be installed in lieu of rigid conduit for 2 (two inch) or smaller in dry construction in furred spaces, ceiling cavities, chase spaces, interior portions other than concrete and solid plaster, or for exposed work except on mechanical structure or supports.
- b. A transition between a run of rigid conduit concealed in a wall and a run of thin wall conduit along a ceiling shall be made in an outlet box above the ceiling, if accessible, near the wall.
- c. Electrical metallic tubing, couplings, elbows, and fittings shall not be installed:
  - In any location outdoors, in direct contact with earth or underground (in below slab-on-grade or in earth)
  - Indoors in wet or damp locations, or in concrete, cinder blocks or bricks.
  - Where exposed to severe corrosive influence and/or severe physical damage
  - Encased in concrete
  - For transition between EMT and rigid conduits, use junction boxes.

## 3. Rigid Steel Conduit

- a. All conduit terminations shall be provided with insulating bushings.
- b. Condulet fittings shall not be used in lieu of pull boxes.
- c. Except where located under the ground floor slab, all service and feeder conduit shall be heavy wall rigid steel conduit.
- d. Rigid steel conduit shall be installed in exterior masonry walls, in wet locations where subject to severe physical damage, or where conduit trade size is two and one half (2 1/2) inches or larger.

## 4. Flexible Metal Conduit

- a. Flexible metallic conduit shall be provided at the end of each conduit run terminating at electric motors, transformers or other equipment.
- b. Conduit shall be sized in accordance with the latest of edition of the NEC unless shown otherwise, with minimum conduit size being ½ inch. Flexible metal and watertight ("Sealtite") conduit in size ½ inch and larger are acceptable for motor, appliance and fixture connections provided green grounding conductor is installed and NEC is followed.
- c. The length of flexible conduit shall be in accordance with the National Electric Code.

## 5. Non-Metallic Conduit

- a. Thin wall rigid non-metallic conduit (Schedule 40) shall only be used for concrete encasement.
- b. Except where embedded in concrete, conduit shall be supported to permit adequate lineal movement to allow for expansion and contraction of conduit due to temperature change. Where a temperature change in excess of 14 degrees Celsius is anticipated, such as direct burial, exposed outside of the building, or in uninsulated spaces inside the building (attics, crawl spaces, etc.), expansion joints shall be installed in accordance with the manufacturer's specifications.

- c. Heavy wall non-metallic conduit (Schedule 80) shall be used where conduits are direct buried exterior to the building. It shall be installed in accordance with the National Electrical Code and shall be of a type approved by the National Electrical Code as "suitable for direct burial".
  - d. Where conduit is installed in the ground floor slab within the building foundations, thin wall rigid non-metallic conduit shall be used. At the Contractor's option, this installation may consist of galvanized steel conduit encased with three (3) inches of concrete or rigid steel conduit with a minimum of 15 mils of PVC coating. Where thin wall non-metallic conduit is used under the ground floor slab, the elbows required to turn the raceway up into cabinets, equipment, boxes, etc. shall be of rigid steel. The conduit shall be converted at the level of the slab surface to the metallic type conduit specified for use in that area.
  - e. PVC Schedule 40 shall not be used exposed or concealed in walls. PVC Schedule 40 may be used in elevated floor slabs and in foundation slabs. Minimum concrete cover shall be  $\frac{3}{4}$ " at finished or formed surface and shall be 3 inches at concrete surface cast against earth or for slabs placed on-grade. Greater amounts of concrete cover shall be used in areas subject to damage or corrosion. Installed systems shall comply with the minimum requirements of ACI318 chapter 6. The placement of conduit in floor slabs must be thoroughly coordinated with and approved by structural engineer of record. Such placement must be clearly addressed by the construction documents. Potential conflicts with steel reinforcing bars, composite slab shear anchors and reductions in net concrete sections are among the issues that must be considered by the structural engineer. The effect of closely spaced conduit groups on fire-rated horizontal assemblies shall be addressed by the design team. Post bid proposals to move under floor conduit into the slab are subject to approval by the structural engineer and related slab reinforcement or slab reconfiguration could require a credit from the contractor.
6. Terminations
- a. IMC and RMC shall terminate with either a double locknut/bushing set, or in a threaded hub.
  - b. Where concentric, eccentric or over-sized knockouts are encountered, a grounding-type-insulated bushing shall be provided.
  - c. EMT terminations shall be made utilizing steel-plated hexagonal, insulated throat, compression connectors. No pot metal, setscrew or indented type connectors shall be utilized.
  - d. All conduits shall be provided with insulated throat.
7. Conduit Couplings
- a. Where conduits of any type pass over a building expansion joint, a standard "expansion joint fitting," compatible with the type raceway being used, shall be provided.
  - b. Conduit couplings for IMC, GRC, and PVC shall be in accordance with the NEC.
  - c. EMT couplings shall be of the plated-steel hexagonal compression type. No pot metal, setscrew or indented type couplings shall be utilized.
8. Duct Banks
- a. Excavation and backfill shall conform to Division 2 of the specifications, except heavy-duty, hydraulic-operated compaction equipment shall not be used.
  - b. Trenches shall be cut neatly and uniformly, sloping uniformly to require pitch.

- c. Ducts shall be pitched to drain toward manholes or handholes and away from buildings and equipment. Minimum slope shall be four inches (4") in 100 feet. Where necessary to achieve this between manholes, ducts shall be sloped from a high point in the run to drain in both directions.
- d. Concrete encased non-metallic ducts shall be supported on plastic separators coordinated with duct sizes and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Separators to the earth and to the ducts should be secured to prevent floating during placement of concrete. Steel or tie wires shall not be used in such a way as to form conductive or magnetic loops around ducts or duct groups.
- e. Waterproof marking cord should be installed 130 pound tensile test (marked at least every foot), Greenlee #435 or equal, in all ducts, including spares, after thoroughly rodding, clearing and swabbing all lines free of any and all obstructions.
- f. All ducts shall be sealed at terminations, using sealing compound and plugs, as required to withstand 15 psi minimum hydrostatic pressure.
- g. The installation of manholes of conduit shall be in accordance with OSHA requirements.
- h. After installation of the raceway system and before pulling the cables, the raceway system shall be air tested to 15 psi hydrostatic pressure.

END OF SECTION 26 05 33

**SECTION 26 05 34 – BOXES AND CABINETS**

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**A. GENERAL**

1. The Electrical Contractor shall provide junction boxes, pull boxes, cable, support boxes, and wiring troughs as required by NEC and as otherwise indicated in the Drawings.
2. All necessary mounting hardware and accessories shall be provided for a complete installation.
3. All boxes shall be labeled for its particular application.

**B. PRODUCT**

1. Boxes shall be as manufactured by Steel City Electric Company, Metropolitan, B & C or approved equal.
2. Outlet boxes shall be 4" square, 2 1/8" deep except as noted below.
3. Outlet boxes shall be equipped with plaster rings of appropriate depth to finish flush with finished walls. Outlets in exposed masonry wall shall be equipped with extra deep square corner tile rings so that box may be installed in the core of the block.
4. Outlets for concealed work and ceiling outlets for exposed work shall be galvanized stamped steel.
5. Wall outlets for exposed conduit work shall be Crouse-Hinds, Appleton, Rayco, or equivalent, series FS and FD switch and receptacle threaded hub boxes, with matching FS and FD covers.
6. Junction boxes larger than 4" square shall be galvanized and without pre-formed knockouts. Junction boxes over 12" square shall have piano hinge covers.

**C. EXECUTION**

1. Boxes and troughs shall be supported independently of conduit entering them. Brackets, threaded rod hangers with lock nuts, bolts, or other suitable supporting methods may be used.
2. Accessible junction boxes for change of direction or feeder taps shall be furnished where required and shall be of adequate size to prevent crowding of conductors in accordance with the requirements of the NEC.
3. Thru-the-wall outlet boxes shall not be permitted. Boxes shall be separated a minimum of 18 inches apart.
4. In general, outlets shall be installed at the heights indicated. The Contractor shall examine the plans of and coordinate with all other trades to assure mounting heights are correct for the intended purpose. Assure that all mounting heights comply with the latest version of ADA. Outlets installed at incorrect heights shall be relocated to the correct elevation at the Contractor's expense.
5. Each outlet designated on the plans shall be provided with an outlet box.
6. Each outlet box which supports a fixture shall be provided with a fixture stud into the outlet box. Outlet box and/or fixture stud shall be attached with not less than three screws or bolts.
7. Exterior outlets shall be provided with watertight gaskets and covers.
8. All covers for concealed junction boxes shall be painted to correspond to the appropriate color coding of the conduit system connected to the box. See the General Notes for separate color coding.

END OF SECTION 26 05 34



**SECTION 26 09 23- OCCUPANCY SENSORS**

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## A. GENERAL

## 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.

## 2. SUMMARY

- a. This Section includes photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
- b. Related Sections include the following:
  - 1) Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.
  - 2) Division 26 Section "Dimming Controls" for architectural dimming system equipment.

## 3. SUBMITTALS

- a. Product Data: Include dimensions and data on features, components, and ratings for lighting control devices.
- b. Shop Drawings: For relay lighting control panels include riser diagram, panel schedules, and switch schedules. Riser diagram shall include panel interconnections, switch control links, and switch addresses and locations.
- c. Samples: Occupancy sensors for color selection and evaluation of technical features.
- d. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- e. Maintenance Data: For lighting control devices to include in maintenance manuals specified in Division 1. Include installation and programming manuals for relay lighting control system.

## 4. QUALITY ASSURANCE

- a. Source Limitations: Obtain lighting control devices from a single source with total responsibility for compatibility of lighting control system components specified in this Section and in Division 26 Section "Dimming Controls."
- b. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.
- c. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.
- d. Comply with NFPA 70.

## 5. COORDINATION

- a. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions.

## B. PRODUCTS

### 1. MANUFACTURERS

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1) Relay Lighting Control Panels & Low-voltage switches:
    - a) Lutron Electronics, Inc.
    - b) Siemens Energy & Automation, Inc.
    - c) Hubbell Building Automation, Inc.
    - d) GreenGate; Cooper Controls, Inc.
    - e) Douglas Lighting Controls, Inc.
  - 2) Contactors and Relays:
    - a) Automatic Switch Co.
    - b) Challenger Electrical Equipment Corp.
    - c) Cutler-Hammer Products; Eaton Corporation
    - d) Furnas Electric Co.
    - e) GE Lighting Controls
    - f) Hubbell Lighting, Inc.
    - g) Siemens Energy and Automation, Inc.
    - h) Square D Co.; Power Management Organization
    - i) Zenith Controls, Inc.
  - 3) Time Switches:
    - a) Diversified Electronics, Inc.
    - b) Grasslin Controls Corp.
    - c) Intermatic, Inc.
    - d) Leviton Manufacturing
    - e) Paragon Electric Co., Inc.
    - f) Tork, Inc.
    - g) Zenith Controls, Inc.
  - 4) Photoelectric Relays:
    - a) Allen-Bradley/Rockwell Automation
    - b) Area Lighting Research, Inc.
    - c) Fisher Pierce
    - d) Grasslin Controls, Corp.
    - e) Intermatic, Inc.
    - f) Paragon Electric Co., Inc.
    - g) Rhodes: M H Rhodes, Inc.
    - h) SSAC, Inc.
    - i) Tork, Inc.
  - 5) Indoor Photoelectric Sensors:
    - a) Arrow Hart Wiring Devices
    - b) BRK Electronics
    - c) Bryant Electric
    - d) Douglas Lighting Controls, Inc.
    - e) GreenGate; Cooper Controls, Inc.
    - f) Honeywell, Inc.; Home and Building Controls
    - g) Hubbell Lighting, Inc.
    - h) Leviton
    - i) Lightolier



- j) Lithonia Control Systems
- k) MyTech Corporation
- l) Novitas, Inc.
- m) RAB Electric Manufacturing Co., Inc.
- n) SenTec, Inc.
- o) Sterner Lighting Systems, Inc.
- p) Tork, Inc.
- q) Touchplate
- r) Unenco Electronics (A Hubbell Co.)
- s) Watt Stopper, Inc. (The)

1) Occupancy Sensors:

- a) Arrow Hart Wiring Devices
- b) BRK Electronics
- c) Bryant Electric
- d) Douglas Lighting Controls, Inc.
- e) GreenGate; Cooper Controls, Inc.
- f) Honeywell, Inc.; Home and Building Controls
- g) Hubbell Lighting, Inc.
- h) Leviton
- i) Lightolier
- j) Lithonia Control Systems
- k) MyTech Corporation
- l) Novitas, Inc.
- m) RAB Electric Manufacturing Co., Inc.
- n) SenTec, Inc.
- o) Sterner Lighting Systems, Inc.
- p) Tork, Inc.
- q) Touchplate
- r) Unenco Electronics (A Hubbell Co.)
- s) Watt Stopper, Inc. (The)

2. GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

- a. Line-Voltage Surge Protection: Include in all 120- and 277-V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

3. RELAY LIGHTING CONTROL SYSTEM

- a. Summary: Networkable lighting control relay panels operating magnetically held 20A 277V relays each. Inputs can be field configured to accept toggle, momentary, and maintained switch types and dry contacts from various relays. Any switch on the system shall be able to operate any relay, even if terminated in separate cabinets.
- b. Relay panel: low voltage lighting control panel shall be microprocessor controlled with a minimum of 8 relays and 8 inputs, an integral 4 x 16 - 64 character display, and with a programming keypad.
  - 1) Relay Type: Rated 20A, 277Vac. Magnetically held, fail in the "on" position.
  - 2) Inputs: System shall support 2 wire (toggle) inputs, momentary 3 wire, and dry contacts.
  - 3) Display: LCD, four rows of 16 characters each.
  - 4) Control Pad: 16 button pad allowing full control programming to relay system.
  - 5) Indicating Lights: LED lamps, indicate status of relays.
- c. Override Switches: low-voltage single button switch with LED pilot light. Provide engraved, color filled faceplate indicated "override switch".

d. System Operating Features:

- 1) Programmable intelligence shall include 365 day control, Time-Of-Day control, 32 holiday dates, warn occupants of an impending off, timed inputs, preset control, auto daylight savings, astronomical clock w/offsets, and local control.
- 2) Network: control system network shall support a minimum of 10 control panels.
- 3) Astronomical clock w/offsets: provide integral clock.
- 4) Input for dry contacts from external photoelectric relay.
- 5) Warning: system shall provide provisions to flash lights to inform occupants of an impending "off" command. Time of delay programmable between 1 second and 999 minutes.
- 6) Controller shall have a timed override function where, based on a switch input, the lighting schedule shall be overridden for a preset adjustable length of time.
- 7) Priorities: Priorities shall be capable of being assigned to inputs. Priorities shall permit: on only, off only, and on and off controls.
- 8) Masking: Masking shall be capable of being assigned to inputs. Masking shall permit functionality of input to change based on time of day scheduling.
- 9) Memory Backup: The system shall have means to retain programming for up to 30 days during power interruption.
- 10) PC Connection: RS232 port, allowing system programming by a PC at any control panel.

4. TIME SWITCHES

- a. Description: Solid-state programmable units with alphanumeric display complying with UL 917.

5. OUTDOOR PHOTOELECTRIC RELAYS

- a. Description: Solid state, with single-pole, double-throw dry contacts rated to operate connected relay or contactor coils or microprocessor input, and complying with UL 773A.
- b. Light-Level Monitoring Range: 0 to 3500 fc, with an adjustment for turn-on/turn-off levels.
- c. Time Delay: Prevents false operation.
- d. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

6. INDOOR PHOTOELECTRIC SENSOR

- a. Ceiling-Mounting Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.
- 1) Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
  - 2) Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
  - 3) Light-Level Monitoring Range: 10 to 200 fc (108 to 2150 lx), with an adjustment for turn-on and turn-off levels within that range.
  - 4) Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
  - 5) Indicator: Two LEDs to indicate the beginning of on and off cycles.

- b. Skylight Photoelectric Sensors: Solid-state, light-level sensor; housed in a threaded, plastic fitting for mounting under skylight, facing up at skylight; with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.
  - 1) Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
  - 2) Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
  - 3) Light-Level Monitoring Range: 1000 to 10,000 fc (10 800 to 108 000 lx), with an adjustment for turn-on and turn-off levels within that range.
  - 4) Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
  - 5) Indicator: Two LEDs to indicate the beginning of on and off cycles.

## 7. OCCUPANCY SENSORS

- a. Ceiling-Mounting Units: Unit receives control power from a separately mounted auxiliary power and control unit, and operates power switching contacts in that unit.
- b. Switch-Box-Mounting Units: Unit receives power directly from switch leg of the 120- or 277-V ac circuit it controls and operates integral power switching contacts rated 800 W at 120-V ac, and 1000 W at 277-V ac, minimum.
- c. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, unless otherwise indicated.
  - 1) Time Delay for Turning Lights Off: Adjustable over a range from 1 to 15 minutes, minimum.
  - 2) Manual Override Switch: Turns lights off manually regardless of elapsed time delay.
  - 3) Ambient-Light-Level Control: Adjustable for setting a level of ambient illumination above which sensor will not turn lights on when occupancy is sensed.
  - 4) Isolated Relay Contact: Operates on detection of occupancy or vacancy, as indicated, to activate an independent function.
- d. Auxiliary Power and Control Units: As follows:
  - 1) Relays rated for a minimum of 20-A normal ballast load or 13-A tungsten filament or high-inrush ballast load.
  - 2) Sensor Power Supply: Rated to supply the number of connected sensors.
- e. Dual-Technology Type: Uses a combination of passive-infrared and ultrasonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (on or off) is selectable in the field by operating controls on unit.

## 8. MULTIPOLE CONTACTORS AND RELAYS

- a. Description: Electrically operated and mechanically held, and complying with UL 508 and NEMA ICS 2.
  - 1) Current Rating for Switching: UL listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballasts with 15 percent or less total harmonic distortion of normal load current).
  - 2) Control Coil Voltage: Match control power source.

## C. EXECUTION

### 1. INSTALLATION

- a. Install equipment level and plumb and according to manufacturer's written instructions.
- b. Mount lighting control devices according to manufacturer's written instructions and requirements in Division 26 Section "Basic Electrical Materials and Methods."
- c. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

### 2. CONTROL WIRING INSTALLATION

- a. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Division 26 Section "Conductors and Cables" for low-voltage connections.
- b. Wiring Method: Install all wiring in raceway as specified in Division 26 Section "Raceways and Boxes," unless run in accessible ceiling space and gypsum board partitions.
- c. Bundle, train, and support wiring in enclosures.
- d. Ground equipment.
- e. Connections: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

### 3. IDENTIFICATION

- a. Identify components and power and control wiring according to Division 26 Section "Basic Electrical Materials and Methods."

### 4. FIELD QUALITY CONTROL

- a. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.
- b. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.
- c. Check tightness of electrical connections with torque wrench calibrated within previous six months. Use manufacturer's recommended torque values.
- d. Verify settings of photoelectric devices with photometer calibrated within previous six months.
- e. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:
  - 1) Continuity tests of circuits.
  - 2) Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
    - a) Include testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

- f. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.
- g. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.
- h. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

5. CLEANING

- a. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

6. DEMONSTRATION

- a. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
  - 1) Train Owner's maintenance personnel on troubleshooting, servicing, adjusting, and preventive maintenance. Provide a minimum of three hours' training.
  - 2) Training Aid: Use the approved final version of maintenance manuals as a training aid.
  - 3) Schedule training with Owner, through Architect, with at least seven days' advance notice.

7. ON-SITE ASSISTANCE

- a. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

END OF SECTION 26 09 23



**SECTION 26 24 16 – PANELBOARDS AND CIRCUIT BREAKERS**

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**A. GENERAL**

1. The Electrical Contractor shall provide all panelboards and circuit breakers as shown on the plans in accordance with this specification.
2. All equipment shall meet a third party agency accredited by the NCBCC, NEC and NEMA Standards as applicable to the equipment specified herein.
3. All panelboards shall be equipped with a main circuit breaker or main lugs as indicated on the drawings.
4. All panelboards shall be equipped with branch breakers as shown on the drawings. Maximum number of breakers in a panelboard shall not exceed 42 poles.
5. All panelboards identified on the drawings for use as service equipment shall be so labeled and listed for such use by a third party agency accredited by the NCBCC.
6. Full size insulated copper neutral bars shall be included in all panelboards. Neutral bussing and ground bussing shall have suitable lugs for outgoing "branch circuits" or 50% of the breaker poles furnished in the panelboard.
7. A full size copper ground bus and copper neutral bus shall be included in all panelboards sized for 100% terminations.
8. All current-carrying parts of the bus assembly shall be copper.
9. Panelboards shall be labeled with a third party accredited by the NCBCC short circuit rating not less than the rating indicated on the drawings. Circuit breakers shall be fully rated for the amount shown on the plans. Series rating of the circuit breaker is not allowed.
10. The word "spare", unless noted otherwise on the panel schedules, shall be a single pole, 20 amp circuit breaker.
11. The word "space", unless noted otherwise on the panel schedules, shall be for a space in the panelboard for a standard size, single pole circuit breaker.
12. Terminals for feeder conductors to the panelboard mains and neutral shall be listed as suitable for the type of conductor specified by a third party agency accredited by the NCBCC. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.
13. Feed-thru panels are not permitted.
14. The use of series-rated breakers is not acceptable.
15. "Load Centers" are not acceptable.
16. Flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 and NFPA 70E requirements. Provide "arc flashing" warning labels on all power panels, enclosed circuit breakers, and other equipment where required by NFPA 70E.
17. All panelboards 600 amp and less shall be specified with bolt-on breakers.
18. The number of the branch circuit shall be identified with permanent wire tag attached to the wire.

19. Circuit breakers feeding sleeping areas, such as dorms, shall be arc fault.
20. Branch circuits shall have individual neutrals, no sharing of the neutrals between circuits.

## B. PRODUCT

1. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage = 240	Maximum Branch Circuit	= 225 amps
Amps = 600	Short Circuit Rating	= 22,000 amps

- Panelboards shall be Square D Company type NQOD (bolt-on) or approved equivalent by Siemens/ ITE, Eaton (Cutler Hammer), or General Electric, and shall be door in door type construction.
  - Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
  - The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, a third party agency accredited by the NCBC, and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.
  - Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring- loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. All panelboards shall have fronts trim with 1-piece "door in door" type construction to allow access to the panel gutter without removal of the entire panel cover, available flush or surface mounted as scheduled, ANSI 49 gray. Fronts shall not be removable with door in the locked position. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish. Circuit information on directory cards shall be neatly typed or computer generated.
  - Panelboard trims shall cover all live parts. Switching device handles shall be accessible.
2. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage = 480	Maximum Branch Circuit	= 225 amps
Amps = 600	Short Circuit Rating	= 18,000 amps 480 VAC 65,000 amps 240 VAC

- Panelboards shall be Square D Company Type NF (bolt-on) or approved equivalent by Siemens/ITE, Eaton (Cutler Hammer), or General Electric.
- Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type.
- The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA, a third party agency accredited by the NCBC, and National Electrical Code requirements for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel. Surface mounted cans shall be galvanized and without preformed knockouts.
- Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock shall not protrude beyond the front of the door. All panelboard locks shall be keyed alike. All panelboards shall have fronts trim with 1-piece "door in door" type construction to allow access to the panel gutter without removal of the entire panel cover, available flush or surface mounted as scheduled, ANSI 49 gray Fronts



shall not be removable with door in the locked position. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish. Circuit information on directory cards shall be neatly typed or computer generated.

e. Panelboard trims shall cover all live parts. Switching device handles shall be accessible.

3. This section shall be for panelboards whose characteristics shall not exceed the following:

Voltage: 480	Maximum Branch Circuit =	1,200 Amps
Amps: 1200	Short Circuit Rating =	200,000 Amps

a. Panelboards shall be Square D Company, Type I-Line or approved equivalent by Siemens/ITE, Eaton (Cutler Hammer), or General Electric.

b. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with NEMA, a third party agency accredited by the NCBCC, and NEC Standards for panelboards. Cabinets to be equipped with spring latch and tumbler-lock on door of trim. Doors over 48" long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. Endwalls shall be removable. Fronts shall be of code gauge, full finished steel with rust inhibiting primer and baked enamel finish.

c. The panelboard interior assembly shall be dead front with panelboard front removed. Main lugs or main breaker shall be barriered on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall be barriered.

d. A circuit directory frame with a clear plastic covering and a directory card shall be provided on the inside of the door. Circuit information on directory cards shall be neatly typed or computer generated.

4. Molded Case Circuit Breakers

a. This specification covers molded case circuit breakers rated 15 through 225 amperes 120VAC, 240VAC, 277VAC, and 480VAC. Any breakers larger than 225 amp shall be adjustable trip type with long time, short time, instantaneous,  $I^2T$  settings.

Breakers covered under this specification may be installed in switchboards, panelboards, motor control centers, combination motor starters, busway plugs and individual enclosures.

b. Circuit breakers shall be manufactured by Square D Company of the size as indicated on the drawings or approved equivalent by Siemens/ITE, Cutler Hammer, or General Electric.

c. All circuit breakers shall have a bolt-on, quick-break over center toggle type mechanism. The handle mechanism shall be trip-free to prevent holding contacts closed against a short circuit or sustained overload. All circuit breakers shall assume a position between on and off when tripped automatically. Multi-pole circuit breakers shall be common trip such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Arc extinction is to be accomplished by magnetic arc chutes. All ratings shall be clearly visible.

d. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Circuit breakers shall be calibrated to carry 100% rated current in an ambient of 40 degrees Celsius. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40 degrees Celsius, the circuit breaker automatically derates itself so as to better protect its associated conductor. The instantaneous magnetic trip shall

be adjustable and accessible from the front of all circuit breakers on frame sizes 250 amps and above.

- e. The interrupting rating of each circuit breaker shall be as indicated on the drawings. The interrupting rating of the circuit breakers shall be at least equal to the available short circuit current at the line terminals of the circuit breaker and correspond to UL listed integrated short circuit current rating specified for the panelboards and switchboards.
- f. UL Class A (5 milliampere sensitivity) ground fault circuit protection shall be provided on 120 V ac branch circuits as specified on the plans or panelboard schedule. This protection shall be an integral part of the branch circuit breaker which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional single pole circuit breaker.
- g. Motor starters, and other applications as indicated on drawings, shall be furnished with magnetic-only type molded case circuit breakers. Each breaker shall be provided with a single magnetic adjustment that will set all poles to the same trip current. Adjustment shall be continuous throughout the adjustable trip range. The magnetic trips shall be accessible from the front of these circuit breakers.

#### C. EXECUTION

- 1. Panelboards shall be flush or surface mounted as shown on the plans.
- 2. Panel enclosures shall not be used as junction or pull boxes for splicing conductors.
- 3. Each flush mounted panel shall be equipped with two empty one inch conduits sealed in the wall from a panel to a six inch square flush mounted box installed above a lay-in type ceiling or flush in the wall at the ceiling for a plaster or spline type acoustical tile ceiling.
- 4. All panels shall be equipped with circuit information directory cards. Directory cards shall be neatly typed or computer generated and attached on the inside of the door. Directory notations shall include room number (using signage designations where available) that branch circuit serves.
- 5. GFI circuits shall be tested by the Contractor prior to the pre-final inspection.
- 6. An engraved nameplate shall be provided for each panel. See Specification Section 26 01 00 (Electrical General Provisions).

END OF SECTION 26 24 16

**SECTION 26 27 26 – WIRING DEVICES**

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**A. GENERAL**

1. Switches, dimmer switches, photocell, contactors and receptacles, with proper cover plates, shall be provided where indicated on the Drawings.
2. All devices shall be labeled for its particular application.

**B. PRODUCT**

1. All wiring devices shall be as specified in the Symbol Legend of the Drawings.
2. Toggle switches shall be single pole, three-way, or four-way as indicated on the drawings. Switches shall be of the grounding type, with hex-head grounding screw, rated 20A, 120/277 volt, AC only. Lighted handle switches shall have neon lights of the correct voltage rating where indicated on the drawings. All switches shall have quiet operating mechanisms without the use of mercury switches. All switches shall be listed by an "approved" third-party agency, approved for the voltage and amperage indicated.
3. When the Contractor proposes to use a different wiring device than the one specified in the Symbol Legend of the Drawings, he shall submit one of the following manufacture's devices for approval:
  - a. Dimmer Switches: Lutron, Leviton, or Pass & Seymour.
  - b. Industrial Specification Heavy Duty Grade Receptacles: Hubbell Hubbell-pro series or equals by: Leviton, Pass & Seymour, Bryant or Eagle.
4. 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 20A, 125 volt and the face configuration shall conform to the NEMA Standard No. WD-1, NEMA WD-6, DSCC W-C-596G and UL-498, 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.
5. Receptacles shall be industrial specification heavy duty grade mounted vertically. Receptacles mounted over counter, backsplashes, etc shall be mounted horizontally.
6. Cover plates for all wall mounted devices shall be provided as scheduled on the Drawings. Where covers are not specified, they shall be stainless steel and furnished to match the field conditions and outlets provided.
7. All cover plates for all devices shall have the circuit designation serving the device written on the back of the cover plate with a permanent marker.
8. All cover plates shall be semi-jumbo (midi size) as opposed to standard size plates.
9. All stainless steel cover plates shall be 302 alloy, non-magnetic and non-corrosive.
10. Unless specifically noted otherwise on the plans, all dimmer switches (indicated by the Symbol S<sub>D</sub>) shall be a slide type dimmer with a toggle preset, sized to handle the switched load.
11. Receptacles in wet locations shall be installed in a heavy duty "In-use" type, installed with a hinged outlet cover/enclosure clearly marked "Suitable for Wet Locations While In Use" and "UL Listed". There must be a gasket between the enclosure and the mounting surface, and between

the hinged cover and mounting plate/base to assure proper seal. TayMac, Hubbell, Leviton, heavy-duty grade, or approved equivalents.

12. At the end of the project, spare cover plates shall be turned over to the Owner. The quantity shall be equal to 2% of each type installed on the project.
13. Switch and receptacle cover plates on exposed work shall be galvanized cast ferrous metal, standard size, and shall be single or ganged as indicated on the drawings.

#### C. EXECUTION

1. Mounting height shall be as indicated on the Drawings. Coordinate with other trades so that devices will miss equipment installed by others.
2. Receptacles shall be industrial specification grade or heavy-duty grade, mounted vertically. Receptacles mounted over counters, back-splashes, etc., shall be mounted horizontally.
3. Special wiring devices shall be shown on the drawings with complete description thereof.
4. GFCI receptacles shall be rated minimum 20 amp (NEMA 5-20R configuration).
5. GFCI receptacles shall be provided where installed to serve countertop and are located within 6 feet of a sink.
6. Where two or more devices are ganged, they shall be in a common box with a ganged plate.
7. All receptacles shall have a green ground conductor to run parallel with the phase conductor back to the electrical panel.
8. Breakers feeding sleeping areas shall be arc fault type.
9. Arc fault receptacles shall be provided for "dormitory" use as required per NEC.
10. Receptacles shall not be mounted back to back.
11. In all areas where carpet is to be installed as finished floor material, unless otherwise specified, the Electrical Contractor will furnish solid brass carpet flanges for installation on floor outlet boxes. Flanges will be furnished and installed on all active outlets after the carpet is installed. Where a specified number of outlet fittings are to be furnished to the Owner, for each fitting not installed during the construction period, it will be turned over to the Owner with the receptacle, carpet flange and all necessary appurtenances.
12. All wiring devices shall be 20 amp minimum and shall be of the grounding type, with hex-head green grounding screw, to be connected to the green ground conductor. Self-grounding type is not acceptable.

END OF SECTION 26 27 26

**SECTION 26 28 16 – DISCONNECTS**

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**A. GENERAL**

1. Disconnect switches shall be provided where indicated on the drawings, or as required by the National Electrical Code (NEC).

**B. PRODUCT**

1. Safety switches shall be the "heavy duty" type. General duty switches are not acceptable.
2. Safety switches shall be third-party listed.
3. Disconnects shall be furnished with factory finish paint and appropriate knockouts for conduit connections.
4. Front operated handles will not be permitted.
5. All fused disconnects shall be equipped with positive pressure fuse clips and shall have visible disconnecting blade switches.
6. NEMA 1 enclosures shall be provided where installed indoors. NEMA 3R enclosures shall be provided where exposed to the elements, unless noted otherwise.
7. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the "on" position.
8. Switches shall be capable of being padlocked in the "on" or "off" position.
9. Switches shall have non-teasible, positive, quick make-quick break mechanisms.
10. Switches shall be properly labeled. See Section "General Provisions" - Electrical Identification, Paragraph B.2.

**C. EXECUTION**

1. Disconnect switches shall be mounted as indicated on the Drawings and shall be independently supported. Conduits entering the disconnect switch shall not be used to support switches.
2. Where fused disconnect switches are required or shown on the plans, fuse selection shall be per the following table:

Circuit Type	Fuse Type
Service Entrance & Feeder Circuits over 600 Amp	Class L, UL listed, current limiting with 200K Amp Interrupting rating.
Service Entrance & Feeder Conduits 600 Amp or less	Class RK1, or J, UL listed, current limiting with 200K Amp Interrupting rating.
Motor, Motor Controller, and Transformer Circuits	Class RK5, UL listed, current limiting time delay, with 200 K Amp Interrupting rating
Individual Equipment where Fault Current does not exceed 50KA	Class K5, UL listed, with 50 KA Interrupting rating

3. Fusible safety switches with short-circuit withstand ratings of 100K Amp or 200K Amp require Class R or Class J rejection fuse block feature.
4. Electrical contractor shall provide spare fuses for each equipment requiring fuses.

END OF SECTION 26 28 16

**SECTION 26 36 00 – AUTOMATIC TRANSFER SWITCH**

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**A. GENERAL**

1. The Contractor shall furnish an automatic transfer switch as shown on the drawings and as specified herein.
2. When an emergency generator system or prime power system is furnished as part of the work, the subcontractor furnishing the generator equipment shall furnish the automatic transfer switch.
3. Transfer switch(es) shall be as manufactured by Kohler, or approved equivalent by Cummins, Generac, or Caterpillar.
4. The automatic transfer switch shall be contactor type (full size neutral contactor), with arc suppression chutes.
5. The automatic transfer switch shall conform to UL-1008, NEC-517 and NEC-700.

**B. PRODUCT**

1. The transfer switch(es) shall be 277/480 volt rated 400 amp, three (3) phase, four (4) wire, four (4) pole with overlapping neutral and with adjustable time-delayed neutral transfer. The transfer switch(es) shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a Nema 1/3R enclosure (see plans) in accordance with Underwriters' Laboratories, Inc. Standard UL-1008.
2. The automatic transfer switch shall be rated to withstand the RMS symmetrical short circuit current available at the automatic transfer switch terminals with the type of overcurrent protection and voltage as shown on the plans.
3. The transfer switch(es) shall be equipped with a manual operator that is designed to prevent injury to the operating personnel if the electrical operator should suddenly become energized during manual transfer. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.
4. The automatic transfer switch shall have a test switch or push button to simulate power failure.
5. Generator exercising time switch with load/no load selector switch shall be included.
6. The transfer switch shall be rigidly constructed to close into and withstand the bolted fault current available at the switch.
  - a. All transfer switch coils, springs, control elements shall be easily inspectable and conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.
  - b. All feeder lugs, relays, timers, control wiring and accessories shall be front accessible.
  - c. The control module and transfer switch shall be physically separated.
  - d. Main contacts shall be silver alloy composition.
7. The transfer switch shall be provided with light-emitting diodes (LED) as follows:
  - a. Contactor Position: normal (utility) and emergency (generator)
  - b. Plant Exercisor active
  - c. In Phase Monitor active
  - d. A test button shall light all light emitting diodes (LEDs)

8. Auxiliary contacts shall be provided as follows:
  - a. Contactor in normal position – 3 sets
  - b. Contactor in emergency position – 3 sets
9. Three phase transfer switches shall be 3-pole with overlapping neutral transfer contacts, or 4-pole with neutral contacts of same capacity as phase contacts.
10. Transfer switch control system
  - a. The control module shall direct the operation of the transfer switch. The modules sensing and lock shall be micro-processor based. The control settings shall be stored in non-volatile memory.
  - b. The control module shall have a three position, key-operated programming control switch. The key shall be removable in any position. The positions shall be:
    - Off – allows all enabled accessories to be monitored only. Settings cannot be changed while in this position.
    - Local – allows all enabled accessory settings to be changed locally at the transfer switch control panel.
    - Remote – allows all enabled accessories to be altered via the remote communications port.
11. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. The main contacts shall be mechanically locked into position for both the normal and emergency positions without the use of hooks, latches, magnets or springs.
12. The switches shall include voltage and frequency sensing of the emergency source and shall be factory set to allow transfer to emergency when that source is at approximately rated voltage and frequency.
13. The transfer time shall not exceed one-sixth (1/6) second.
14. In-phase monitoring shall be provided to continuously monitor the contactor transfer times, source voltage, frequency and phase angle to provide a self-adjusting, zero crossing contactor transfer signal.
15. Anti-single phasing protection shall be provided to detect regenerative voltage as a failed source condition.
16. Approval Required
  - a. As a precondition for approval, the transfer switch(es), complete with timers, relays and accessories shall be listed by Underwriters' Laboratory, Inc. in their Electrical Construction Materials Catalogue under Standard UL-1008 (automatic transfer switches) and approved for use on Emergency Systems.
  - b. On request, the manufacturer shall provide a letter certifying compliance with all requirements of the transfer switch specifications. The certification shall identify equipment by serial number and shall include no exceptions to the specifications not stipulated with the submittal.
17. The automatic transfer switch shall also be equipped with an exerciser to start the generator and transfer the load for a period of thirty minutes once a week. After thirty minutes, the transfer switch shall switch back to the utility power source.



## C. EXECUTION

### 1. Sequence of Operation

- a. Source drops below a range of 70-95% of rated voltage (factory set at 85%) after an adjustable time delay period of .05 to 6 seconds (factory set at 3 seconds) to allow for momentary dips. The transfer switch shall transfer to emergency as soon as the generator voltage has reached a range of 75-100% of rated voltage (factory set at 90%) and generator rated frequency of 85-100% (Factory set at 90%).
  - After restoration of normal power on all phases to 80% of rated voltage, an adjustable time delay period of 0-30 minutes (factory set at 5 minutes) shall delay re-transfer to normal power until it has stabilized. If the emergency power source should fail during the time delay period, the time delay shall be by-passed and the switch shall return, immediately, to the normal source.
  - After the switch has transferred to normal, the engine generator shall be allowed to operate at no load for 5 minutes to allow it to cool before shutdown. The engine cool-down timer may be installed in the generator control panel.

### 2. Submittal, Operator's Manual and Warranty

- a. Submittal shall include specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams; dimension drawings; and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.
- b. Each transfer switch shall be provided with an operator's manual providing installation and operating instructions.
- c. The automatic transfer switch and generator set shall be warranted by the generator set manufacturer for a period of five (5) years from the date of final inspection and acceptance. The warranty shall cover all parts and labor (including travel), expenses and equipment necessary to perform replacement and/or repairs.

3. A letter of certification from a factory representative shall be furnished to the Engineer stating that the automatic transfer switch(es) has been installed in accordance with the manufacturer's instructions, and that the switch has been tested for compliance with the above performance requirements.

END OF SECTION 26 36 00



**SECTION 26 43 13 – TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)**

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## A. GENERAL

## 1. Scope

- a. This section includes Surge Protective Devices (SPDs) for low-voltage power equipment (1000Vac and less).
- b. Work under this section consists of furnishing all materials necessary for the execution and complete installation of Surge Protective Devices (SPDs).

## 2. Related Work/Sections

- a. In addition to this section, the Contractor shall refer to other specification sections and drawings to ascertain the extent of work included.
- b. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner or others except when permitted and then only after arranging to provide temporary utility services according to requirements indicated. Notify and coordinate with the engineer when an interrupt is required and prior to interrupting.

## 3. Quality Assurance/Reference Standards

The SPD Surge protection system shall be designed and manufactured, and where appropriate, listed to the following standards.

## a. Underwriters Laboratory (UL)

- 1) UL1449 3<sup>rd</sup> Edition: Surge Protective Devices (SPD)
- 2) UL1283 5th Edition: Electromagnetic Interference Filters
- 3) cUL – UL: Evaluation to Canadian Safety Requirements (UL 1449, 1283)

## b. Institute of Electrical &amp; Electronic Engineers (IEEE)

- 1) C62.41.1: 2002 IEEE Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits.
- 2) C62.41.2: 2002 IEEE Recommended Practice on Characterization of Surges in Low-voltage (1000V and less) AC Power Circuits.
- 3) C62.45: 2002 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and less) AC Power Circuits.
- 4) C62.62: 2000 IEEE Standard Test Specifications for Surge Protective Devices for Low Voltage (1000V and less) AC Power Circuits.
- 5) C62.72: 2007 IEEE Guide for the Application of Surge Protective Devices for Low Voltage (1000V and less) AC Power Circuits.

## c. National Electrical Manufacturers Association (NEMA)

## d. National Fire Protection Association, NFPA 70, National Electric Code, 2011 (NEC)

## e. Federal Information Processing Standards Publication 94 (FIPS 94), 1983 Guideline on Electrical Power for ADP Installations.

## f. MIL-STD 220A

#### 4. Project Conditions

- a. Service Conditions: The Surge Protective Device (SPD) shall be rated for continuous operation under the following conditions:
  - 1) Maximum Continuous Operating Voltage (MCOV): 115% to 125% of the nominal operating voltage
  - 2) Operating Temperature: -40°C to 60°C
  - 3) Relative Humidity: 0% to 95%, non-condensing
  - 4) Operating Altitude: 0 feet to 12,000 feet

#### 5. Submittals

- a. Alternate manufacturers shall submit specification compliance report and drawings ten (10) days prior to bid for consideration.
- b. The specific item proposed and its area of application shall be indicated on the product specification sheet.
- c. Submit certified test results for all models as follows:

UL listing verification:

  - 1) Submit UL1449 3<sup>rd</sup> Edition Voltage Protection Ratings "VPR".
  - 2) Submit proof that products are UL *listed and labeled by Underwriters Laboratories* to UL 1449 3<sup>rd</sup> Edition.
- d. Provide warranty statement.

#### 6. Locations

- a. See the electrical power riser diagram and electrical plan drawings for Surge Protective Device (SPD) unit locations.

### B. PRODUCTS

#### 1. General

- a. The following are the general requirements of the SPD products:
  - 1) Nomenclatures used herein are intended to indicate product type and configuration of equipment required.
  - 2) UL 1449 3<sup>rd</sup> Edition Listed, bearing the official UL 3<sup>rd</sup> Edition gold hologram label.
  - 3) UL 1283 5<sup>th</sup> Edition Listed.
  - 4) The Surge Protective Device (SPD) shall be a standalone configuration. Systems that must be integral to the switchgear will not be considered.
  - 5) All SPD systems shall be permanently connected, parallel designs. Series suppression elements shall not be acceptable.

- 6) The SPD shall be marked with a Short Circuit Current Rating (SCCR) and shall not be installed at a point on the system where the available fault current is in excess of that rating per the National Electric Code, Article 285, Section 6.
  - 7) All SPD units shall be from the same manufacturer.
  - 8) SPD designs using a single fuse to protect two (2) or more surge paths shall not be acceptable.
  - 9) SPD designs that limit the 100% rated surge protections shall not be acceptable.
  - 10) Fuse links or printed circuit board trace fusing shall not be acceptable.
  - 11) Hybrid design utilizing:
    - a) Thermally Protected Metal Oxide Varistors
    - b) Filter capacitors to suppress EMI/RFI electrical noise.
2. Modular Surge Protection for Service Entrance/Main Distribution Applications “MDP”
- a. Configured for the voltage as shown on the riser diagram and/or panel schedules.
  - b. The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below:

Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
2500 - 6000A	300	600
1200 - 2000A	250	500
600 - 1000A	200	400
225 - 400A	150	300
125 - 225A	100	200

- c. The SPD shall be rated for 208/120Vac 3 Phase, 4 Wire + Ground, Wye.
- d. Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G). Each replaceable module shall provide the uncompromising ability to deliver full surge current rating per mode.
- e. SPD modules shall be configured to isolate individual suppression component failures without causing total loss of surge protection in that mode.
- f. Opening of supplementary protective devices, internal or external, shall not be permissible during UL 1449 3<sup>rd</sup> Edition Nominal Discharge testing.
- g. Optional Connection Methods: Distribution Block, 100A, #2AWG Wire.
- h. Each individual module shall feature a green LED indicating the individual module has all surge protection devices active. If any module is taken off-line, the green LED will turn off and a red LED will illuminate, providing *individual module* as well as *total system* status indication.
- i. The SPD shall include Solid State Status Indication Lights & Form C Contact.
- j. The modular SPD shall be provided in a NEMA 4X enclosure.

- k. The SPD shall provide EMI/RFI electrical noise attenuation up to 43dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.
- l. Voltage Protection Ratings: The UL 1449 3<sup>rd</sup> Edition Voltage Protection Ratings “VPR” (6kV, 3000 Amps, 8/20µs waveform) shall not exceed the UL assigned values listed below:

Voltage Protection Ratings (VPR) 6kV, 3000A, 8/20µs Waveform	Voltage Rating	
	208/120V	480/277V
Line to Neutral	900V	1200V
Line to Ground	800V	1200V
Neutral to Ground	700V	1200V
Line to Line	1200V	2000V

- m. The SPD shall have a minimum UL 1449 3<sup>rd</sup> Edition Nominal Discharge Current Rating (I<sub>n</sub>) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the (I<sub>n</sub>) rating shall be 20,000 Amps.
- n. Approved Manufacturers: The following SPD manufacturers and respective models shall be deemed acceptable, subject to conformance with indicated requirements:

THOR SYSTEMS	TSr Product Series
Current Technologies	SL2 Product Series
Liebert	Interceptor II Series

- 3. Non-Modular Surge Protection for Distribution, Sub-Distribution and Branch Circuit Panels (Lower Ampacity, 15A to 800A, Applications)
  - a. Configured as shown on the riser diagram and/or panel schedules.
  - b. The SPD surge current ratings shall be based on the electrical system ampacity listed in the table below:

Electrical System Ampacity @ SPD Install Point	Surge Protection (kA)	
	Per Mode	Per Phase
400 - 800A	150	300
125 - 225A	100	200
15 - 100A	50	100

- c. The SPD shall be rated for 208/120Vac 3 Phase, 4 Wire + Ground, Wye.
- d. Modes of Protection: The SPD system shall provide surge protection in all possible modes (L-N, L-G, L-L, and N-G). Each device shall provide the uncompromising ability to deliver full surge current rating per mode.
- e. All non-modular units shall be factory wired using color coded #10AWG Rope Lay Wire (with 413 strands/36AWG, seven [7] groups of 59 strands each): two feet (2') for each phase conductor and three feet (3') for Neutral and Ground conductors.
- f. The SPD shall include Solid State Status Indication Lights & Form C Contact.
- g. The non-modular SPD shall be provided in a compact NEMA 4X polycarbonate enclosure with a CLEAR cover.
- h. The SPD shall provide EMI/RFI electrical noise attenuation up to 43dB in the range of 50kHz to 100MHz as defined by MIL-STD-220A test procedures.

- i. Voltage Protection Ratings: The UL 1449 3<sup>rd</sup> Edition Voltage Protection Ratings “VPR” (6kV, 3000 Amps, 8/20 $\mu$ s waveform) shall not exceed the UL assigned values listed below:

Voltage Protection Ratings (VPR) 6kV, 3000A, 8/20 $\mu$ s Waveform	Voltage Rating	
	208/120V	480/277V
Line to Neutral	700V	1200V
Line to Ground	700V	1200V
Neutral to Ground	800V	1200V
Line to Line	1000V	2000V

- j. The SPD shall have a minimum UL 1449 3<sup>rd</sup> Edition Nominal Discharge Current Rating ( $I_n$ ) of 10,000 Amps. When used in conjunction with a UL 96A certified Lightning Protection System the ( $I_n$ ) rating shall be 20,000 Amps.
- k. Approved Manufacturers: The following NON-MODULAR SPD manufacturers and respective models shall be deemed acceptable, subject to conformance with indicated requirements:

THOR SYSTEMS	TSn Product Series (50 to 150kA/Mode)
Current Technologies	TG Product Series (50 to 150kA/Mode)
Liebert	Accuvar All Product Series (up to 80kA/Mode)
	LM Product Series (100 to 150kA/Mode)

#### 4. Warranty

- a. All Surge Protective Devices (SPDs), associated hardware, and supporting components shall be warranted to be free from defects in materials and workmanship, under normal use and in accordance with the instructions provided, for a period of five (5) years.
- b. A detailed warranty statement shall be provided with each unit.

### C. EXECUTION

- This section covers the execution and commissioning of the Surge Protective Device (SPD) required on this project.
- Technical assistance shall be provided by the manufacturer through the efforts of a factory representative or a local distributor.
- Verify absence of damage.
- The unit shall be installed in accordance with the manufacturer’s printed instructions. All local and national codes shall be observed.
- The unit shall be installed of the same voltage rating as the intended protected equipment.
- The unit shall be installed on the load side of the service equipment overcurrent device.
- The location of the field-mounted SPD shall allow adequate clearances for maintenance.
- Lead Length: The mounting of the SPD shall ensure the connecting leads are as short (recommend one [1] meter or less) and straight (no sharp bends) as reasonably possible.
- Before energizing the SPD, the unit shall be verified as to: correct as specified: manufacturer, product series, and model number.

10. All voltage modes including L-L (Line-to-Line), L-G (Line-to-Ground), L-N (Line-to-Neutral), and N-g (Neutral-to-Ground) shall be measured and verified against the unit voltage ratings.
11. Continuity measurements shall be made between the Neutral and Ground connections to verify the Neutral-to-Ground bond.

END OF SECTION 26 43 13



**SECTION 26 51 13 – LIGHTING FIXTURES**

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**A. GENERAL**

1. The Contractor shall provide all fixtures and lamps where indicated on the Drawings.
2. Work shall include all stems, canopies and accessories necessary for a complete lighting fixture installation.

**B. PRODUCT**

1. Fixtures shall be as specified in the Fixture Schedule on the Drawings or approved equivalents.
2. Provide luminaire disconnecting means as required by 2008 NEC 410-130.
3. All outdoor fixtures shall bear a third party agency accredited by the NCBCC label for damp or wet locations as applicable.
4. Unless otherwise noted, all fixtures shall be new, free of defects and imperfections. Damaged fixtures shall be replaced at this Contractor's expense.
5. Ballasts for fluorescent fixtures shall be energy efficient, unless otherwise noted, high efficiency program start, electronic, 60 cycle ballast for the voltage indicated in the Fixture Schedule, and shall be certified by ETL and Underwriters' Laboratory. Ballasts shall incorporate harmonic filtering so that the third harmonic content does not exceed 10 percent of the input current. Additionally, ballasts must be designed to withstand the transient conditions of IEEE Publication 587 Category A, as well as meet the RFI and EMI limitations shown for FCC Class A applications. Electronic ballasts must meet the following criteria:
  - a. Ballast to be "UL list, Class P", internally thermally protected.
  - b. Ballast to be "Sound Rated A", total harmonic distortion (THD) shall not exceed 10%.
  - c. No "PCB" ballasts will be accepted.
  - d. Ballast enclosure size shall be same as, or smaller than, magnetic ballast.
  - e. Light regulation shall be +/- 10% input voltage variation.
  - f. Ballast shall have high power factor (minimum of 90%).
  - g. Lamp current crest factor shall be equal to, or less than, 1.7.
  - h. Input current third harmonics shall not exceed ANSI recommendations (32% total harmonic distortion, 27.5% of the third triplets).
  - i. Flicker shall be 15% or less with any lamp suitable for the ballast.
  - j. Ballast design shall withstand line transients per IEEE 587, Category A.
  - k. Ballast case temperature shall not exceed 25 degrees C rise over 40 degrees C ambient.
  - l. Ballast shall meet FCC Rules and Regulations, Part 18.
  - m. Parallel wiring between the ballast and the fixture is recommended.
  - n. Minimum of five (5) years warranty is required with each electronic ballast.
  - o. The listed manufacturers shall have at least five (5) years of experience in manufacturing electronic ballasts.
  - p. Fluorescent lamps shall comply with the EPA Guidelines regarding the Toxicity Characteristic Leaching Procedure (TCLP).

6. Ballasts for high intensity discharge fixtures shall be high power factor, 60 cycle ballast for the voltage indicated on the Fixture Schedule, and shall be third party agency accredited by the NCBCC listed. Ballasts shall be encapsulated, extra quiet type, mounted on sound absorbing pads where noted.
7. All high efficiency T8 fluorescent lamps shall be equal to GE Staybright or Trimline. Incandescent lamps shall be inside frosted 130 volt extended service.
8. The electronic ballast shall be provided with a end of life shutdown circuit.
9. All lamps shall be manufactured by Sylvania, General Electric, or Philips.
10. All acrylic lenses for lay-in troffers and wrap around fixtures shall have a minimal lens thickness of 0.125" unless noted otherwise on plans.
11. All fluorescent lighting fixtures located in Elevator Equipment Rooms shall be provided with clear plastic tube guards, whether specified in the Fixture Schedule or not.
12. All lighting fixtures shall be as specified on the plans or an approved equivalent. The following manufacturers specification grade fixtures have been pre-approved as equivalent to the various fixture types specified: Thomas Industries, Cooper Lighting, Lithonia, Exitronic, Peerless, Emco, Capri, Kirlin, Kenall, LAM, Progress, Visa, Columbia Lighting, Prescolite, Moldcast, Juno Lighting, Hubbell, Lite Control and Dual-Lite. Use of a specific manufacturer and model number on the Electrical Plans shall constitute pre-approval of that specific fixture, as well as those listed above.
13. Whenever a mechanically held lighting contactor is specified, it shall be provided with a Square D Form R6 (2 wire interface module) or equivalent to assist in unlatching the contactor upon removal of AC power.
14. "Bat-wing" supports shall be used to support all flexible metal cabling fixture whips from off of the ceiling. The clip shall be affixed to the support wires supporting the ceiling and lights.
15. Where vandal proof or tamper proof fixtures are specified, tamper proof screwdrivers shall also be provided. The quantity of screwdrivers provided shall be equal to 10% of the number of vandal proof fixtures, or two (2), whichever is greater.
16. Emergency Exit Fixture
  - a. It shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. No battery is required if the fixture is fed from a generator, or any other emergency power source. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards; NEC, NC Building Code, Energy Conservation Code, NFPA-101, and NEMA Standards.
  - b. 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 degrees C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and – negative terminal. The battery shall conform to the requirements of NEC 700-12(F).
  - c. 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 percent. 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.

- d. Additional Features: Pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type and a 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.
- e. LED: The use of LED is required due 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.
- f. Unit Test: 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 in accordance with NEC 700. 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. Note: The test shall demonstrate that the batteries conform to the requirements of NEC 700.12(F).
- g. Warranty: The entire unit shall be warranted for three years. The battery must have any additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract documents. The warranty applies to both the emergency exit luminaire and the emergency egress luminaire.

#### 17. Emergency Egress Fixture

- a. It shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Fixture 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.
- b. 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 degrees C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and – negative terminal. The battery shall conform to the requirements of NEC 700.12(F).
- c. 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 percent. 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.
- d. Additional Features: Pilot light to indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type and a 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.
- e. Unit Test: 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 in accordance with NEC 700. 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. Note: The test shall demonstrate that the batteries conform to the requirements of NEC 700.12(F).
- f. Warranty: The entire unit shall be warranted for three years. The battery must have any additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract documents. The warranty applies to both the emergency exit luminaire and the emergency egress luminaire.

## 18. Lighting Poles:

- a. Safety Factor: The structural design of the pole must be demonstrated to be based on the AASHTO criteria for pole stress allowances.
- b. Wind Factor: The pole shall be designed to withstand 110 MPH winds based on IBC2000 Standards. The premise of the wind speed criteria will be the 50 year mean recurrent isotach wind map. Applicable gust factors to be applied per code.
- c. Pole Material: The pole shall be extruded aluminum, as specified in Fixture Schedule on Sheet E-1.
- d. Accessibility: Branch circuit wiring shall be accessible at each pole by means of a gasketed handhole in the pole.
- e. Foundation: Pole bases for site lighting is detailed on the electrical plans and based on State Construction Guidelines.
- f. Ground Bar: For safety of equipment and personnel, a ground bar accessible from the handhole that accepts up to 4 AWG gauge wires shall be provided.

## C. EXECUTION

1. All fixtures shall be installed in accordance with the National Electric Code.
2. All fixtures other than the lay-in type shall be individually supported from building structure with 1/4" threaded rods and nuts.
3. Where a recessed fluorescent, high intensity, or downlight fixture replaces a section or part of a ceiling tile, fixture is to be supported at the two (2) opposite ends to the steel frame of the building. Supports shall be provided with the same type of wire as used to support the lay-in ceiling track., and be distinguished by color and tag. Attach one end of the wire to one corner of the fixture and the other end to the building's structural system. The lay-in fixture shall then be screwed to the main runners of the lay-in ceiling track at all four (4) corners using sheet metal screws. For fire rated suspended ceiling, luminaire shall supported to the building structure as per the ceiling design criteria, luminaire shall then be screwed to the main runners of the suspended ceiling track at all four (4) corners using sheet metal screws.
4. The complete emergency lighting system shall be tested by throwing the circuit breakers feeding the emergency lighting circuits. One and one-half hours thereafter, the battery voltages shall be recorded in a report to be submitted to the Engineer. This test shall be performed just prior to final inspection, under witness of the state electrical inspector, and in accordance with NEC Articles 700-4 (a) and (d).

END OF SECTION 26 51 13

**SECTION 27 00 00 - VOICE, DATA, CATV CABLING INFRASTRUCTURE**

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## A. GENERAL

1. Work under this section shall be subject to the General, Supplemental General and Special Conditions and, together with this section, are a part of the contract.
2. It is the purpose of this specification to require the furnishing of the highest quality materials, equipment, and workmanship available; to fulfill the requirements of the work specified herein.
3. All wiring, jacks, fiber bundles and patch panels will be labeled in accordance with the STS-1000 (Telecommunications Wiring Guidelines) Section 10. This shall also include analog Category 6 phone lines for Fax /modem locations. Additional Category 6 voice lines shall be provided for Fire Alarm, Security and Energy Management systems. Coordinate with system providers for exact jack locations.
4. Cabling Infrastructure
  - a. INTERNAL NETWORK/TELEPHONE The internal infrastructure will provide network/telephone infrastructure to various points and numbers indicated in building. The cable shall meet or exceed the EIA/TIA Commercial Building Telecommunications Wiring Standard. Each run will consist of two or four Category 6 cables originating at patch panels in the MDF and terminating at a dual or quad faceplate as indicated on the drawing. All faceplates will have a red and blue jack category 6 - RJ-45 jacks installed. Quad faceplates will have an additional black and white category 6 - RJ-45 jacks installed. All runs will be in conduit, raceways, or wire racks as dictated by best practices. All runs will be documented and tested. Contractor will coordinate jack labeling standard with the owners.
  - b. TELEPHONE Contractor will coordinate with owners telephone provider to provide and install a cabling infrastructure for a Telephone system throughout the facility.
  - c. WIRELESS - Contractor will provide network and power to appropriated places to support wireless access points (3) per attached drawings in the form of a duplex power outlet and a duplex Cat 6 network jack above ceiling level.
  - d. HVAC - Contractor will coordinate with HVAC contractor on technology infrastructure needs for HVAC within the scope of this plan.
  - e. FIREALARM SYSTEM - Contractor will coordinate with Fire Alarm System contractor on technology infrastructure needs within the scope of this plan.
  - f. Provide all labor, equipment, supplies, materials, and incidentals and all operations necessary for the "TURNKEY," fully operational, tested, and completed installation of a Complete Wiring Infrastructure to support owner supplied equipment for voice and data systems, in complete accordance with the Contract Documents.
5. The work shall include, but not be limited to, the following:
  - a. Coordination of the Raceway installation and racks & equipment placement
  - b. Coordination with the owners telephone / intercom system provider.
  - c. Phone Switch and Intercom by owner / others.
  - d. Provide (1) Cat 6 or other appropriate drop for the fire alarm system. Coordinate exact point of interface with fire alarm system provider.

- e. Provide (1) Cat-6 voice or other appropriate drop for energy management system. Coordinate exact point of interface with energy management system provider.
  - f. Coordination with the Local Telephone Exchange DEMARC.
  - g. Provide a complete cabling infrastructure to support the systems provided herein
  - h. If additional conduit sleeves are required for installation of the cabling infrastructure then the contractor shall provide as required.
  - i. If additional patch panels are required in the IDF, then the contractor shall provide as required.
  - j. Provide and install a CATV wiring infrastructure as specified.
  - k. All work shall be done in accordance with the STS – 1000 Telecommunications Wiring Guideline.
  - l. Protective devices for all outside circuits, whether aerial or underground, must comply with STS-1000 Requirements.
6. Permits and Inspections: Obtain and pay for all permits and inspections required by all legal authorities and agencies having jurisdiction for the work. These permits or inspections shall be a part of the work of the Contractor performing the work.
7. FCC Approval - The system shall be approved for direct interconnection to the telephone utility under Part 68 of FCC rules and regulations. Systems which are not FCC approved or utilized an intermediary device for connection, shall not be considered. Provide the FCC registration number of the system being proposed as a part of the submittal process.
8. Submittals - Submit the following Shop Drawings and Submittals, per the schedule listed below for review by the Architect/Engineer:
- a. Prior to proceeding with the work, a complete schedule of ALL equipment and materials to be furnished for the work. Accompanying the schedule shall be manufacturer's specification or cut sheets for all major components listed in this specification.
    - 1) Shop Drawings - Complete shop drawings for all systems and assemblies specified. Each drawing shall have a descriptive title and all subparts of each drawing shall be labeled. All drawings shall have the name and location of the project and the Systems Contractor's name in the title block.
    - 2) Cabinets & Assemblies - Complete scaled drawings of all equipment racks, consoles, special assemblies, etc. Each drawing shall show all equipment with its manufacturer and model number.
    - 3) Device Locations - Complete, scaled building drawings detailing installation locations of all equipment. All conduit with cable quantities and types and all terminal block locations shall also be indicated.
    - 4) Device Layout - Complete scaled drawings detailing all device plates, plug panels, input/output panels, rack panels and custom components to be fabricated by the Systems Contractor. Include the same details for all custom or non-standard components to be furnished by vendor/manufacturers of the Systems Contractor. Show all connectors, mounting devices and labeling details on these drawings.
    - 5) System Diagrams - Detailed one line drawings of all systems. Each system drawing shall detail the field wiring and wiring within racks and consoles. Each drawing shall show

proposed (and eventually as built) circuit numbers for all cables and terminal connections. Provide typical wiring termination details for all devices.

- 6) Systems Contractor job references and key employee résumé's, as described in the Contractor Qualifications portion of this specification.
  - 7) Systems Contractor certificates as described in the Data Infrastructure Sections of this specification.
  - 8) A list of test equipment, giving makes, models and serial numbers for all equipment to be used for testing, and alignment of systems. Include certification of Ownership and familiarity with the operation of the following minimum test equipment:
  - 9) LAN cable meter with NEXT and attenuation functions
  - 10) Systems Contractor certificates as described in the Data Infrastructure Sections of this specification.
- b. Prior to proceeding with respective portions of work
- 1) Front panel layouts for all equipment racks, prior to installation, reflecting equipment to be used.
  - 2) Details and descriptions of any other aspect of the system which differ from the contract drawings due to field conditions or due to the equipment furnished.
  - 3) Submittal as otherwise noted on the drawings and/or as noted herein.
  - 4) Approved shop drawings and instruction brochures, shall be present at the job site during the period set aside for system testing.
- c. At Project Completion
- 1) As-Built drawings accurately reflecting the installed condition provided on Acad R14 drawings with a cable schedule showing all cable installed. Prior to final acceptance, provide three complete sets of drawings showing all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions.
  - 2) The contractor shall provide a Mylar reproducible set of technology as-built plans with a complete as-built riser, plans shall include a complete building layout with all locations of outlets and racks shown with associated cable numbers.
  - 3) Operation And Maintenance Manuals - Prior to final acceptance, provide three complete sets of operation and maintenance manuals for the system. The operation manual shall contain all instruction necessary for the proper operation of the installed system and manufacturers instruction. The maintenance manual shall contain all "proof of performance" information as required in Section 3, and all manufacturers maintenance information, and copies of non-priority computer programs and system set up disks documenting all programmable features for the installed system.
9. Definitions of Terms - The term "Systems Contractor" shall refer to the person, persons, or company who or which actually contracts to perform the Data Telephone MATV Cabling Infrastructure.
10. Contractor Qualifications
- a. The Contractor must be a "Systems Contractor" who has been regularly engaged in the furnishing and installation of commercial and industrial sound, communications and telephone systems for a period of at least the last five (5) years and who can show evidence of

successfully completing, with its present staff, at least three (3) projects of similar size and scope, including the multimedia resource management. The Systems Contractor, not its employees, must meet these contractor qualifications. With the submittal, provide a list of jobs completed, with contact, address and phone number of the owner and the Systems Contractor's key employees assigned to the project, listing their responsibilities during the job and the length of time with the contractor in this capacity.

- b. The Systems Contractor shall demonstrate to the satisfaction of the Architect/Engineer that it has:
  - 1) Adequate plant and equipment to pursue the work properly and expeditiously.
  - 2) Adequate staff and technical experience to implement the work.
  - 3) Suitable financial status to meet the obligations of the work.
  - 4) Technically capable and factory trained service personnel to provide routine and emergency service for all products used in the project.
- c. The Systems Contractor shall Have a RCDD on his staff.
- d. Any contractor, who intends to bid on this work and does not meet the requirements of the "Contractor Qualifications" paragraph(s) above, shall employ the services of a "Systems Contractor" who does meet the requirements and who shall furnish the equipment, shop fabricate the equipment racks and subassemblies, make all connections to equipment and equipment racks, make all connections to remote controls and connection panels, and continuously supervise the installation and connections of all system cable and equipment.
- e. A subcontractor so employed as the "Systems Contractor" shall be acceptable to the Architect/Engineer and shall be identified in the submittal.

#### 11. Quality Assurance

- a. All equipment and materials required for installation under these specifications shall be new (less than 1 year from date of manufacture) and without blemish or defect.
- b. Each major component of equipment shall have the manufacturer's name, address and model number on a plate securely affixed in a conspicuous place. NEMA code ratings, UL label, or other data which is die-stamped into the surface of the equipment shall be easily visible.
- c. It is not the intent of these specifications to limit or restrict submission of proposals for products by other manufacturers but to set a baseline of operational performance and functions which all bidders must meet.
- d. Where a specific piece of equipment has been discontinued and/or replaced by a new model, submission of the new model does not guarantee acceptance. Substitute items shall require evaluation by the Architect/Engineer, Owner or their agent prior to acceptance.
- e. If substitute equipment is allowed even by an approved submittal, the Wiring Contractor shall be completely responsible for its use and for its ability to fulfill all intended functions in the completed systems. The Contractor shall replace all such equipment with equipment listed by type and model number in the specifications if there is any evidence of equipment instability and/or incompatibility.
- f. Any use of substitute equipment shall be at no extra cost to the Owner.



- g. If a Bidder wishes to propose substitute equipment and/or a system to meet all the functional requirements of this specification but deviates from the equipment or system specified herein, by individual components or entire design philosophy, he is encouraged to do so. To be considered, the substitutes must be accepted "as equal" in a written addenda at least 15 working days prior to the date bids are to be received. To be considered, submit the information required by this specification under "Submittals - Prior to proceeding with the work" for review by the Architect/Engineer and be prepared to provide an on-site demonstration of the system proposed.

## B. PRODUCTS

1. Except where specifically noted otherwise, all equipment supplied for the Wiring Infrastructure shall be the standard product of a single manufacturer of known reputation and experience in the industry.
2. Wiring that enters racks shall be installed neatly. Provide enough rack space for the patch bays, +20%, specified under the data section of this specification, plus one (1) rack unit of blank space for each twelve (12) wired, blank, and future patch bay point, for Owner provided/installed hubs/switches.
3. Provide power strips with surge protection to provide power outlets for all Rack mounted electronics, and Owner provided hardware, plus 20% spare in each rack.
4. Provide 25 - 3ft black patch cables for MDF telephone patches , 100 – 3 ft green patch cables for MDF data patches , 100 – 12 ft green patch cables for data to desktops, 25 – 12ft black patch cables for telephones.
5. Voice, Data, Cable Infrastructure
  - a. Twisted Pair Cable
    - 1) Cabling shall be unshielded twisted pair (UTP) and shall meet ANSI/TIA/EIA-568,TSB-36 requirements for Category 6. Provide UTP cable with the following minimum features: Note wiring shall be plenum rated.
      - a) Conductors: 24 AWG solid copper, 4 pair;
      - b) Characteristic Impedance: 100 ohms +/-15% at 1-350 MHz;
      - c) DC Resistance: 25.7 ohms/1000 ft maximum @ 20 degrees C;
      - d) Mutual Capacitance: 14 pF/ft nominal at 1MHZ;
      - e) Attenuation (per 1000 ft):
        1. 6.3 dB at 1 MHz
        2. 13.0 dB at 4 MHz
        3. 20.0 dB at 10 MHz
        4. 25.0 dB at 16 MHz
        5. 28.0 dB at 20 MHz
        6. 32.0 dB at 26 MHz
        7. 36.0 dB at 31.25 MHz
        8. 52.0 dB at 62.5 MHz
        9. 67.8 dB at 100 MHz
    - 2) Provide one "homerun" UTP cable between each data outlet port indicated on the drawings and the appropriate Intermediate Distribution Frame (IDF)/Main Distribution Frame (MDF). In-field splicing of UTP cables shall not be permitted.
    - 3) UTP cables shall not exceed 90 meters from the data outlet port to the appropriate IDF/MDF patch panel.

- 4) The 2002 National Electric Code Article 800 Type CMP specification shall be considered when UTP cables are installed, without benefit of adequate raceway, in a plenum air return. Non-plenum wiring is not acceptable on this project.
- b. Data Station Outlet
- 1) Face plates
    - a) Provide Data Station Outlets as indicated on the drawings with the following features: Inserts shall be color coordinated to match: voice-black, data – green, spare 1 – black, spare 2 – red.
      1. Single gang, flush mountable, almond colored plastic construction;
      2. Shall accept data, telephone, fiber optic, MATV, video, audio and blank insert modules;
      3. Shall have the capability to accept up to four individual ports;
      4. Inserts shall snap in and out from the front of the Data Station Outlet;
      5. Face plates shall be supplied with pressure-sensitive icon labels;
  - 2) Inserts
    - a) Provide Data Port inserts with the following features: Insert shall match color green for Cat 6 data wiring.
      1. RJ-45 type rated for Category 6;
      2. RJ-45 insert shall be configured to EIA-568A wiring standards;
      3. Attenuation through the RJ-45 port at 10/16 MHz shall be less than .015/.025 dB;
      4. Provide 110 style IDC terminations for all eight conductors of a UTP cable;
      5. Data port inserts shall be MOD-TAP 17.1b.017.017.B0011 or equivalent.
    - b) Provide Telephone Inserts with the following features: Insert shall match color black for Cat 6 voice wiring.
      1. RJ-45 type rated for Category 6;
      2. RJ-45 insert shall be configured to USOC wiring standards;
      3. Provide 110 style IDC terminations for all six conductors of a UTP phone cable.
      4. Telephone inserts shall be MOD-TAP 17-51-60-61 or equivalent
    - c) Provide MATV inserts with the following features:
      1. “F” – “F” type, feed-through connector;
      2. MATV inserts shall be Mod-Tap 17-51-V01, or equivalent.
  - d) Patch Panels
    1. Patch panels shall be provided at each MDF rack location for termination of all UTP. Patch panels shall have the following features:
    2. Patch Panels for Twisted Pair Cable
      - MDF panels shall be mountable in EIA standard 19" equipment racks;
      - MDF panels shall be rated for Category 6;
      - Each panel shall provide a minimum of twenty-four RJ-45 ports in one rack space position (1RU); do not use patch panels with more than 48 ports.
      - Each RJ-45 port shall provide 110 style IDC terminations for all eight conductors of a UTP cable;
      - RJ-45 ports shall be configured to EIA-568A wiring standards;
      - Attenuation through the RJ-45 port at 10/16 MHz shall be .015/.025 dB;

- At each MDF panel, provide one RJ-45 port for each data station outlet port and each vertical riser cable, plus ten percent for future expansion;
- Clearly label each patch point with the location of its associated data station port; coordinate with owner for labeling requirements.
- Patch Panels for twisted pair cable shall be Hubbell 670XXA Series or equivalent.

3. Voice terminating device at Telephone Equipment Room.

- The Cat 6 voice cabling shall be punched down to 100-pair 110 style blocks for cross connection. Each 110 block(s) will have a 50% growth potential and capacity to meet the maximum number of workstations in the facility. The layout of 110 blocks will be defined during the construction stage. D-rings must be used to maintain a neat and functional wall field.
- The manufacturer and model of all 110 blocks must be approved by engineer.

4. Provide cable management panels between each patch panel for twisted pair cable. Cable management panels shall be panduit "WMP" series, or equal.

c. Certification

- 1) Systems Contractor shall be factory certified to install the Data Cabling Infrastructure. The Systems Contractor shall include a copy of the factory-provided certification with his submittal.
- 2) The manufacturer of the passive, data connectivity components shall warrant the passive components of the Data Cabling Infrastructure for a period of fifteen (15) years, if installed correctly by its factory certified contractor.

6. TV Distribution System

- a. Provide television signal distribution systems, of types, performance, capabilities and channels/frequencies as indicated; RF amplifiers, splitters, taps, signal combiners and other components as required for a complete installation. Except as otherwise indicated, provide manufacturer's standard television distribution system components as indicated by published product information, designed and constructed as recommended by the manufacturer. Provide a television distribution system with the following functional and construction features:

- 1) Amplifier: Provide MHz RF amplifier(s) as necessary to provide required signal level at each television outlet as specified elsewhere in this document. The wide band amplifier(s) shall have the following minimum specifications:
  - a) Output Level 42 dBmV
  - b) Flatness (50-450 MHz) +/- dB
  - c) Slope Control Range 0-15 dB (adjustable)
  - d) Input Return Loss 16 dB
  - e) Noise Figure 7 dB
  - f) Hum Modulation -60 dB
  - g) Cross Modulation -60 dB
  - h) Second Order Intermodulation -75 dB
  - i) Input Test Point -20 dB
  - j) Output Test Point -20 dB
- 2) Taps: Provide radiation-proof directional taps as required. The radiation-proof directional taps must meet the following minimum specifications:
  - a) Radiation Shielding -90 dB
  - b) Bandwidth 5-1000 MHz

- 3) Splitters: Provide splitter(s) as required. Each splitter must meet the following minimum specifications.
  - a) Radiation Shielding -140 dB
  - b) Bandwidth 5-1000 MHz
  - c) Isolation 20 db minimum
- 4) Combiner: Provide combiner(s) as required. Each combiner shall meet the following minimum specifications:
  - a) Frequency Range 5-1000 MHz
  - b) Insertion Loss -16 dB
  - c) Port-to-Port Isolation 40 dB
  - d) Test Port -20 dB
- 5) Connectors: Provide connectors as required. Each connector shall meet the following minimum specifications
  - a) One piece construction
  - b) Integral crimp sleeve
- 6) Outlets: Provide outlets as required. Each outlet shall meet the following minimum specifications:
  - a) Each outlet location shown on the drawings shall consist of a single gang broadband receptacle equal to Hubbell FLP series with "F connector with Data connector" inserts.
  - b) The Television Signal Distribution System must provide a signal level of at least +2 dBmV and a maximum of +10 dBmV to each television set.
- 7) TV System Cabling:
  - a) Trunk Line and Drop Cable:
 

UL LISTED:	CATVP
Type:	Coaxial - RG-6/U for Drop Cable; RG-11/U for Trunk Line
Nominal Impedance:	75 ohm
Center Conductor:	18 AWG Bare Copper
Shield:	100% Aluminum Foil with 90% Aluminum Braid
Nominal Attenuation:	54 MHz 1.6 dB/100 feet, 216 MHz 3.2 dB/100 feet

### C. EXECUTION

1. Perform the work in accordance with acknowledged industry and professional standards and practices, and the procedures specified herein.
2. Furnish and install all materials, devices, components, and equipment for complete operational systems.
3. Maintain a competent supervisor and supporting technical personnel, acceptable to the Owner, during the entire installation. Change of the supervisor during the project shall not be acceptable without prior written approval from the Architects.
4. Coordinate all efforts with those of related trades. In the event of any conflicts, delayed or improper preparatory work by others, notify the Architect. The Architect's decision shall be binding. Verify all field conditions.

## 5. Installation of Systems

- a. Device Locations - Locate all apparatus requiring adjustments, cleaning, or similar attention so that it shall be accessible for such attention. Equipment racks shall be positioned to permit full access for operation and service.
- b. Blank And Custom Panels - Finish of blank panels and custom assembly panels shall match adjacent equipment panels as closely as possible.
- c. Markings - Switches, connectors, jacks, receptacles, outlets, cables, and cable terminations shall be logically and permanently marked. Custom panel nomenclature shall be engraved, etched, or screened. Marking for these items are purposely detailed on the drawings to ensure consistency and clarity. Verify any changes in working type size, and/or placement with the Architect prior to marking.
- d. Environment - The equipment specified herein is designed to operate in environments of normal humidity, dust, and temperature. Protect equipment and related wiring during installation where extreme environmental conditions can occur.
- e. Conduit - The Wiring Contractor shall be responsible for reviewing and coordinating conduit installation for the Voice Data systems with the Division 26 Prime Contractor.

## 6. Electrical Power

- a. Grounding - Review and coordinate electrical power system installation including grounding, with the Division 26 Prime Contractor to ensure proper operation of the system.
- b. Verification - Verify that all AC power circuits designated for the system are properly wired, phased, and grounded. Report in writing any discrepancies found to the Division 26 Prime Contractor for corrective action.
- c. Equipment Rack - Provide distribution of electrical power within the equipment racks with a minimum of two spare AC receptacles per branch circuit, used in the racks. Racks in Computer room shall be coordinated with owner for placement.

## 7. Cleaning - Clean all junction and terminal box interiors thoroughly before installing plates, panels, or covers.

## 8. Wiring Methods and Practices

- a. Identification - All wires shall be permanently identified at each wire by marking with "E-Z" tape marker or equivalent.
- b. Terminal Blocks - All terminal block connections shall be readily accessible. Not more than two wires connected to one terminal. Spare terminal blocks, equivalent to 10% of those in actual use shall be provided.
- c. Splicing - Splicing of cables shall not be permitted between terminations of specified equipment.
- d. Pulling Cable - Do not pull wire or cable through any box fitting or enclosure where change of raceway alignment or direction occurs. Do not bend conductors to less than recommended radius. Employ temporary guides, sheaves, rollers, and other necessary items to protect cables from excess tension, abrasion, or damaging bending during installation.
- e. Cable Tie - Form in a neat and orderly manner all conductors in enclosures and boxes, wireways, and wiring troughs, providing circuit and conductor identification. Tie as required using T & B "Ty-Raps" (or equivalent) of appropriate size and type. Limit Spacing between

ties to six inches and provide circuit and conductor identification at least once in each enclosure.

- f. Service Loops - Provide ample service loops at each termination so that plates, panels, and equipment can be demounted for service and inspection.
- g. Wiring Harnesses
  - 1) All wires and cables used in assembling custom panels and equipment racks shall be formed into harnesses which are tied and supported in accordance with accepted Engineering practice.
  - 2) Harnessed cables shall be formed in either a vertical or horizontal relationship to equipment, controls, components, or terminations.

## 9. Equipment Racks

- a. The equipment racks shall be considered as custom assemblies and shall be assembled, wired, and tested in a properly equipped shop maintained by the Data Voice Contractor.
- b. Equipment Location - Placement of equipment in equipment racks, as indicated in the drawings, is for maximum operator convenience. Verify any changes in placement prior to assembly. All system components and related wiring shall be located with due regard for the minimization of induced electromagnetic and electrostatics noise, for the minimization of wiring length, for proper ventilation, and to provide reasonable safety and convenience for the operator.
- c. Rack Installation (Racks provided and installed by contractor) - Racks shall be installed plumb and square without twists in the frames or variations in level between adjacent racks. Wiring contractor shall provide ladder tray configuration in computer room for a neat cable installation to racks mounted in center of room. Coordinate all placement with owners information services department.
- d. Identification - All terminal blocks, rack mounted equipment, and active slots of card frame systems shall be clearly and logically labeled as to their function, circuit, or system as appropriate. Labeling on manufactured equipment shall be engraved plastic laminate with white lettering on black or dark background that is similar to panel finish.

## 10. Acceptance Testing

- a. The Acceptance Testing shall be performed by the Owner or the Owner's agent. Coordinate this period so that free access, work lighting, and electrical power is available on the site.
- b. Make additional mechanical and electrical adjustments within the scope of work and which are deemed necessary by the Owner as a result of the acceptance test.
- c. Data Cable Infrastructure Testing - Test each twisted pair cable segment (example: from the data station port through the patch bay and patch cable to the hub port connector). Publish a log of each test to verify that the cable segment passes the EIA/TIA-568 TEB-36 requirements for Category 6 compliance. Bind the test log in a booklet and turn the booklet over to the Owner. The test shall include:
  - 1) Connector/cable continuity – line mapping;
  - 2) Cable segment length;
  - 3) Dual near end cross talk (NEXT);
  - 4) Attenuation at 100 MHz;
  - 5) Attenuation per foot;
  - 6) Pass/fail results of each portion of the test above.

## 11. System Documentation

- a. Prior to final acceptance tests, submit to the Architect, three copies of an operating and maintenance manual for the system that has been installed. These manuals shall be used during the final acceptance testing of the system. Each manual shall contain the following information:
  - 1) Complete As built drawings
  - 2) Test documentation to support compliance
  - 3) Operations and maintenance manuals

## 12. Warranty

- a. The Contractor shall guarantee all components and labor of the work defined in this specification for a period of one year after final acceptance by the Owner. The following conditions shall apply:
- b. The Contractor shall provide service within eight (8) hours, after notification by the Owner or his representative, within the hours of 8:00 a.m. to 5:00 p.m. from Monday through Friday. Service Request forms shall be supplied to the Owner and the faxing or mailing of such a request form shall constitute notification by the Owner of a service request.

END OF SECTION 27 00 00





**SECTION 28 31 10 – ADDRESSABLE ANALOG FIRE ALARM SYSTEM**

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## A. GENERAL

COMPLIANCE STATEMENT: This project specification incorporates all of the relevant criteria contained in the State of North Carolina Department of Administration State Construction Office Fire Alarm Guidelines and Policies 2011.

Website: [http://www.nc-sco.com/documents/guidelines/2011Revised\\_Fire\\_Alarm\\_Guidelines.pdf](http://www.nc-sco.com/documents/guidelines/2011Revised_Fire_Alarm_Guidelines.pdf).

## 1. RELATED DOCUMENTS

- a. Refer to Division 26 Specifications

## 2. MINIMUM CODES AND STANDARDS

- a. The latest issue of specifications, standards and publications listed below form a part of this specification.
  - 1) NFPA 72 National Fire Alarm Code
  - 2) NFPA 70 National Electric Code (NEC)
  - 3) 2012 North Carolina State Building Code
  - 4) UL Testing Lab Compliance
  - 5) Local Codes and Standards
  - 6) ANSI A17.1
  - 7) North Carolina Accessibility Code (ADA)
  - 8) FM Compliance

## 3. QUALITY ASSURANCE

- a. Manufacturer's Qualifications: Firms regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products are Listed and Labeled. Products of firms that do not maintain factory authorized service organization and spare parts stock are not acceptable for use on State Owned Buildings.
- b. Acceptable Manufacturers are: Edwards Systems Technologies (EST-3), Notifier (NFS2-3030) and Simplex (4100U-ES).
- c. Company specializing in performing the work and making the final terminations and connections. Minimum of 5 years documented experience installing fire detection and alarm systems similar in size and scope to the project. Only the Installer may make program changes and must be present for the 100% test, Designer's pre-final review and Owner inspections.
- d. All connections to the FACP and the system's programming shall be done only by the manufacturer, or by an authorized distributor that stocks a full complement of spare parts for the system. The technicians are required to be trained and individually certified by the manufacturer, for the FACP model/series being installed. This training and certification must have occurred within the most recent 24 months, except that a NICET Level III certification will extend this to 36 months. Copies of the certifications must be part of the Shop Drawing submittal to the Designers, prior to installation. The submittal cannot be approved without this information.
- e. Any fire alarm device mounted outside shall be listed for the location and installed according to the listing.

## 4. SUBMITTALS:

- a. Shop Submittals shall provide mA draw for each device submitted and the listed minimum voltage required to operate. Panel submittal shall list voltage drop allowed for panel and for individual NAC circuits.
- b. Shop Drawings:
  - 1) The fire alarm contractor shall submit complete Shop Drawings to the engineer for review, prior to performing any work. They shall clearly demonstrate compliance with the engineer's plans and specifications, which have a System Response Matrix showing the fire alarm system's actions (outputs) required for each type of alarm, supervisory, and trouble signal. Any non-compliant features must be fully described.
  - 2) The submitted shop drawings shall show equipment, device identification numbers and locations, and connecting wiring of entire fire alarm system. Include wiring and riser diagrams. Wiring diagrams shall be based on the project floor plans, with devices and proposed conduit routing. The conductor composition for each conduit section shall be provided. The distance and route for each NAC (Notification Appliance Circuit) shall be shown. Riser diagrams shall show consecutive connections for all devices with addresses and candela and Candela ratings.
  - 3) Engineer's approval (with or without corrections) of contractor's Shop Drawings, samples, cut sheets, etc., is for general conformance with the contract documents and design concept. It shall not relieve the contractor of responsibility for full compliance with the project plans and specifications, EXCEPT for any specific non-compliant features for which the engineer gives written authorization.
- c. Installation Instructions: The contractor shall submit to the engineer of record the Manufacturer's detailed installation instruction for the Fire Alarm Control Panel and all duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and similar items which require mechanical installation.
- d. Battery Calculations:
  - 1) Systems are to be provided with a separate and independent source of secondary power. The State does not contract for full Central Station Service (with runners), so all systems that report to a Central or Remote Supervising Station shall have a minimum of 60 hours battery power capacity, plus 15 minutes minutes of full alarm load. Proprietary and other systems require 24 hours capacity plus 15 minutes alarm load.
    - a) When automatic starting generator is provided, use 24 hours for battery endurance, plus the appropriate (15 minutes) alarm load. See NFPA 72.
    - b) Most campus alarm supervising stations are normally classified as "Proprietary" systems.
    - c) Most Facilities can use the State Capitol Police located in Raleigh "Remote Supervising Station"
  - 2) Include a copy of system battery sizing calculations with the shop drawing submittal to the engineer. Use manufacturer's battery discharge curve to determine expected battery voltage after 60 hours of providing standby power. Then use calculated Notification Appliance Circuit current draw in the alarm mode to determine expected voltage drop at End of the Line Resistor (EOL), based on conductor resistance per manufacturer's data sheet or NEC.
  - 3) Fire Alarm Vendor's calculations must be submitted with the shop drawings, and prior to installation of equipment. (Buildings without generators typically require 60 hours of battery backup to cover the weekend, otherwise 24-hour battery back-up is required). In the submittal package identify Notification Appliance Circuits (NAC) current draws and

voltage drops for each circuit. In no case shall the calculated voltage at any notification appliance fall below the minimum listed operating voltage for the devices used.

- 4) The voltage drop at EOL must not exceed 14% of the expected battery voltage, after the required standby time plus alarm time. (Typically, for a 24 volt system, this limits the voltage drop from the battery to the EOL to 3 volts). Determine "worst case" voltage at far end of each NAC, by subtracting its calculated V-drop from the expected battery voltage. The result must be no less than the minimum listed operating voltage for the alarm notification appliances used.
  - 5) All of these calculations must be placed on a dedicated sheet of as-built drawings, for future reference by fire alarm service technicians. NAC voltage drop is to be verified during system tests.
- e. Maintenance Data: The contractor shall submit maintenance data and parts lists for each type of fire alarm equipment installed, including furnished specialties and accessories. Include this data, product data, and shop drawings in maintenance manual.
- f. Maintenance Contract: The contractor shall submit a quote for a maintenance contract to provide all maintenance, test, and repair described below and/or in accordance with NFPA-72, "Guide for Testing Protection Signaling Systems". Include also a quote for unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty. Maintenance and testing shall be on a semiannual basis or as required whichever is the most restrictive. A preventive maintenance schedule shall be provided by the Contractor that shall describe the protocol for preventive maintenance. The schedule shall include:
- 1) Semiannual systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, water flow switches and all accessories of the fire alarm system.
  - 2) Semiannual testing of each circuit in the fire alarm system.
  - 3) Semiannual testing of each smoke detector in accordance with the requirements of NFPA-72.
- g. Certifications:
- 1) Submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses, and telephone numbers in the certification.
  - 2) Installer's training certificate as defined under Quality Assurance.

## B. PRODUCTS

### 1. FIRE ALARM CONTROL PANEL (FACP)

- a. FACP - General: The FACP shall meet the following general requirements (unless otherwise required by the owner for certain systems):
- 1) The system is to be the addressable type, with a 24vdc nominal operating voltage.
  - 2) The system is to have multiple access levels so owner's authorized personnel can disable individual alarm inputs or normal system responses (outputs) for alarms, without changing the system's executive programming or affecting operation of the rest of the

system. The process on how to do this must be included in the training required to be given to the owner's designated personnel, and must also be part of the written documentation provided by the fire alarm equipment supplier.

- 3) Signal Line Circuits: (SLC) also called addressable loop - Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto an NFPA Style 6 (Class A) Signaling Line Circuit (SLC) with no "T" taps.
  - 4) Initiation Device Circuits: Initiation Device Circuits (IDC) shall be wired Class A (NFPA 72 Style D).
  - 5) Notification Appliance Circuits: Notification appliance circuits shall be wired Class B (NFPA 72 Style Y).
  - 6) Digitized electronic signals shall employ check digits or multiple polling. In general a single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
  - 7) Loss of Power: Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
  - 8) The FACP must have an Alarm Silence switch, and be equipped with the Subsequent Alarm (alarm resound) feature. Any remote annunciators or graphic displays located away from the alarm area must also include an audible signal with alarm resound feature.
- b. System Response to an Alarm Condition: When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
- 1) The system alarm LED shall flash.
  - 2) A local piezo-electric signal in the control panel shall sound.
  - 3) An 80-character minimum LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
  - 4) On systems equipped with a printer, printing and history storage equipment shall log the information associated with each new fire alarm control panel condition, along with time and date of occurrence.
  - 5) All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated. Exact programming shall be provided by the Contractor to meet the Owner's requirements.
  - 6) Activate all fire alarm Notification Appliances in the building, sounding and flashing in synchronization continuously until the initiating device and control unit have been reset to normal condition.
  - 7) Activate digital alarm communicator.
  - 8) Deactivate door hold control relay such that all smoke doors are allowed to close.
  - 9) Deactivate control relays so that HVAC units shut down. Exception is for hazardous exhaust systems and smoke control.
  - 10) Activate elevator recall sequence if smoke is detected in any elevator lobby, shaft, or in the elevator equipment room.

- c. System Response to a Trouble Condition:
- 1) Systems AC power trouble signal shall not be sent unless maintained for 1 to 3 hours (or more) Provide additional relays as required for this purpose.
  - 2) Provide immediate transmission of all other supervising signals. Note: Any trouble signal transmitted to the FACP shall be delayed for 60 seconds.
  - 3) Provide adjustable time delay for all other trouble signals prior to transmission.
  - 4) FACP: The FACP shall contain a microprocessor based Central Processing Unit (CPU). The CPU and its associated equipment shall be protected so it can not be affected by voltage surges or line transients consistent with UL standard 864. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, local and remote operator terminals, printers, annunciators, and other system controlled devices. The main FACP shall perform the following functions:
    - 5) Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
    - 6) Supervise all initiating, signaling, and notification circuits throughout the facility by way of connection to monitor and control modules.
    - 7) Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.
    - 8) Visually and audibly annunciate any trouble, supervisory or alarm condition on operator's terminals, panel display, and annunciators.
- d. System Capacity and General Operation: The system shall have the following capacities and general operation modes:
- 1) The FACP shall provide, or be capable of expansion to 198 intelligent/addressable devices per Signaling Line Circuits (SLC) and 2000 annunciation points, minimum, per system. The number of SLCs provided shall be as indicated on the Drawings. Total points shall be as indicated on the drawings or otherwise specified.
  - 2) The FACP shall include a full featured operator interface control and annunciation panel that shall include a backlit, 80 minimum character liquid crystal display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
  - 3) All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.
- e. The FACP shall be able to provide the following features:
- 1) Upload/Download to PC Computer
  - 2) Charger Rate Control
  - 3) Drift Compensation
  - 4) Automatic Day/Night Sensitivity Adjust
  - 5) Device Blink Control
  - 6) Pre-alarm Control Panel Indication
  - 7) Trouble Reminder
  - 8) NFPA 72 Smoke Detector Sensitivity Test
  - 9) System Status Reports
  - 10) Periodic Detector Test
  - 11) Alarm Verification, by device, with tally

- 12) Non-Alarm Module Reporting
  - 13) Block Acknowledge
  - 14) Smoke Detector Maintenance Alert
  - 15) Control-By-Time
- f. The control panel shall be capable of printing historical data and device parameters and shall include all equipment necessary to produce printouts, including an external printer and shall be U.L. listed as meeting the NFPA 72 sensitivity testing and maintenance requirements without the need for manually removing and testing each smoke detector. The control panel shall provide a display and a printed list of these sensitivity measurements as a permanent record of the required sensitivity testing. The system shall also annunciate a trouble condition when any smoke detector approaches 80% of its alarm threshold due to gradual contamination, with an annunciation of the location of the smoke detector requiring service. If any specialized equipment must be used to program any function of the smoke detector devices, then one must be furnished as part of the system.
- g. The system shall perform time based control functions including automatic changes of specified smoke detector sensitivity settings.
- h. Central Processing Unit: The Central Processing Unit (CPU) shall communicate with, monitor, and control all other modules within the control panel. Removal, disconnection or failure of any control panel module shall be detected and reported to the system display by the CPU.
- 1) The CPU shall contain and execute all control-by-event (including ANDing, ORing, NOTing, CROSSZONEing) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure. The CPU shall also provide a real-time clock for time annotation of all system displays. The Time-of-Day and date shall not be lost if system primary and secondary power supplies fail.
  - 2) The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
- i. Operators Control: Provide an operators interface which allows the following minimum functions. In addition, the operators interface shall support any other functions required for system control and/or operation:
- 1) Acknowledge (ACK/STEP) Switch
  - 2) Signal Silence Switch
  - 3) System Reset Switch
  - 4) System Test Switch
  - 5) Lamp Test Switch
- j. Display: The system display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters. The display assembly shall contain, and display as required, custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
- 1) The system display shall provide an 80 minimum-character back-lit alphanumeric Liquid Crystal Display (LCD).
  - 2) The Display shall also provide four Light-Emitting-Diodes (LEDS), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, and SIGNAL SILENCE.

- 3) The system display shall provide a touch key-pad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be accessible through the display interface assembly to prevent unauthorized system control or programming.
- k. Signaling Line Circuit (SLC) Interface Board: The FACP shall contain SLC interface boards as required to communicate with the SLC. Each SLC board shall monitor and control a minimum of 198 intelligent addressable devices. This includes 99 analog detectors (Ionization, Photoelectric, or Thermal) and 99 monitor or control modules.
    - 1) Each SLC interface board shall contain its own microprocessor, and shall be capable of operating in a local mode (any SLC input activates all or specific SLC outputs) in the event of a failure in the main CPU of the control panel. The SLC interface board shall not require any jumper cuts or address switch settings to initialize SLC Loop operations. SLC interface boards shall provide power and communicate with all intelligent addressable detectors and modules connected to its SLC Loop on a single pair of wires. This SLC Loop shall be capable of operation as NFPA 72 Style 6.
    - 2) Each SLC interface board shall receive analog information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular detector. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
  - l. Printer: Provide a printer to provide hard-copy printout of all changes in status of the system. The printer shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. Thermal printers are not acceptable. The printer shall operate from a 120 VAC, 60 Hz power source. Provide table and stand for printer if it is to remain constantly connected to the fire alarm panel.
  - m. Remote Transmissions: The FACP shall be interfaced to a Digital Alarm Communications Transmitter (DACT).
  - n. Power Supply: The FACP power supplies shall operate on 120 VAC, 60 Hz and shall have a continuous rating adequate to power all equipment and functions in full alarm continuously. All modules and drivers must be able to withstand prolonged short circuits in the field wiring, either line-to-line or line-to-ground, without damage. Further, the power supply shall be expandable for additional notification appliance power in 3.0 Ampere increments.
  - o. The power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge.
  - p. Batteries: Shall be completely maintenance free, shall not require liquids, fluid level checks or refilling, and shall not be capable of producing spills and/or leaks. Batteries shall be sealed gel-cell type with expected life of 10 years. Battery voltage shall be as required by the FACP and related equipment. Battery shall have sufficient capacity to power the fire alarm system for not less than 60 hours plus 15 minutes of alarm upon a normal AC power failure. NAC circuits shall not exceed 75% of maximum current load allowed. (For batteries serving emergency voice communications the duration of alarm reserve shall be 15 minutes in lieu of 5 minutes)
  - q. Enclosures: The FACP shall be housed in a 3rd party listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The door shall provide a key lock and shall

include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be hinged on either the right or left side (field selectable).

## 2. ALARM APPLIANCES

- a. Programmable Electronic Sounders: Sounders located outdoors shall be listed for use in wet locations. Electric sounders shall operate with synchronized audible output and have the following specifications:
  - 1) Voltage: Programmable electronic sounders shall operate on 24 VDC nominal.
  - 2) Programming: Electronic Sounders shall provide the ANSI 53.41 three-pulse temporal pattern audible evacuation signal, described in NFPA 72, with an output sound level of at least 90 dBA measured at 10 feet from the device. Output sound level shall be 120 dB maximum. Electronic Sounders shall be field programmable without the use of special tools.
- b. Strobe Lights shall be located as shown on the Drawings and provided per the requirements of the NCSBC chapter #11 and ANSI 117. Strobe lights indicated for use exterior to the building shall be mounted at the indicated elevation and listed for use in wet locations. Strobe lights shall operate with synchronized flash output and have the following specifications:
  - 1) Voltage: Strobe lights shall operate on 24 VDC nominal.
  - 2) Maximum pulse duration: 2/10ths of one second.
  - 3) Strobe intensity and flash rate: Must meet minimum requirements of UL 1971. Provide strobe lights with minimum intensity Candela (Cd) rating of 15/75 Cd, or greater if shown otherwise on drawings.
- c. Horns: Where provided, shall provide average ambient sound level of dBA as listed in the NFPA 72.
- d. Audible/Visual Combination Devices shall comply with all applicable requirements for both Programmable Electronic Sounders and Strobe Lights.
- e. Bells shall be 10" diameter vibrating type located as shown on the Drawings; bells located outdoors shall be listed for use in wet locations. Bells shall have the following specifications:

Voltage: Bells shall operate on 24 VDC normal.

## 3. INITIATING DEVICES

- a. Addressable Devices - General: All initiating devices shall be individually addressable. Addressable devices shall comply with the following requirements:
  - 1) All addressable spot type and duct smoke detectors shall be the analog type and the alarm system shall automatically compensate for detector sensitivity changes due to ambient conditions and dust build-up within detectors. This feature must be armed and sensitivities set prior to acceptance of the system.
  - 2) Address Setting: Addressable devices shall provide an address-setting means.
  - 3) Connections: Addressable devices shall be connected to a Signaling Line Circuit (SLC) with two (2) wires.
  - 4) Operational Indications: Addressable initiation devices shall provide dual alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the device is operational and in regular communication with the control panel. Both LEDs shall be placed into steady illumination by the FACP to indicate that an alarm condition has been



detected. The flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the device base to connect an external remote alarm LED.

- 5) Intelligent Initiation Devices: All smoke detectors shall be the “intelligent” in that smoke detector sensitivity shall be set through the FACP and shall be adjustable in the field through the field programming of the system. Sensitivity shall be capable of being automatically adjusted by the FACP on a time-of-day basis. Using software in the FACP, detectors shall be capable of automatically compensating for dust accumulation and other slow environmental changes that may affect performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
  - 6) Spot-type detectors must be the plug-in type, with a separate base (not a mounting ring), to facilitate their replacement and maintenance. The base shall have integral terminal strips for circuit connections, rather than wire pigtailed. Each detector or detector base shall incorporate an LED to indicate alarm.
  - 7) Device mounting Base: Unless otherwise specified all detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.
  - 8) Sounder Base: Provide bases with a built-in (local) sounder rated at 85 dBA minimum, measured at 10 ft. Configure sounder bases such that sounders are activated under conditions as described in the Matrix.
  - 9) Test Means: The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel when in the “test” condition.
  - 10) Device Identification: Detectors shall store an internal identifying type code that the control panel shall use to identify the type of device. Device identifications shall be either ION, PHOTO, or THERMAL.
- b. Photoelectric Smoke Detectors: Photoelectric smoke detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
  - c. Ionization Smoke Detector: Ionization smoke detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.
  - d. Thermal Detectors: Thermal Detectors shall be intelligent addressable devices rated at 135°F (58°C) and shall have a rate-of-rise element rated at 15° F. (9.4°C) per minute. It shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC loop. Thermal detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements.
  - e. Duct Smoke Detector: In-Duct Smoke Detector Housings shall accommodate a velocity rated photoelectric detector. The device, independent of the type used, shall provide continuous analog monitoring and alarm verification from the panel. When sufficient smoke is sensed, an alarm signal shall be initiated at the FACP. Proper installation and physical location of each duct detector and access door shall be coordinated between the electrical, the mechanical and the fire alarm sub-contractors and approved by the electrical and mechanical engineers prior to equipment installation.

- f. Addressable Pull Stations - General: Addressable pull stations shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. All pull stations shall be dual-action, have a positive, visual indication of operation and utilize a key type reset. The Glass-break rods are not allowed.

#### 4. MISCELLANEOUS SYSTEM ITEMS

- a. Addressable Dry Contact Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised zone (either Style D or Style B) of non-addressable Alarm Initiating Devices (any Normally Open [N.O.] dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings.
  - 1) Indication of Operation: An LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.
  - 2) Supervision: Unless specifically noted otherwise on the drawings provide one monitor module for each sprinkler switch.
- b. Two Wire Detector Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised IDC zone, Class A of non- addressable 2- wire smoke detectors or alarm initiating devices (any N.O. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings. Indication of Operation: Unless otherwise indicated on the Drawings an LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the control panel.
- c. Addressable Control Module: Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual (A/V) Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay. The control module shall provide address-setting means using DIP switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel.
  - 1) Configuration: The control module NAC circuit may be wired for Style Y with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
  - 2) Power Source: Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, 3rd party listed remote power supply. AN power sources and connections are not shown on the Drawings
  - 3) Test Switch: A magnetic test switch shall be provided to test the module without opening or shorting its NAC wiring.
- d. Isolator Module: Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors

that may be rendered inoperative by a short circuit fault on the SLC Loop. Modules must be readily accessible (not above ceiling) and clearly labeled.

- 1) Operation: Isolator Modules shall operate such that if a wire-to-wire short occurs, the Isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section. The Isolator Module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
  - 2) The Isolator Modules shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- e. Water Flow Switch: Flow switches shall be integral, mechanical, non-coded, non-accumulative retard type. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds. Flow switches shall be located a minimum of one (1) foot from a fitting that changes the direction of the flow and a minimum of three (3) feet from a valve as required per NFPA 13. Installation: Water Flow Switches shall be connected by the Division 26 (Electrical) Contractor but furnished and installed by the Division 23 (Mechanical) Contractor.
- f. Sprinkler and Standpipe Valve Supervisory Switch: Supervisory switch mechanisms shall be contained in a weatherproof housing that shall provide a 3/4 inch tapped conduit entrance and shall incorporate the necessary facilities for attachment to the valves. Switch housing shall be finished in red baked enamel. Mounting: Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
- g. Serially Connected Remote Annunciator: Annunciator shall communicate with the fire alarm control panel via an EIA-485 communications loop (four-wire) and shall individually annunciate all zones in the system. System zones shall be as indicated on the Drawings. Up to 10 annunciators may be connected to the EIA-485 communications loop.
- 1) Annunciator Indicators: The annunciator shall provide a red Alarm LED per zone, and a yellow Trouble LED per zone. The annunciator shall also have an "ON-LINE" LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels. Annunciator switches may be used for System control such as, Global Acknowledge, Global Signal Silence, and Global System Reset. All annunciator switches and indicators shall be software programmable.
  - 2) LCD Alphanumeric Display Annunciator: The Alphanumeric Display Annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text. The LCD Annunciator shall display all alarms and trouble conditions in the system.
  - 3) System Capacity: The system shall allow a minimum of four LCD annunciators. In addition to annunciation functions, each LCD annunciator shall be capable of the following software programmed system functions: Acknowledge, Signal Silence and Reset.
  - 4) Connections: The annunciator shall connect to a two-wire EIA-485 interface. The two-wire connection shall be capable operation at distances of 6,000 feet. Provide interface to fiber optic cable systems and/or repeater units where such are indicated on the Drawings.

- h. Remote Annunciator Indicator Lights (RAIL): RAILS shall be provided with a key type switch for testing of the annunciated device. In addition, RAILS shall have the following features:  
Voltage: RAILS shall operate on 24 VDC nominal.
- i. Door Hold-Open Magnets: Door hold open magnets shall be suitable for mounting in a single gang electrical device box. Door hold open magnets shall be furnished with keepers, door chains, and other accessories as required to properly hold open doors as indicated on the Drawings. Holding force of the magnet shall be appropriate for the door to be held open. Door hold open magnets shall operate in a fail safe manner, i.e., the door shall release in event of a failure of voltage to the device. Power Source: Door hold open magnets shall be configured to operate from a nominal 24 VDC system as supplied by the FACP or other power supply listed for the purpose. All hold open magnet supply sources, whether a part of the FACP or whether derived from a separate power supply, shall be supervised. Door hold open magnet circuits which use step-down transformers, 120 VAC, or local relays are not permitted. Door shall close after 60 seconds of the power loss.
- j. Battery Power Supply (BPS) &/or Supplementary Notification Appliance Circuit (SNAC): These types of panels shall be completely maintenance free, shall not require liquids, fluid level checks or refilling, and shall not be capable of producing spills and/or leaks. Batteries shall be sealed gel-cell type with expected life of 10 years. Battery voltage shall be as required by the FACP and related equipment. Battery shall have sufficient capacity to power the fire alarm system for not less than 60 hours plus 15 minutes of alarm upon a normal AC power failure. Battery cabinet shall be twice the size of the batteries it will contain. NAC circuits shall not exceed 75% of maximum current load allowed.
- k. Surge Protection: The following protection against voltage transients and surges must be provided by the fire alarm equipment supplier, and installed by the electrical contractor:
  - 1) On AC Input: A feed-through (not shunt-type) branch circuit transient suppressor such as Leviton 51020-WM-DN, or Di-Tech DTK-120S20A, or equivalent UL 1449- 2nd Edition Listed device.
  - 2) On DC Circuits Extending Outside Building: Adjacent to the FACP, and also near point of entry to outlying building, provide "pi"-type filter on each leg, consisting of a primary arrester, series impedance, and a fast acting secondary arrester that clamps at 30v-40v. Some acceptable models: Simplex 2081 -9027, Simplex 2081 -9028, Transtector TSP860I, Ditek DTK 2MHL P24B series, Citel America B280-24V, and Northern Technologies DLP-42. Submit data on others to the engineer for approval. UL 497B listing is normally a prerequisite for their consideration. Devices using only MOV active elements are not acceptable.

## 5. Wiring

- a. Addressable loop (signaling line) circuits shall be wired with type FPL/FPLR/FPLP fire alarm cable, AWG 18 minimum, low capacitance, twisted shielded copper pair. Cable shield drain wires are to be connected at each device on the loop to maintain continuity, taped to insulate from ground, and terminated at the FACP. Acceptable cables include Atlas 228-18-1-1STP, BSCC S1802s19 (same as EEC 7806LC), West Penn D975, D991 (AWG 16), D995 (AWG 14), or equal wire having capacitance of 30pf/ft. maximum between conductors. Belden 5320FJ acceptable if only FPL rating needed. The cable jacket color shall be red, with red (+) and black (-) conductor insulation.
  - 1) Unshielded cable, otherwise equal to the above, is permitted to be used if the manufacturer's installation manual requires, or states preference for, unshielded cable.
  - 2) In underground conduit, use Type TC or PLTC cable (PE insulated) to avoid problems from moisture.

## C. EXECUTION

### 1. FIRE ALARM SYSTEM:

- a. The fire alarm system shall be new and furnished with a warranty (parts & labor) of at least one year from the date of final inspection and/or acceptance by the Owner. Equipment, initiating devices, and alarm appliances shall be arranged and the annunciator zones shall be configured as described by the engineer's written specifications.
- b. All equipment supplied must be specifically listed for its intended use and shall be installed in accordance with the manufactures recommendations. The contractor shall consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Contractor shall refer to the Riser/Connection diagram for all specific system installation/termination/wiring data.
- c. All system components shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load. Adhesives are not permitted to mount fire alarm system components to building surfaces or structure.
- d. When programming the system, activate the automatic drift compensation feature for all spot-type smoke detectors. Systems with alarm verification are not to have this feature activated without written direction from the owner's representative or the AHJ. Alarm verification must not be used with multi-sensor/multi-criteria detectors under any circumstances, as inadequate system response may result. Most applications of analog addressable smoke detectors do not require alarm verification to reduce nuisance alarms, as they are better able to discriminate between fire and common non-fire ambient events. A short operational test with normal occupancy can determine if transient ambient events are a problem
- e. Set spot-type smoke detector sensitivities to normal/medium, unless directed otherwise by the design engineer/owner's rep. High sensitivity may be appropriate in relatively benign, clean environments such as art museums and libraries, to improve system response time without causing nuisance alarms
- f. Print a complete System Status and Programming Report after the above steps have been done. This must include the program settings for each alarm initiating device and the current sensitivity of each analog addressable smoke detector.

### 2. FIRE ALARM CONTROL EQUIPMENT INSTALLATION

- a. The technician who makes final connections and programs the FACP is the "installer" even though most field connections to system devices and appliances are normally made by electrical contractor personnel. The responsibility for assuring a proper installation overall rests with this individual fire alarm system technician. In addition to doing the final hookups and activating the system, this individual is expected to check the field connections to assure all work is properly done. The absence of system "trouble" signals is not a sufficient measure of the field wiring, which could have "T" taps, the wrong type of wire, improper terminations, ground (drain wire) issues, etc.
- b. Avoid placing the FACP in a locked room, since this could delay access during an emergency. Avoid M/E rooms for the same reason, and because the environment there is often inhospitable to electronics. Proper location of the FACP can make an FAA redundant. Possible location is the main entrance of a building.
- c. Notification Appliance Circuit booster power supplies must be individually monitored by the FACP and protected by a smoke detector per NFPA 72. They shall not be located above a

ceiling, or in non-conditioned space. A 24vdc power circuit serving addressable control relays must also be monitored for integrity.

- d. Basic operating instructions shall be framed and permanently mounted at the FACP. (If the owner concurs, they may instead be affixed to the inside of the FACP's door.) In addition, the NFPA 72 "Record of Completion" must either be kept at/in the FACP, or its location shall be permanently indicated there by an engraved label.
  - e. Provide an engraved label inside the FACP identifying its 120vac power source, as follows: Panelboard location, panelboard identification, and branch circuit number.
  - f. Alarm notification appliances (audible and visible) are to comply with NFPA 72, the North Carolina Building Code, and ANSI 117 criteria for intensity and placement. The standard audible evacuation signal is the ANSI S3.41 three-pulse temporal pattern except it shall not be used if the planned action during fire emergency is to relocate occupants or protect in place, instead of immediate evacuation (e.g., some health care facilities, prisons). All strobe lights installed in a single space must be synchronized. Devices are allowed to be mounted on the ceiling with 80" minimum and 96" maximum. See the NFPA 72 for additional alarm notification appliance requirements for special situations.
3. ADDRESSABLE INTERFACE MODULES (Control and Monitor Modules)
- a. Addressable interface modules (used to monitor all contact type initiating devices) must be located in conditioned space, unless they are tested, listed, and marked for continuous duty across the range of temperatures and humidity expected at their installed location.
  - b. One module can serve as many as 3 sprinkler system valve supervisory switches in a single space; otherwise provide one module per switch.
  - c. One module may serve as many as 6 heat detectors, in a single space.
  - d. Sprinkler system supervisory circuits for monitoring valve position, air pressure, water temperature, pump status, etc., must cause distinct audible and visible indications at the FACP. The audible supervisory signal shall either be a 4" diameter bell or a pulsing piezoelectric alarm. Provide the following engraved label adjacent to the bell/alarm: "SPRINKLER STATUS ABNORMAL". If only valve position is supervised, provide an engraved label reading: "SPRINKLER VALVE CLOSED".
  - e. The numbers of the fire alarm devices in a loop shall not exceed 20 devices otherwise provide IM module.
4. SURGE PROTECTION
- a. For each AC power circuit that interfaces with fire alarm equipment install an AC suppressor in a listed enclosure near the electrical panelboard, and trim excess lead lengths. Wind small coil in the branch circuit conductor just downstream of the suppressor connection. Coil to be 5 to 10 turns, about 1" diameter, and securely tie-wrapped. This series impedance will improve the effectiveness of the suppressor in clipping fast rise time voltage transients.
  - b. On DC Circuits Extending Outside Building: Install the surge arrester in a labeled enclosure near the point of entry to or exit from each building.
5. AC POWER
- a. Systems are to be provided with a separate and independent source of emergency power. Switching to emergency power during alarm shall not cause signal drop-out. Batteries must meet the appropriate NFPA capacity requirements, with a 25% safety factor.

- b. The branch circuit breaker(s) supplying the system must be physically protected by panelboard lock or handle lock and each must be identified with a 1/4" permanent red dot applied to handle or exposed body area.
- c. Provide an engraved label at each fire alarm system control unit, system sub-panel or data gathering panel, supplementary notification appliance (SNAC) panel, digital alarm communicator, etc.
- d. The fire alarm system shall monitor 120vac power to shunt trip breakers used in conjunction with fire suppression system. Examples include a shunt trip used for cooking appliance power shut-off when the kitchen hood fire suppression system shoots, or primary elevator power shut-down upon sprinkler flow in any elevator equipment space or shaft. Use an addressable monitor module to accomplish this supervisory function.

## 6. CONDUIT AND WIRING

- a. The exterior of all junction boxes containing fire alarm conductors shall be painted red; box interiors shall not be painted. Or Box covers for junction boxes containing fire alarm conductors shall be painted red on both sides.
- b. Box covers shall be labeled to indicate the circuit(s) or function of the conductors contained therein. Labels shall be neatly applied black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.
- c. All fire alarm system wiring shall be in metal conduit or surface metal raceway. All fire alarm system raceway, couplers, and connectors must meet the performance and installation requirements of Electrical Specification Section "RACEWAYS".
  - 1) If cable size and the requirement to maintain a Class "A" loop on all Signaling Line Circuits cause conduit fill to exceed specified maximums for the 1/2" size; therefore, 3/4" raceway should be used.
  - 2) PVC conduit is permitted to be used underground, in concrete, and in locations approved by the AHJ.
  - 3) Engineers shall discuss buildings on the historic register with the AHJ.
- d. All conduits that penetrate outside walls from air conditioned space must have internal sealing (duct-seal), to prevent condensation from infiltrating humid air
- e. All wiring shall be color coded All the circuits in the system shall be wired with AWG 14, minimum, stranded copper, THHN/THWN conductor, installed in metallic conduits. Color Coded wires shall be in accordance with the following scheme, which shall be maintained throughout the system, without color change in any wire run:
 

1) Initiating Circuits, General	Red (+)/White (-)
2) Initiating Circuits, Smoke Only	Violet (+)/Gray (-)
3) Signal Line Circuit cable	Red jacket with Red(+)/Black(-)
4) Alarm Indicating Appliance Circuits	Blue (+)/Black (-)
5) AHU Shutdown Circuits	Yellow (+)/Brown (-)
6) Door Control Circuits	Orange
7) Elevator Capture Circuits	Brown
- f. To minimize wiring fault impact, isolation modules shall be provided in all of the locations listed below. If ceiling height is less than or equal to 10 feet, isolator base type initiating devices are permitted to be used to satisfy any or all of the following:
  - 1) In or immediately adjacent to the FACP, at each end of the addressable loop. These two isolators must be in the same room and within 15 feet of the FACP.

- 2) After each 20 initiating devices and control points on the addressable loop, or a lesser number where recommended by the manufacturer. (Check instructions.)
  - 3) For loops with 20 devices and control points, install an isolator at the approximate middle of the loop (in addition to those at the FACP).
  - 4) Near the point any addressable circuit extends outside the building, except for those attached to the building exterior walls and well sheltered by walkways.
  - 5) For loops covering more than one floor, install isolator at terminal cabinet on each floor (with additional isolator[s] on any floor with over 20 addresses).
  - 6) Each isolation module must be clearly labeled, readily accessible for convenient inspection (not above a lay-in ceiling), and shown on as-built drawings
- g. Detection or alarm circuits must not be included in raceways containing AC power or AC control wiring. Within the FACP, any 120 VAC control wiring or other circuits with an externally supplied AC/DC voltage above the nominal 24 VDC system power must be properly separated from other circuits and the enclosure must have an appropriate warning label to alert service personnel to the potential hazard.
  - h. Style 6 Circuits Required: Systems with one or more addressable sub-panels that (1) have an integral addressable loop controller, or (2) monitor multiple non-addressable initiation zones, shall comply with the NFPA 72 requirements for Style circuits.
  - i. There shall be no splices in the system other than at device terminal blocks, or on terminal blocks in cabinets. "Wire nuts" and crimp splices will not be permitted. Permanent wire markers shall be used to identify all connections at the FACP and other control equipment, at power supplies, and in terminal cabinets. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.
  - j. In multistory buildings, all circuits leaving the riser on each floor shall feed through a labeled terminal block in a hinged enclosure accessible from the floor. If building layout requires the terminal cabinet to be above a drop ceiling, its location must be clearly and permanently identified with a placard readable from floor. Terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.
  - k. All wiring shall be checked for grounds, opens, and shorts, prior to termination at panels and installation of detector heads. The minimum resistance to ground or between any two conductors shall be ten (10) megohms, as verified with a megger. Provide advance notice to the Engineer of record of these tests.
  - l. The system shall be electrically supervised for open or (+/-) ground fault conditions in SLC, alarm circuits, and control circuits. Removal of any detection device, alarm appliance, plug-in relay, system module, or standby battery connection shall also result in a trouble signal. Fire alarm signal shall override trouble signals, but any pre-alarm trouble signal shall reappear when the panel is reset.

## 7. NOTIFICATION DEVICES

- a. Both audible and visible alarm signals shall be provided. Visible signals must be the strobe (flash discharge) type, with white or clear lens, and shall comply with current ADA requirements for intensity and placement.
- b. Alarm notification appliance (NAC) circuits shall be NFPA 72 Style Y (Class B). The load connected to each circuit must not exceed 80% of rated module output and the coverage of each circuit shall not exceed 3 floors (to limit the effect of faults, and to facilitate troubleshooting). The NAC voltage drop during alarm must not exceed 14% of the voltage



measured across the batteries at that time. To achieve this, the design must consider wire size, length of circuit, device load, inherent voltage loss within the FACP's power supply, etc. The contractor shall use power outage testing to verify that the NAC circuit was designed and installed properly.

- c. End of Line (ECU Device): The end of line device shall be installed in accessible terminal cabinets or dedicated accessible boxes, to facilitate testing and maintenance.

## 8. DETECTORS

- a. The FACP and all other control equipment locations, including any transponders, sub-panels, and booster power supplies, must be protected by a spot type smoke detector located within 15 feet of the equipment (measured horizontally).
- b. When installed in a room, detectors shall be oriented so their alarm light is visible from the nearest door to the corridor, unless Remote Alarm Indicator Light (RAIL) equipped.
- c. Spot-type smoke detectors shall secure the head to the base thru the built-in locking device. For detector mounted within 12 feet of the floor, activate this lock after the system has been inspected and given final acceptance.
- d. Spot-type smoke detectors shall not be used where ceiling height exceeds 25 feet because it makes access for maintenance very difficult and could impede response. Projected beam smoke detectors are recommended for these applications because they can be mounted on wall surfaces, where access is convenient (or at least where they can be reached with an extension ladder). These integrating devices can be located to compensate for possible smoke stratification. Refer to NFPA 72.
- e. Unless suitably protected against dust, paint, etc., spot type smoke detectors shall not be installed until the final construction clean-up has been completed. In the event of contamination during construction, the detectors must be replaced by the contractor at no additional cost to the Owner. Covers supplied with smoke detector heads do not provide protection against heavy construction dust, spray painting, etc., and must not be used for that purpose. They are suitable only during final, minor cleanup or touchup operations.
- f. A detector installed where accidental damage or deliberate abuse is expected shall be provided with a guard that is listed for use with it and is acceptable to the AHJ.
  - 1) Mechanical guards always make access for regular testing and maintenance more difficult. Therefore the preferred approach, where practical, is to relocate the detectors out of harm's way, consistent with proper device response.
- g. Identification of individual detectors is required. Assign each a unique number as follows, in sequence starting at the FACP: (Addressable Loop # -- Device #) Show on the as-built plans, and also permanently mount on each detector's base so that it's readable standing on the floor below without having to remove the smoke detector. Exception: For detectors with housings (i.e., air duct, projected beam, air sampling, flame), apply the identification to a suitable location on exterior of their housing. Device labels may not be affixed to the device. Identification labels must be printed labels with black lettering on a clear background. Handwritten labels or labels made from embossed tape are not acceptable.

## 9. DUCT MOUNTED SMOKE DETECTORS

- a. All air duct/plenum detectors must have a Remote Alarm Indicator Lamp (RAIL) installed in the nearest corridor or public area and identified by an engraved label affixed to the wall or ceiling. Duct smoke detectors are permitted to be installed only inside an air duct. It is not appropriate to mount them in front of a return air opening. Duct detectors shall also be installed in a manner that provides suitable, convenient access for required periodic cleaning

and calibration. The numbers of detectors per duct shall be per NFPA 72 requirements based on the size of the air duct, air duct configuration, air speed, and duct manufacturer's installation requirements.

- b. Each duct detector installation shall have a hinged or latched duct access panel, 12x12 inches minimum, for sampling tube inspection and cleaning. Indicate airflow direction on the duct, adjacent to the detector, using stencil or permanent decal.
- c. Duct detector sampling tubes shall extend the full width of the duct. Those over 36 inches long must be provided with far end support for stability.
  - 1) The preferred method for providing support is to extend the intake tube through the far side of the duct, seal around the tube where it penetrates the duct wall, and plug the end with a rubber stopper. This facilitates visual inspection, intake tube cleaning, and injection of smoke or equivalent aerosol for testing the detector.
- d. Duct smoke detector mounting position and air sampling tube orientation, are critical for proper operation. The Manufacturer's detailed installation instructions must be followed. The contractor shall mark the direction of air flow on the duct at each duct detector location.
- e. Unless the AHJ requires otherwise, all duct smoke detectors shall be programmed for fire alarm (not for supervisory annunciation).

#### 10. AIR HANDLER UNIT (AHU) SHUTDOWN

- a. A supervised "AHU Shutdown Defeat" switch must be provided in/adjacent to the FACP or as a key-operated function in the Remote Annunciator (if provided). If the FAA option is utilized, provide an informative engraved label at the FACP about this function. The switch must cause a system "trouble" indication when it's placed in the off-normal ("Shutdown Defeated") position. This is to provide the owner with a convenient means to temporarily resume HVAC operation in the event an unwanted alarm will not clear, prior to arrival of the fire alarm service technician.
- b. If the system includes AHU shutdown or smoke removal startup, silencing the alarm (without resetting) must not reverse the shutdown. A supervised "AHU Shutdown Defeat" switch must be provided in the FACP. The switch must be labeled and its "Normal" position indicated. Provide supervised Hand-Off-Auto switch(es) at the FACP for any building smoke control equipment (pressurization or exhaust fans).
- c. If the building has smoke control system fans (pressurization or exhaust), or smoke purge fans, provide Hand-Auto-Off switch(es) in or adjacent to FACP. They must be clearly labeled, and FACP-monitored or provided with status indicator lights. This is often provided by the controls contractor, rather than the fire alarm contractor, and does not need to be part of the fire alarm system. Responsibility should be clearly indicated in the project specification. For three-position toggle switches we recommend this intuitive arrangement: Hand (Manual Run) to be "up" and have an amber LED; Auto to be center position with a green LED; Off to be down and have a red LED.

11. ALARM VERIFICATION FOR SMOKE DETECTORS. The fire alarm system shall be equipped with Alarm Verification.

#### 12. REMOTE ALARM TRANSMISSION REQUIREMENTS

- a. Each system with automatic fire detection, or which monitors a sprinkler system, shall be equipped with a 4-channel (minimum) Digital Alarm Communicator Transmitter (DACT) for transmission of fire alarm, supervisory, and trouble signals to a Central Station, Remote Supervising Station, or Proprietary Supervising Station. DACT shall be dual line type in accordance with NFPA 72.

- b. The following signals shall be reported as applicable:
- Fire Alarm
  - Sprinkler Waterflow Alarm
  - Fire Pump Running Alarm (if pump provided)
  - Fire Pump Abnormal Status Supervisory Signal
  - Sprinkler Valve Tamper (Closed) Supervisory Signal
  - Sprinkler Low Temperature I Air Pressure Supervisory Signal
  - Burglary! Intrusion I Duress I Other Security or Emergency Alarm
  - Fire Alarm System AC Power Trouble (only if 120vac interrupted for 1 to 8 hours)
- 1) In lieu of a DACT, the use of an addressable network is acceptable. Other appropriate means of transmitting fire alarm system signals off-premises may be permitted to be used, at the discretion of the AHJ who approves the plans.
- c. Sprinkler and fire pump supervisory signals are permitted to be combined by the DACT, for transmission. Contact the AHJ for more information.
- d. The precedence of DACT I signals transmitted to the Supervising Station shall be as follows:
- 1) Fire Alarm
  - 2) Supervisory Signal
  - 3) Trouble Signal\*
  - 4) Security Alarm
- e. Do not confuse fire suppression system “supervisory” signals and fire alarm system “trouble” signals. These are completely different types of signals, annunciated and transmitted as separate and distinct events.
- f. The Contractor must provide a type of DACT that is compatible with the owner’s alarm receiving equipment, or the Supervising Station selected by the owner, as applicable. He must also program the PROM, connect each DACT to the telephone line(s) provided to him, and verify proper signal receipt by the Supervising Station. The transmission means shall comply with NFPA 72 (which does not permit VOIP).
- 1) See NFPA 72 for means of transmission requirements. It permits the phone line(s) to be shared, since the DACT can capture a line that’s busy if needed. However, PBX station circuits are not permitted to be used. Contact the AHJ if VOIP, cellular, derived local channel, or RF technology is intended for the reporting means.
  - 2) Where leased or dedicated lines are available back to the Owner’s security station provide a polarity reversal type alarm module. Polarity reversal type alarm modules report only Alarm, Line Trouble, and OK conditions.

### 13. AUTOMATIC SMOKE DOOR AND AUTOMATIC LOCK REQUIREMENTS

- a. Wall-mounted magnetic door holders and separate heavy-duty closers shall be used, instead of combination door control units. The electromagnets shall be controlled by the building’s smoke detection system FACP. Individual smoke detector auxiliary contacts shall not be used to release door holders.
- b. Automatic door locks controlled by the system must be either fail safe magnetic locks or failsafe electro-mechanical with reverse bevel dead bolts.
- c. All locked protected doors must immediately unlock upon fire alarm, loss of AC power, disablement of the fire alarm system (defined as loss of 24 VDC power) or upon manual operation of an unlock switch at a constantly attended location.

#### 14. SPRINKLER SYSTEM MONITORING

- a. The following sprinkler system alarm and supervisory functions shall be provided as a part of the fire alarm system:
  - 1) Waterflow alarm, by sprinkler zone (not to exceed one floor).
  - 2) Supervision of each control valve.
  - 3) Supervision of air pressure, if used (both high and low).
  - 4) Supervision of fire pump.
- b. Sprinkler supervisory monitoring of flow switches, tamper switches, and similar functions shall be accomplished with a separate system address for each activity monitored.

#### 15. FIRE ALARM SYSTEM INSTALLATION AND CONFIGURATION

- a. Supervision required: The connections between individual addressable modules and their contact type initiating device(s) must be supervised.
- b. Floor Plans with Device Numbers: A copy of the floor plans shall be provided in the control panel. A separate sheet shall be provided for each floor. Plans shall be reduced in size from engineering plans in order to fit on 11 x 14 sheets. All device addresses shall be clearly labeled on plans. Indicate locations of all cabinets, modules and end of line device. Plans shall be bound in book form. Sheets shall be laminated. Provide legend for symbols. Provide holder for plan book in panel or in a locked box adjacent to panel keyed to match panel. Provide label for box and book.
- c. Loop 1 shall be assigned to the first floor devices and loop number shall increase with floor number. Device numbering starts in the same location on each floor and increase accordingly as circuit location increases.

#### 16. SYSTEM DOCUMENTATION, TRAINING, AND MAINTENANCE

- a. Maintenance: The manufacturer, or authorized distributor, must maintain software version records on the system installed. The system software shall be upgraded free of any charge if a new VER is released during the warranty period. For new VER to correct operating problems, free upgrade shall apply during the entire life of the system.
- b. System Report In addition to the Shop Drawing submittal described elsewhere, the fire alarm system contractor shall provide the engineer two bound copies of the following technical information, for transmittal to the owner:
  - 1) As-Built wiring diagram showing all loop numbers and device addresses, plus terminal numbers where they connect to control equipment.
  - 2) As-built wiring and conduit layout diagrams, including wire color code and/or label numbers, and showing all interconnections in the system.
  - 3) Electronic circuit diagrams of all control panels, modules, annunciators, communications panels, etc.
  - 4) Manufacturer's detailed maintenance requirement.
  - 5) Technical literature on all control equipment, isolation modules, power supplies, batteries, detectors, manual stations, alarm/supervisory signal initiating devices, alarm notification appliances, relays, remote alarm transmission means, etc.
  - 6) The as-built "calculations" sheet.

- c. Electronic archive: Complete configuration data (site-specific programming) for the system must be stored on electronic media and archived by the fire alarm system manufacturer or authorized distributor. A diskette or CD copy of this data shall be submitted to the engineer for transmission to the owner on the day the system is commissioned.
- d. The contractor shall provide the owner with one copy of the following:
  - 1) All software required, both for the installed fire alarm system and personal computer (PC) necessary to access the fire alarm system for trouble shooting, programming, modifications, monitoring, de-bugging, or similar functions, (if Owner does not have the needed PC to check the system).
  - 2) Complete documentation for all software for both the installed fire alarm system and for any interface PC software necessary for system functions as described above.
  - 3) Framed floor plans, mounted at the FACP and RACP. Plans shall show all system devices with the unique device identification numbers indicated adjacent to each device. The identification numbers shall match those represented in the as-built drawings and those reported at the FACP and the LCD annunciator.
  - 4) Interconnection cable where such is required to connect the fire alarm system to a PC; (if Owner does not have the needed PC to check the system)
- e. The manufacturer's authorized representative must instruct the owner's designated employees in operation of the system, and in all required periodic maintenance. A minimum of 8 hours on-site time will be allocated for this purpose and, for those facilities operating on a 24-hour basis (prisons, hospitals, etc.) one additional hour of instruction will be individually provided for the 2nd and 3rd shift. Two copies of a written, bound summary will be provided, for future reference.
  - 1) Some facilities maintain their own systems and require more in-depth training. Check to verify needs and requirements.
  - 2) Scheduling of training must be arranged to meet the Owner's schedule. Additional training shall be available at a cost to be mutually agreed upon by the Owner and the Contractor.
  - 3) Training shall be in the Owner's provided classroom.
  - 4) The training may not be waived, deleted or reduced in the number of hours required.
  - 5) Training shall cover as minimum the following topics:
    - a) Preventive maintenance service techniques and schedules, including historical data trending of alarm and trouble records.
    - b) Overall system concepts, capabilities, and functions. Training shall be in depth, so that the owner shall be able to take any device out of service and return any device to service without need of Manufacture's approval or assistance.
    - c) Explanation of all control functions, including training to program and operate the system software.
    - d) Methods and means of troubleshooting and replacement of all field wiring devices.
    - e) Methods and procedures for troubleshooting the main fire alarm control panel, including field peripheral devices as to programming, bussing systems, internal panel and unit wiring, circuitry and interconnections.
    - f) Manuals, drawings, and technical documentation. Actual system software used for training shall be provided in digital form and shall be left with the Owner at the completion of training for the Owner's use in the future.

## 17. SPARE PARTS:

- a. The following spare parts shall be provided with the system. For multi-building projects, calculate quantities separately for each building that contains a dedicated fire alarm control panel. If FACP also serves auxiliary buildings (e.g., storage, boiler/chiller), calculate as if one building. Increase decimal quantities to the next higher whole number.

• Fuses (If Used)	2 of each size in system
• Manual Fire Alarm Boxes	2% of installed quantity
• Addressable Control Relays	4% of installed quantity
• Indoor Horns/Speakers with Strobes Lights	4% of installed quantity
• Indoor Strobe-only Notification Appliances	4% of installed quantity
• Monitor Modules (Addressable Interface)	4% of installed quantity
• Isolation Modules I Isolation Bases	4% of installed quantity
• Addressable, Electronic Heat Detectors	4% of installed quantity
• Spot-Type Smoke Detectors I Sounder Bases	6% of installed quantity

\* No spares are required for projected beam, air sampling, or duct smoke detectors

## 18. SYSTEM TESTING &amp; CERTIFICATION

- a. Upon completion of the installation the Contractor and the Manufacturer's authorized installer together shall conduct a 100% performance test of each and every alarm initiating device for proper response. The system shall operate for 48 hours prior to start of test. The Contractor shall be present for the full 100% test.
- b. The A/E and owner must be given 7 days advance notice of the tests. All Audio Visual Device Testing shall be scheduled with the owner.
- c. 100% Test: The manufacturer or authorized distributor (by definition, "installer") must 100% test all site-specific software functions for the system and then provide a detailed report or check list showing the system's operational matrix. This documentation must be part of the "System Status and Programming Report".
- 1) Upon completion of the installation and its programming, the installer's technician shall test every alarm initiating device for proper response and indication, and all alarm notification appliances for effectiveness. Also, in coordination with the other building system contractors, all other system functions shall be verified, including (where applicable) elevator capture and the control of HVAC systems, door locks, pressurization fans, fire or smoke doors/dampers/shutters, etc. The engineer must be notified in advance of these 100% tests, to permit witnessing them if desired.
  - 2) If AHU shutdown occurs for any alarm, then the matrix would indicate the specific control relay(s) for that function being commanded to operate for alarm from any initiating device. If a rolling steel fire door is to drop only upon waterflow alarm from its sprinkler zone, or upon any two spot smoke detectors in adjacent spaces being simultaneously in alarm, the matrix would show the door's control relay activating upon alarm from the applicable waterflow switch(es), or from any two smoke detectors in the selected spaces (AND gate).
  - 3) The digital communicator shall be on-line and tested for proper communication to the receiving station.
  - 4) All supervised circuits must also be tested to verify proper supervision. (Control circuits and remote annunciation lines are among those required to be supervised.)
  - 5) All testing described above shall be repeated in the event that subsequent software or wiring modifications are determined necessary to meet the requirements of the contract documents. Such re-testing shall be included as part of the base bid and provided at no additional cost to the Owner.

- d. Test Documentation: The installer must fill out and submit the following documentation to the owner, through the engineer, prior to the AHJ's system acceptance inspection:
    - 1) Written verification that this 100% system test was done with copy of print out generated during test.
    - 2) The NFPA 72, "Record of Completion" Form. Use this form (no substitutes) to detail the system installation and also to certify that: (a.) It was done per Code, and (b.) The Code-required 100% test was performed. The fire alarm installer (manufacturer or authorized distributor's technician) must sign this form. If a representative of the AHJ, owner, or engineer witnesses the tests, in whole or in part, they must also sign the form to signify that fact only (annotating the form as needed to clarify their limited role).
    - 3) For buildings with a smoke control or smoke purge system, an HVAC balance report, in the smoke control / smoke purge mode.
    - 4) The System Status and Programming Report described in NFPA 72. This must be generated on the day of the system acceptance inspection and shall include the measured sensitivity of each smoke detector.
    - 5) The purpose of doing Item (4) on the day of the inspection is to assure detector sensitivity has not been affected by construction dust. Prudent contractors will have taken measures to prevent detector contamination during construction, and will also have had the system do a detector sensitivity test and printout prior to the day of the inspection, to make certain all devices are properly programmed and operating within their limits.
  - e. After completion of the 100% system test and submission of documentation as described above the installer is to request the engineer to set up an inspection. The system must operate for at least two days prior to this inspection. The responding Fire Department shall be notified of this, for pre-fire planning purposes. On local government projects, local fire authorities may also want to participate in system acceptance inspections. However, for State-owned property they have no inspection jurisdiction and, if present, are only to observe.
19. PRE-FINAL INSPECTION: *At the Owner's request and after passing the Designer's pre-final inspection, the Contractor and Manufacturer's authorized installer will conduct system test in the presence of the Owner and the Designer.*
20. FINAL INSPECTION: The fire alarm system will be inspected, with portions of it functionally tested. This will normally include the use of appropriate means to simulate smoke for testing detectors, as well as functionally testing the system interface with building controls, fire extinguishing systems and any off-premises supervising station. Operation of any smoke removal system will be checked as instructed by the AHJ. This statistical (sampling) inspection is intended to assure that the contractor has properly installed the system and performed the 100% operational test as required by NFPA 72. The electrical contractor shall provide two-way radios, ladders, and any other materials needed for testing the system, including a suitable smoke source.
- a. Smoke control and smoke management systems are normally tested by measuring air flow rates and pressure differentials, plus observing any effect the system has on the operation of exit, elevator, and stairway doors. Testing with smoke "bombs" (smoke candles) is NOT appropriate because they produce cold chemical smoke that lacks buoyancy and, therefore, does not rise like the smoke from a fire.

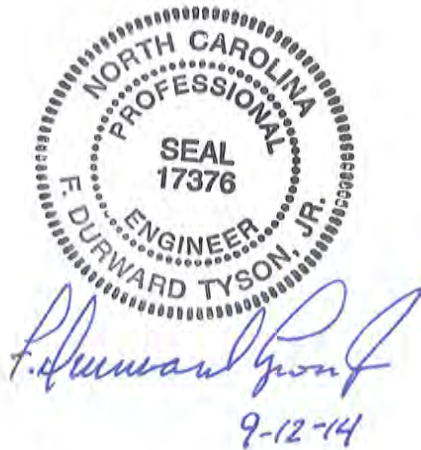
- b. The test will be conducted entirely by the Contractor. A copy of the final database software must be presented to the Owner before this test. The software shall be loaded from these disks into the system in the presence of the Owner. The review will then be conducted using this software. Any deficiencies shall be recorded and corrected. After the items have been corrected, the system shall be tested again.
  - 1) In the event of malfunctions or excessive nuisance alarms, the Contractor must take prompt corrective action. The Owner may require a repeat of the Contractor's 100% system test, or other inspections.
  - 2) Test Report: Upon successful completion of the Inspection and after the correction of all efficiencies, the manufacturer's authorized representative shall issue a test report to the Engineer and Owner, detailing and certifying the test.
  - 3) System Acceptance: After successful completion of the Final Inspection and recommendation of the Engineer, the system will be accepted by the Owner. At this time the warranty period begins.

END OF SECTION 28 31 10



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## SECTION 32 14 43 – POROUS CEMENT CONCRETE PAVEMENT

### SECTION 100 GENERAL REQUIREMENTS

**101. Scope of Work:** The work to be completed under this contract includes the furnishing of all labor, materials and equipment necessary for construction of the proposed improvements in conformance with the plans and specifications.

**101.1 References:** Please refer to Section 600 for ASTM and AASHTO Testing & Material Specifications.

**102. Contractor Qualifications:** The use of a Finishing Contractor who has successfully completed the Carolinas Ready Mix Concrete Association (CRMCA) Pervious Concrete Installers Course is strongly recommended. Prior to award of the contract, the placing contractor shall furnish the Owner a statement attesting to qualifications and experience and the following:

1. A minimum of 2 completed Pervious Concrete projects with addresses.
2. A proven Concrete Mix Design which corresponds with the above referenced projects.
3. Proposed equipment to be used for placement and compaction of pervious concrete.

Demonstration of pervious concrete placement skill and qualification will be based on NCDOT visit to Contractor referenced projects.

**103. Concrete Producer Qualification:** The use of a concrete producer who has successfully completed the CRMCA Pervious Concrete Installer/ Technician Course is strongly recommended.

If the placing contractor and/or concrete producer have insufficient experience with Portland cement pervious concrete pavement as outlined in the previous two sections, the contractor shall retain an experienced Pervious Concrete Consultant who meets the requirements in the previous two sections to monitor production, handling, and placement operations at the contractor's expense.

**104. Concrete Mix Design:** The Contractor shall furnish a proposed mix design with proportions of materials to the NCDOT prior to commencement of work. The data shall include unit weights determined in accordance with ASTM C 29 paragraph 11, jigging procedure. The Concrete Mix Design must guarantee a porosity of no less than 20%.

### SECTION 200 MATERIALS

**201. General:** Locally available material having a record of satisfactory performance shall be used.

**202. Cement:** Portland Cement Type I or II conforming to ASTM C 150 or Portland Cement Type IP or IS conforming to ASTM C 595, or ASTM C 1157.

**202.1 Fly ash and Ground Iron Blast-Furnace Slag:** Fly ash conforming to ASTM C 618 may be used in amounts not to exceed 30 percent of total cementitious material. Ground Iron Blast-Furnace Slag conforming to ASTM C 989 may be used in amounts not to exceed 50 percent by weight of total cementitious material.

Note: When Class "F" Fly ash is used as part of the minimum cementitious content specified in Section 301, bond strength development may be delayed and additional curing time is required. See Section 505.

**203. Aggregate:** Use coarse aggregate (3/8 to No. 16) per ASTM C 33 or No. 89 coarse aggregate (3/8 to No. 50) per ASTM D 448. If other gradation of aggregate is to be used, submit data on proposed material to owner for approval.

**204. Air Entraining Agent:** Shall comply with ASTM C 260.

**205. Admixtures:**

Type A Water Reducing Admixtures – ASTM C 494.

Type B Retarding – ASTM C 494.

Type D Water Reducing/Retarding – ASTM C 494.

Also, a hydration stabilizer can be utilized and is recommended in the design and production of pervious concrete. This stabilizer suspends cement hydration by forming a protective barrier around the cementitious particles, which delays the particles from achieving initial set. The admixture's primary function should be as a hydration stabilizer, however it must also meet the requirements of ASTM C 494 Type B Retarding or Type D Water Reducing/Retarding admixtures.

**206. Water:** Comply with ASTM C 94.

**SECTION 300 PROPORTIONS**

**301. Cement Content:** The total cementitious material content shall not be less than 600 lbs. per cu. yd due to the parking lot being subject to vehicular traffic.

**302. Water / Cementitious Ratio:** For vehicle pavements: 0.30 For pedestrian pavements: 0.35

**303. Aggregate Content:** The volume of aggregate per cu. yd. shall be a minimum 18 cu. ft. when calculated as a function of the unit weight determined in accordance with ASTM C 29 jigging procedure. Fine aggregate, if used, should not exceed 3 cu. ft. and shall be included in the total aggregate volume.

**304. Admixtures:** Shall be used in accordance with the manufacturer's instructions and recommendations.

**305. Mix Water:** Mix water shall be such that the cement paste displays a wet metallic sheen without causing the paste to flow from the aggregate. (Mix water yielding a cement paste with a dull-dry appearance has insufficient water for hydration).

- Insufficient water results in inconsistency in the mix and poor bond strength.
- High water content results in the past sealing the void system primarily at the bottom and poor surface bond.

**306. Mix Design:** Using concrete materials acceptable to the NCDOT, a concrete mix shall be designed and proven for the consistency intended for use on the work and specified. The pervious concrete mix design testing data shall be provided to the NCDOT to demonstrate the pervious concrete strength prior to starting any work.

**SECTION 400 SUB-GRADE PREPARATION & FORM-WORK**

**401. Subgrade Material (Walkways):** The subgrade consists of a mixture of sandy loam and coarse sand. The subgrade will be roughly graded to approximately 3" of the final design grade by the Contractor.

**402. Subgrade Material (Roads):** Provide subgrade of 8" #57 stone below pavement areas.

**403. Subgrade Support:** Due to the unique characteristics of the sand subgrade acting as a stormwater filter and the need to maintain a high subgrade infiltration rate, no compaction effort should be conducted on the subgrade. Also, heavy equipment traffic should be minimized to maintain infiltration characteristics of the sand substrate.

**404. Forms:** Forms may be of wood or steel and shall be the depth of the pavement. Forms shall be of sufficient strength and stability to support mechanical equipment without deformation of plan profiles following spreading, strike-off and compaction operations.

**SECTION 500 MIXING, HAULING AND PLACING**

**501. Mix Time:** Truck mixers shall be operated at the speed designated as mixing speed by the manufacturer for 75 to 100 revolutions of the drum.

**502. Transportation:** The Portland cement aggregate mixture may be transported or mixed on site and should be used within one (1) hour of the introduction of mix water, unless otherwise approved by a NCDOT Engineer. This time can be increased to 90 minutes when utilizing the hydration stabilizer specified in Section 205.

**503. Discharge:** Each mixer truck will be inspected for appearance of concrete uniformity according to Section 304. Water may only be added by the concrete producer to obtain the required mix consistency. A minimum of 20 revolutions at the manufacturer's designated mixing speed shall be required following any addition of water to the mix. Discharge shall be a continuous operation and shall be completed as quickly as possible. Concrete shall be deposited as close to its final position as practicable and such that fresh concrete enters the mass of previously placed concrete. The practice of discharging onto subgrade and pulling or shoveling to final placement is not allowed.

**504. Placing and Finishing Equipment:** Unless otherwise approved by the Engineer in writing, the Contractor shall provide mechanical equipment of either slip form or form riding with a following compactive unit that will provide a minimum of 10 psi vertical force. The pervious concrete pavement will be placed to the required cross section and shall not deviate more than +/- 3/8 inch in 10 feet from profile grade. If placing equipment does not provide the minimum specified vertical force, a full width roller or other full width compaction device that provides sufficient compactive effort shall be used immediately following the strike-off operation. After mechanical or other approved strike-off and compaction operation, no other finishing operation will be allowed. If vibration, internal or surface applied, is used, it shall be shut off immediately when forward progress is halted for any reason. The Contractor will be restricted to pavement placement widths of a maximum of fifteen (15') feet unless the contractor can demonstrate competence to provide pavement placement widths greater than the maximum specified to the satisfaction of the NCDOT Engineer.

**505. Curing:** Curing procedures shall begin within 20 minutes after the final placement operations. The pavement surface shall be covered with a minimum six- (6) mil thick polyethylene sheet or other approved covering material. Prior to covering, a fresh water fog or light mist shall be sprayed above the surface when required due to ambient conditions (temperature, wind and humidity). The cover shall overlap all exposed edges and shall be secured (without using dirt or stone) to prevent dislocation due to winds or adjacent traffic conditions.

**Cure Time:**

1. Portland Cement Type I, II or IS – 7 days minimum.
2. Portland Cement Type I or II with Class F Fly ash (as part of the 600 lbs/cy minimum cementitious) or Type IP – 10 days minimum.
3. No vehicular traffic shall be allowed for 10 days.

**506. Jointing:** Control (contraction) joints shall be installed at 40-foot intervals for pavements designed for vehicular traffic. They shall be installed at a depth of 1/4 the thickness of the pavement. These joints can be installed in the plastic concrete or saw cut. If saw cut, the procedure should begin as soon as the pavement has hardened sufficiently to prevent raveling and uncontrolled cracking (normally after curing). Transverse construction joints shall be installed whenever placing is suspended a sufficient length of time that concrete may begin to harden. In order to assure aggregate bond at construction joints, a bonding agent suitable for bonding fresh concrete to existing concrete shall be brushed, rolled or sprayed on the existing pavement surface edge. Isolation (expansion) joints will not be used except when pavement is abutting slabs or other adjoining structures.

**SECTION 600 REFERENCES****701. References:****A. American Society of Testing and Materials (ASTM)**

1. ASTM C 29 “Test for Unit Weight and Voids in Aggregate.”
2. ASTM C 33 “Specification for Concrete Aggregates.”
3. ASTM C 42 “Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.”
4. ASTM C 117 “Test Method for Material Finer than 75  $\mu\text{m}$  (No.200) Sieve in Mineral Aggregates by Washing.”
5. ASTM C 138 “Test Method for Unit Weight, Yield and AirContent (Gravimetric) of Concrete.”
6. ASTM C 150 “Specifications for Portland Cement” (Types I or II only).
7. ASTM C 1157 “Performance Specification for Hydraulic Cement”
8. ASTM C 172 “Practice for Sampling Fresh Concrete.”
9. ASTM C 260 “Specification for Air-Entraining Admixtures for Concrete.”
10. ASTM C 494 “Specification for Chemical Admixtures for Concrete.”
11. ASTM C 595 “Specifications for Blended Hydraulic Cements” (Type IP or IS only).
12. ASTM C 618 “Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.”
13. ASTM C 989 “Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.”
14. ASTM C 1077 “Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.”
15. ASTM D 448 “Specification for Standard Sizes of Coarse Aggregate for Highway Construction.”
16. ASTM D 1557 “Tests for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10 Pound Rammer and 18-inch Drop.”
17. ASTM E 329 “Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction.”

**B. American Association of State Highway and Transportation Officials (AASHTO)**

1. AASHTO T-180 “Moisture-Density Relations of Soils Using a 101 pound (454 kg) Rammer and an 18 in. (457 mm) Drop.”

**END OF SECTION 02751**

**SECTION 32 90 00 - PLANTING****PART I – GENERAL****1.1 DESCRIPTION OF WORK**

- A. Provide all exterior planting as shown on the drawings or inferable therefrom and/or as specified in accordance with the requirements of the Contract Documents.
- B. These specifications include standards necessary for and incidental to the execution and completion of planting, including hauling and spreading of topsoil, and finished grading as indicated on the prepared drawings and specified herein.
- C. Protection of existing features. During construction, protect all existing trees, shrubs, and other specified vegetation, site features and improvements, structures, and utilities specified herein and/or on submitted drawings. Removal or destruction of existing plantings is prohibited unless specifically authorized by the owner.

**1.2 APPLICABLE STANDARDS**

- A. *American National Standards for Tree Care Operations, ANSI A300.* American National Standards Institute, 11 West 42<sup>nd</sup> Street, New York, N.Y. 10036.
- B. *American Standard for Nursery Stock, ANSI Z60.1.* American Nursery and Landscape Association, 1250 Eye Street. NW, Suite 500, Washington, D.C. 20005.
- C. *Hortus Third,* The Staff of the L.H. Bailey Hortorium. 1976. MacMillan Publishing Co., New York.
- D. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

**1.3 QUALIFICATIONS**

- A. Landscape planting and related work shall be performed by a firm with a minimum of five years experience specializing in this type of work. All contractors and their sub-contractors who will be performing any landscape work included in this section of the specification shall be approved by the Landscape Architect.
- B. Landscape contractor shall be actively registered with the North Carolina Landscape Contractors registration board.

#### 1.4 REQUIREMENTS OF REGULATORY AGENCIES

- A. Certificates of inspection shall accompany the invoice for each shipment of plants as may be required by law for transportation. File certificates with the Landscape Architect prior to acceptance of the material. Inspection by federal or state authorities at place of growth does not preclude rejection of the plants at the site.

#### 1.5 SUBMITTALS

- A. **Manufacturer's Data:** Submit copies of the manufacturer's and/or source data for all materials specified, including soils, mulch and structural soil.
- B. **Samples:** Submit samples of all topsoil, soil mixes, mulches, and organic materials. Samples shall weigh 1 kg (2 lb) and be packaged in plastic bags. Samples shall be typical of the lot of material to be delivered to the site and provide an accurate indication of color, texture, and organic makeup of the material.
- C. **Plant Photographs:** Submit color photographs of representative specimens of each plant on the plant list. Photos shall be a minimum 3 x 5 in. taken from angle that depicts the size and condition of the typical plant to be furnished. A scale rod or other measuring device shall be included in the photograph. Label each photograph with the plant name, plant size, and name of the growing nursery.
- D. **Nursery Sources:** Submit a list of all nurseries that will supply plants, along with a list of the plants they will provide and the location of the nursery.
- E. **Soil Test:** Submit soil test analysis report for each sample of topsoil and planting mix from a soil testing laboratory approved by the Landscape Architect.
1. Provide a particle size analysis, including the following gradient of mineral content:

<u>USDA Designation</u>	<u>Size in mm</u>
Gravel	+2 mm
Very course sand	1-2 mm
Coarse sand	0.5 -1 mm
Medium sand	0.25-0.5 mm
Fine sand	0.1-0.25 mm
Very fine sand	0.05-0.1 mm
Silt	0.002-0.05 mm
Clay	smaller than 0.002 mm

2. Provide a chemical analysis, including the following:
  - a. pH and buffer pH
  - b. Percentage of organic content by oven-dried weight.
  - c. Nutrient levels by parts per million, including phosphorus, potassium magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include the testing laboratory



recommendations for supplemental additions to the soil based on the requirements of horticultural plants.

- d. Soluble salt by electrical conductivity of a 1:2, soil: water, sample measured in millimho per cm.
- e. Cation exchange capacity (CEC).

## **1.6 PLANTING SEASON**

- A. Planting shall be done between October 01 and April 30.
- B. Variance: If special conditions exist that warrant a variance in the above planting dates, a written request shall be submitted to the Landscape Architect stating the special conditions and the proposed variance. Permission for the variance will be given if warranted in the opinion of the Landscape Architect. Any variance in the planting season will not affect the guarantee period.

## **1.7 UTILITY VERIFICATION**

- A. The contractor shall contact the local utility companies for verification of the location of all underground utility lines in the area of the work. The contractor shall be responsible for all damage resulting from neglect or failure to comply with this requirement.

## **PART 2 – MATERIALS**

### **2.1 TOPSOIL**

- A. All seed and sod areas shall have a minimum 6” of topsoil applied (depth after rolling).
- B. All shrub beds shall have a minimum 18” of topsoil applied (depth after rolling).
- C. All groundcover and ornamental grasses shall have a minimum 12” of topsoil applied (depth after rolling).
- D. Existing topsoil may be used. It is the Contractor’s responsibility to test the existing topsoil to ensure that it meets the requirements listed below to promote vigorous and healthy establishment and growth of plants.
- E. Imported topsoil may be used in quantities sufficient to complete the specified requirement.
- F. Existing or imported topsoil shall be:
  - 1. Fertile agricultural soil
  - 2. Typical for locality
  - 3. Capable of sustaining vigorous plant growth
  - 4. Taken from drained sites
  - 5. Free of subsoil, rock, stones, clay or impurities, plants, weeds and roots

6. pH value minimum 5.7, maximum 6.5
7. Organic content 5 to 7 percent

## 2.2 MATERIALS FOR SOIL AMENDMENT

### A. Organic Matter

1. Leaf matter and yard waste composted sufficiently to break down all woody fibers, seeds, and leaf structures, and free of toxic and nonorganic matter. Organic matter shall be commercially prepared compost. Submit 0.5 kg (1 lb) sample and suppliers literature for approval.

### B. Course Sand

1. Course concrete sand, ASTM C-33 Fine Aggregate, with a Fines Modulus Index of 2.75 or greater.
2. Sands shall be clean, sharp, natural sands free of limestone, shale and slate particles.
3. Provide the following particle size distribution:

<u>Sieve</u>	<u>Percentage Passing</u>
3/8 in (9.5 mm)	100
No. 4 (4.75 mm)	95-100
No. 8 (2.36 mm)	80-100
No. 16 (1.18 mm)	50-85
No. 30 (0.60 mm)	25-60
No. 50 (0.30 mm)	10-30
No. 100 (0.15 mm)	2-10

### C. Lime

1. Shall be ground, palletized, or pulverized lime manufactured to meet agricultural standards and contain a maximum of 60 percent oxide (i.e. calcium oxide plus magnesium oxide). Submit manufacturer literature for approval.

### D. Sulfur

1. Shall be flowers of sulfur, pelletized or granular sulfur, or iron sulfate. Submit manufacturer literature for approval.

### E. Fertilizer

1. Agricultural fertilizer of a formula indicated by the soil test. Fertilizers shall be organic, slow-release compositions whenever applicable. Submit manufacturer literature for approval.

## 2.3 PLANTS

- A. Plants shall be true to species and variety specified and nursery-grown in accordance with good horticultural practices under climatic conditions similar to those in the locality of the project for at least two years. They shall have been freshly dug during the most recent favorable harvest season.

- B. All plant names and descriptions shall be as defined in *Hortus Third*.
- C. All plants shall be grown and harvested in accordance with the *American Standard for Nursery Stock*.
- D. Unless approved by the Landscape Architect, plants shall have been grown at a latitude not more than 200 miles north or south of the latitude of the project unless the provenance of the plant can be documented to be compatible with the latitude and cold hardiness zone of the planting location.
- E. Unless specifically noted, all plants shall be of specimen quality, exceptionally heavy, symmetrical, and so trained or favored in development and appearance as to be unquestionably and outstandingly superior in form, compactness, and symmetry. They shall be sound, healthy, vigorous, well branched, and densely foliated when in leaf; free of disease and insects, eggs, or larvae; and shall have healthy, well-developed root systems. They shall be free from physical damage or other conditions that would prevent vigorous growth.
- F. Trees with multiple leaders, unless specified, will be rejected. Trees with a damaged or crooked leader, bark abrasions, sunscald, disfiguring knots, insect damage, or cuts of limbs over 3/4 in. in diameter that are not completely closed will be rejected.
- G. Plants shall conform to the measurements specified, except that plants larger than those specified may be used if approved by the Landscape Architect. Use of larger plants shall not increase the contract price. If larger plants are approved, the root ball shall be increased in proportion to the size of the plant.
- H. Caliper measurements shall be taken on the trunk 6 in. above the natural ground line for trees up to and including 4 in. in caliper, and 12 in. above the natural ground line for trees over 4 in. in caliper. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to branch tip. Plants shall be measured when branches are in their normal position. If a range of sizes is given, no plant shall be less than the minimum size, and no less than 50 percent of the plants shall be as large as the maximum size specified. Measurements specified are minimum sizes acceptable after pruning, where pruning is required. Plants that meet measurements but do not possess a standard relationship between height and spread, according to the *American Standards for Nursery Stock*, shall be rejected.
- I. Substitutions of plant materials will not be permitted unless authorized in writing by the Landscape Architect. If proof is submitted in writing that a plant specified is not obtainable, consideration will be given to the nearest available size or similar variety, with a corresponding adjustment of the contract price.
- J. The plant list on the drawing, is for the contractor's information only, and no guarantee is expressed or implied that quantities therein are correct or that the list is complete. The contractor shall ensure that all plant materials shown on the drawings are included in his or her bid.
- K. All plants shall be labeled by plant name. Labels shall be attached securely to all plants, bundles, and containers of plant materials when delivered. Plant labels shall be durable and legible, with information given in weather-resistant ink or embossed process lettering.

L. Selection and Tagging

1. Plants shall be subject to inspection for conformity to specification requirements and approval by the Landscape Architect at their place of growth and upon delivery. Such approval shall not impair the right of inspection and rejection during progress of the work.
2. A written request for the inspection of plant material at their place of growth shall be submitted to the Landscape Architect at least ten calendar days prior to digging. This request shall state the place of growth and the quantity of plants to be inspected. The Landscape Architect may refuse inspection at this time if, in his or her judgment, sufficient quantities of plants are not available for inspection.
3. All plants shall be selected and tagged by the Landscape Architect at their place of growth. For distant material, photographs may be submitted for pre-inspection review.

M. Anti-Desiccants

1. Anti-desiccants, if specified, are to be applied to plants in full leaf immediately before digging or as required by the Landscape Architect. Anti-desiccants are to be sprayed so that all leaves and branches are covered with a continuous protective film.

N. Balled and Burlapped (B&B) Plant Materials

1. Trees designated B&B shall be properly dug with firm, natural balls of soil retaining as many fibrous roots as possible, in sizes and shapes as specified in the *American Standard for Nursery Stock*. Balls shall be firmly wrapped with nonsynthetic, rottable burlap and secured with nails and heavy, nonsynthetic, rottable twine. The root collar shall be apparent at surface of ball. Trees with loose, broken, processed, or manufactured root balls will not be accepted, except with special written approval before planting.

O. Container Plants

1. Plants grown in containers shall be of appropriate size for the container as specified in the most recent edition of the *American Standard for Nursery Stock* and be free of circling roots on the exterior and interior of the root ball.
2. Container plants shall have been grown in the container long enough to have established roots throughout the growing medium.

P. Bareroot and Collected Plants

1. Plants designated as bareroot or collected plants shall conform to the *American Standard for Nursery Stock*.
2. Bareroot material shall not be dug or installed after bud break or before dormancy.
3. Immediately after harvesting plants, protect from drying and damage until shipped and delivered to the planting site. Rootballs shall be checked regularly and watered sufficiently to maintain root viability.

Q. Transportation and Storage of Plant Material

1. Branches shall be tied with rope or twine only, and in such a manner that no damage will occur to the bark or branches.
2. During transportation of plant material, the contractor shall exercise care to prevent injury and drying out of the trees. Should the roots be dried out, large branches broken, balls of earth broken or loosened, or areas of bark torn, the Landscape Architect may reject the injured tree(s) and order them replaced at no additional cost to the owner. All loads of plants shall be covered at all times with tarpaulin or canvas. Loads that are not protected may be rejected.

3. All bareroot stock sent from the storage facility shall be adequately covered with wet soil, sawdust, woodchips, moss, peat, straw, hay, or other acceptable moisture-holding medium, and shall be covered with a tarpaulin or canvas. Loads that are not protected in the above manner may be rejected.
4. Plants must be protected at all times from sun or drying winds. Those that cannot be planted immediately on delivery shall be kept in the shade, well protected with soil, wet mulch, or other acceptable material, and kept well watered. Plants shall not remain unplanted any longer than three days after delivery. Plants shall not be bound with wire or rope at any time so as to damage the bark or break branches. Plants shall be lifted and handled with suitable support of the soil ball to avoid damaging it.

R. Mechanized Tree Spade Requirements

1. Trees may be moved and planted with an approved mechanical tree spade. The tree spade shall move trees limited to the maximum size allowed for a similar B&B root-ball diameter according to the *American Standard for Nursery Stock* or the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller. The machine shall be approved by the Landscape Architect prior to use. Trees shall be planted at the designated locations in the manner shown in the plans and in accordance with applicable sections of the specifications.

## 2.3 MATERIALS FOR PLANTING

- A. Mulch: At all planting areas, mulch shall be triple shredded hardwood bark mulch (non-dyed). Material shall be mulching grade, uniform in size, and free of foreign matter. Submit sample for approval.
- B. Anti-desiccant: shall be an emulsion specifically manufactured for agricultural use, which provides a protective film over plant surfaces. Anti-desiccants shall be delivered in containers of the manufacturer and shall be mixed according to the manufacturer's directions. Submit manufacturer literature for approval.

## PART 3 – EXECUTION

### 3.1 EXCAVATION OF PLANTED AREAS

- A. Locations for plants and/or outlines of areas to be planted are to be staked out at the site. Locate and mark all subsurface utility lines. Approval of the stakeout by the Landscape Architect is required before excavation begins.
- B. Tree, shrub, and groundcover beds are to be excavated to the depth and widths indicated on the drawings. If the planting area under any tree is initially dug too deep, the soil added to bring it up to the correct level should be thoroughly tamped.
- C. The sides of the excavation of all planting areas shall be sloped at 45 degrees. The bottom of all beds shall slope parallel to the proposed grades or toward any subsurface drain lines within the planting bed. The bottom of the planting bed directly under any tree shall be horizontal such that the tree sits plumb.

- D. Maintain all required angles of repose of the adjacent materials as shown on the drawings. Do not excavate compacted subgrades of adjacent pavement or structures.
- E. Subgrade soils shall be separated from the topsoil, removed from the area, and not used as backfill in any planted or lawn area. Excavations shall not be left uncovered or unprotected overnight.
- F. For trees and shrubs planted in individual holes in areas of good soil that is to remain in place and/or to receive amendment in the top 6 in. layer, excavate the hole to the depth of the root ball and to widths shown on the drawing. Slope the sides of the excavation at a 45 degree angle up and away from the bottom of the excavation.
- G. In areas of slowly draining soils, the root ball may be set up to 3 in. or 1/8 of the depth of the root ball above the adjacent soil level.
- H. Save the existing soil to be used as backfill around the tree.
- I. On steep slopes, the depth of the excavation shall be measured at the center of the hole and the excavation dug as shown on the drawings.
- J. Detrimental soil conditions: The Landscape Architect is to be notified, in writing, of soil conditions encountered, including poor drainage that the contractor considers detrimental to the growth of plant material. When detrimental conditions are uncovered, planting shall be discontinued until instructions to resolve the conditions are received from the Landscape Architect.
- K. Obstructions: If rock, underground construction work, utilities, tree roots, or other obstructions are encountered in the excavation of planting areas, alternate locations for any planting shall be determined by the Landscape Architect.

### **3.2 INSTALLATION OF TOPSOIL**

- A. Prior to the installation of topsoil, install subsurface drains, irrigation main lines, lateral lines, and irrigation risers shown on the drawings.
- B. The Landscape Architect shall review the preparation of subgrades prior to the installation or modification of topsoil.
- C. Do not proceed with the installation of topsoil until all utility work in the area has been installed.
- D. Protect adjacent walls, walks, and utilities from damage or staining by the soil. Use 1/2 in. plywood and/or plastic sheeting as directed to cover existing concrete, metal, masonry work, and other items as directed during the progress of the work.
- E. Clean up any soil or dirt spilled on any paved surface at the end of each working day.
- F. Any damage to the paving or architectural work caused by the soils installation contractor shall be repaired by the general contractor at the soils installation contractors expense.

- G. Till the subsoil into the bottom layer of topsoil or planting mix.
- H. Loosen the soil of the subgrade to a depth of 2 to 3 in. with a rototiller or other suitable device. Spread a layer of the specified topsoil 2 in. deep over the subgrade. Thoroughly till the topsoil and the subgrade together.
- I. Immediately install the remaining topsoil in accordance with the following specifications:
- J. Shrub and Groundcover Beds: Prepare specified depth of the approved topsoil graded to meet elevations indicated on engineering plans. Thoroughly roto-till and break up subsoil to a minimum of 6" depth. Remove debris, gravel, rocks and other deleterious material over 1" in diameter, within 12" of surface shrub beds and tree pits, from the project site.  
Trees: For trees which are not located within topsoil shrub beds, prepare 2" of the approved topsoil in the future root zone area or each tree (minimum 8' radius of trunk in all directions) and thoroughly till in to a depth of 6" – 8".
- K. Do not compact topsoil but do wet-soak planting areas to assure proper settlement. Replace topsoil to specified grade after watering, where necessary.
- L. Protect the tilled area from traffic. Do not allow the tilled subgrade to become compacted.
- M. In the event that the tilled area becomes compacted, till the area again prior to installing the planting mix.
- N. Soils shall be thoroughly mixed and tilled with tractor driven PTO tiller unless impossible due to space constraints. In confined areas, heavy duty manual tiller will be used.
- O. Topsoil shall not be stripped, transported, or graded if moisture content exceeds field capacity or if the soil is frozen.
- P. Topsoil stockpiles shall be protected from erosion and contamination.
- Q. Subsoiling: When subsoiling is indicated on the drawings, use a chisel plow subsoil ripping tool mounted on a machine of sufficient power to make vertical trenches 18 in. deep into the subsoil 24 in. apart. Run the ripping tool over each area in opposite directions so that each area is ripped twice to thoroughly break up the compacted subgrade material prior to the installation of topsoil. Install the remaining topsoil in 8- to 10-in. lifts to the depths and grades shown on the drawing. The depths and grades shown on the drawings are the final grades after soil settlement and shrinkage of the organic material. The contractor shall install the soil at a higher level to anticipate this reduction of soil volume, depending on predicted settling properties for each type of soil.
- R. Phase the installation of the soil such that equipment does not have to travel over already-installed topsoil or planting mixes.
- S. Compact each lift sufficiently to reduce settling but not enough to prevent the movement of water and feeder roots through the soil. The soil in each lift should feel firm to the foot in all areas and make only slight heel prints. Over compaction shall be determined by the following field percolation test.
  - 1. Dig a hole 10 in. in diameter and 10 in. deep.

2. Fill the hole with water and let it drain completely. Immediately refill the hole with water, and measure the rate of fall in the water level.
3. In the event that the water drains at a rate less than 1 in. per hour, till the soil to a depth required to break the over compaction.
4. The Landscape Architect shall determine the need for, and the number and location of percolation tests based on observed field conditions of the soil.
5. Maintain moisture conditions within the soils during installation to allow for satisfactory compaction. Suspend installation operations if the soil becomes wet. Do not place soils on wet or frozen subgrade.
6. Provide adequate equipment to achieve consistent and uniform compaction of the soils. Use the smallest equipment that can reasonably perform the task of spreading and compaction.
7. Add lime, sulfur, fertilizer, and other amendments during soil installation. Spread the amendments over the top layer of soil and till into the top 4 in. of soil. Soil amendments may be added at the same time that organic matter, when required, is added to the top layer of soil.
8. Protect soil from over compaction after placement. An area that becomes over compacted shall be tilled to a depth of 6 in.. Uneven or settled areas shall be filled and regraded.

### **3.3 FINE GRADING**

- A. Grade the surface of all planted or lawn areas to meet the grades shown on the drawings or to be flush with the adjacent surface after the 12-month settling period. Set grades at time of installation high enough relative to the type of soil mix and settlement anticipated so that the soil will be at the correct grades after the settlement period. Adjust the finish grades to meet field conditions as directed.
- B. Provide for positive drainage from all areas toward the existing inlets and drainage structures.
- C. Provide smooth transitions between slopes of different gradients and direction. Modify the grade so that the finish grade is flush with all paving surfaces or as directed by the drawings.
- D. Fill all dips and remove any bumps in the overall plane of the slope.
- E. The tolerance for dips and bumps in lawn areas shall be a 1/2 in. deviation from the plane in 10 ft.
- F. The tolerance for dips and bumps in shrub planting areas shall be a 1 in. deviation from the plane in 10 ft.
- G. All fine grading shall be inspected and approved by the Landscape Architect prior to planting, mulching, sodding, or seeding.

### **3.4 PLANTING OPERATIONS**

- A. Plants shall be set on flat-tamped or unexcavated pads at the same relationship to finished grade as they were to the ground from which they were dug, unless otherwise noted on the drawings. Plants must be set plumb and braced in position until topsoil has been placed and tamped around the base of the root ball. Improper compacting of the soil around the root ball may result



in the tree settling or leaning. Plants shall be set so that they will be at the same depth and so that the root ball does not shift or move laterally one year later.

- B. Determine the elevation of the root flare and ensure that it is planted at grade. This may require that the tree be set higher than the grade in the nursery.
- C. If the root flare is less than 2 in. below the soil level of the root ball, plant at the tree the appropriate level above the grade to set the flare even with the grade. If the flare is more than 2 in at the center of the root ball the tree shall be rejected.
- D. Lift plants only from the bottom of the root balls or with belts or lifting harnesses of sufficient width not to damage the root balls. Do not lift trees by their trunk or use the trunk as a lever in positioning or moving the tree in the planting area.
- E. Remove plastic, paper, or fiber pots from containerized plant material. Pull roots out of the root mat, and cut circling roots with a sharp knife. Loosen the potting medium and shake away from the root mat. Immediately after removing the container, install the plant such that the roots do not dry out. Pack planting mix around the exposed roots while planting.
- F. The roots of bare-root trees shall be pruned at the time of planting to remove damaged or undesirable roots (those likely to become a detriment to future growth of the root system). Bare-root trees shall have the roots spread to approximate the natural position of the roots and shall be centered in the planting pit. The planting-soil backfill shall be worked firmly into and around the roots, with care taken to fill in completely with no air pockets.
- G. Cut ropes or strings from the top of shrub root balls and trees smaller than 3 in. caliper after plant has been set. Remove burlap or cloth wrapping and any wire baskets from around top half of balls. Do not turn under and bury portions of burlap at top of ball.
- H. Completely remove any waterproof or water-repellant strings or wrappings from the root ball and trunk before backfilling.
- I. Place existing topsoil and/or topsoil into the area around the tree, tamping lightly to reduce settlement.
- J. For plants planted in individual holes in existing soil, add any required soil amendments to the soils, as the material is being backfilled around the plant. Ensure that the amendments are thoroughly mixed into the backfill.
- K. For plants planted in large beds of prepared soil, add soil amendments during the soil installation process.
- L. Ensure that the backfill immediately around the base of the root ball is tamped with foot pressure sufficient to prevent the root ball from shifting or leaning.
- M. Thoroughly water all plants immediately after planting. Apply water by hose directly to the root ball and the adjacent soil.
- N. Remove all tags, labels, strings, etc. from all plants.

- O. Remove any excess soil, debris, and planting material from the job site at the end of each workday.
- P. Form watering saucers 4 in. high immediately outside the area of the root ball of each tree as indicated on the drawings.

### **3.5 STAKING AND GUYING**

- A. Stake or guy a tree only when necessary for the specific conditions encountered and with the approval of the Landscape Architect or as noted on the drawings. Staking may be required in unusual circumstances such as sandy soils in either the root ball or adjacent soils or in extremely windy locations. Poor-quality trees with cracked, wet, or loose root balls, poorly developed trunk-to-crown ratios, or undersized root balls shall be rejected if they require staking, unless written approval to permit staking or guying as a remedial treatment is obtained from the Landscape Architect. Trees that settle out of plumb due to inadequate soil compaction either under or adjacent to the root ball shall be excavated and reset. In no case shall trees that have settled out of plumb be pulled upright using guy wires.
- B. When required, staking and guying methods shall be approved by the Landscape Architect. If no staking or guying requirements appear on the drawings, submit for approval a drawing of the staking or guying method to be used. Stakes, anchors, and wires shall be of sufficient strength to maintain the tree in an upright position that overcomes the particular circumstances that initiated the need for staking or guying. Guy wires shall be galvanized, multistrand, twisted wire.
- C. Where guy wires are attached around the tree, the trunk shall be protected with 3/4 in. diameter rubber hose, black in color, and of sufficient length to extend past the trunk by more than 6 in.
- D. Stakes and guys shall be installed immediately upon approval or planting, and shall be removed at the end of the first growing season. Any tree that is not stable at the end of this time shall be rejected.
- E. One tree shall be staked as a sample of the standard of work. The Landscape Architect shall approve the sample staking before the Contractor proceeds with the remaining trees to be staked.

### **3.6 WRAPPING**

- A. Wrap the trunk of any tree only when necessary for the specific conditions encountered and with the approval of the Landscape Architect. Wrapping may be required for thin-barked species in unusual circumstances such as trees planted adjacent to South- or West-facing reflective surfaces, or when it is impossible to plant the tree with the trunk oriented to the same north orientation that it held in the growing nursery.
- B. When required, wrapping methods shall be approved by the Landscape Architect. If no wrapping requirements appear on the drawings, submit for approval a drawing of the wrapping method to be used. Wrapping material shall be as specified in this specification. Wrapping material shall be fastened using a biodegradable tape. All tape shall be loosely wrapped around

the wrapping material in single layer to permit its breakdown in sunlight and permit a minimum of 1 in. of unrestricted trunk growth. Stapling or tying the wrap with non- or slowly biodegradable tape or any synthetic or natural fiber string shall be prohibited.

- C. Wrapping material shall be applied from the base of the tree to the first branch.
- D. All wrapping material shall be removed no later than at the end of the year after planting or as specified by the Landscape Architect.

### **3.7 PRUNING**

- A. Plants shall not be heavily pruned at the time of planting. Pruning is required at planting time to correct defects in the tree structure, including removal of injured branches, double leaders, waterspouts, suckers, and interfering branches. Healthy lower branches and interior small twigs should not be removed except as necessary to clear walks and roads. In no case should more than one-quarter of the branching structure be removed. Retain the normal or natural shape of the plant.
- B. All pruning shall be completed using clean, sharp tools. All cuts shall be clean and smooth, with the bark intact with no rough edges or tears.
- C. Except in circumstances dictated by the needs of specific pruning practices, tree paint shall not be used. The use of tree paint shall be only upon approval of the Landscape Architect. Tree paint, when required, shall be paint specifically formulated and manufacturing for horticultural use.
- D. Pruning of large trees shall be done from a hydraulic man-lift such that it is not necessary to climb the tree.

### **3.8 MULCHING**

- A. All trees, shrubs, and other plantings will be mulched with mulch previously approved by the Landscape Architect. The mulch on trees and shrubs shall be to the depths shown on the drawing. Mulch must not be placed within 3 in. of the trunks of trees or shrubs.
- B. Final grade of mulch shall be ½” below adjacent surface or steel edging to prohibit washout or migration of mulch to adjacent surface.

### **3.9 MAINTENANCE OF TREES, SHRUBS, AND VINES**

- A. Maintenance shall begin immediately after each plant is planted and continue until its acceptance has been confirmed by the Landscape Architect.
- B. Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, tightening and repairing guys and stakes, resetting plants to proper grades or upright position, restoring of the planting saucer, and furnishing and applying such sprays or other materials as necessary to keep plantings free of insects and diseases and in vigorous condition.

- C. Planting areas and plants shall be protected at all times against trespassing and damage of all kinds for the duration of the maintenance period. If a plant becomes damaged or injured, it shall be treated or replaced as directed by the Landscape Architect at no additional cost.
- D. Watering: Contractor shall irrigate as required to maintain vigorous and healthy tree growth. Overwatering or flooding shall not be allowed. The contractor shall monitor, adjust, and use existing irrigation facilities, if available, and furnish any additional material, equipment, or water to ensure adequate irrigation. Root balls of all trees and large shrubs shall be spot watered using handheld hoses during the first four months after planting, as required to ensure adequate water within the root ball.
- E. During periods of restricted water usage, all governmental regulations (permanent and temporary) shall be followed. The contractor may have to transport water from ponds or other sources, at no additional expense to the owner when irrigation systems are unavailable.

### **3.10 "AS-BUILT" DRAWINGS**

- A. Prepare an "As-Built" draw to show deviations from the bid documents made during construction. The drawings shall be delivered to the Landscape Architect before final acceptance of work. Upon approval of the "As-Built" drawings, the Prime Contractor shall be responsible for submittal of two (2) reproducible set of plans to the Owner.

### **3.11 FINAL ACCEPTANCE**

- A. The Landscape Architect shall inspect all work for acceptance upon written request of the contractor at the point of substantial completion. The request shall be received at least ten calendar days before the anticipated date of inspection.
- B. Acceptance of plant material shall be for general conformance to specified size, character, and quality and shall not relieve the contractor of responsibility for full conformance to the contract documents, including correct species.
- C. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Landscape Architect, the Landscape Architect shall certify in writing that the work has been accepted.

### **3.12 ACCEPTANCE IN PART**

- A. Work may be accepted in parts when the Landscape Architect and contractor deem that practice to be in their mutual interest. Approval must be given in writing by the Landscape Architect to the contractor verifying that the work is to be completed in parts. Acceptance of work in parts shall not waive any other provision of this contract.

### **3.13 GUARANTEE PERIOD AND REPLACEMENTS**

- A. The guarantee period for trees and shrubs shall begin at the date of final acceptance.

- B. The contractor shall guarantee all plant material to be in healthy and flourishing condition for a period of one year from the date of final acceptance.
- C. When work is accepted in parts, the guarantee periods extend from each of the partial acceptances to the terminal date of the guarantee of the last acceptance. Thus, all guarantee periods terminate at one time.
- D. The contractor shall replace, without cost, as soon as weather conditions permit, and within a specified planting period, all plants determined by the Landscape Architect to be dead or in an unacceptable condition during and at the end of the guarantee period. To be considered acceptable, plants shall be free of dead or dying branches and branch tips and shall bear foliage of normal density, size, and color. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification.
- E. The guarantee of all replacement plants shall extend for an additional period of one year from the date of the accepted replacement. In the event that a replacement plant is not acceptable during or at the end of said extended guarantee period, the Landscape Architect may elect subsequent replacement or credit for that item.
- F. At the end of the guarantee, the contractor shall reset grades that have settled below the proposed grades on the drawings.
- G. The contractor shall make periodic inspections, at no extra cost, during the guarantee period to determine what changes, if any, should be made in the maintenance program. If changes are recommended, they shall be submitted in writing to the Landscape Architect. Claims by the contractor that the Owners maintenance practices or lack of maintenance resulted in dead or dying plants will not be considered if such claims have not been documented by the Contractor during the guarantee period.
- H. In the event of a necessary repair or replacement during the guarantee period, the Contractor is expected to respond in a timely manner.
- I. At the end of the guarantee period and upon written request of the contractor, the Landscape Architect can inspect all guaranteed work. The request shall be received at least ten calendar days before the anticipated date of inspection. Upon completion and re-inspection of all repairs or renewals necessary in the judgment of the Landscape Architect at that time, the Landscape Architect shall certify, in writing, that the guarantee period is complete.

**END OF SECTION 32 90 00**

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**SECTION 33 05 00 – COMMON WORK RESULTS FOR UTILITIES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the General and Special Conditions and Division 1 - Specification sections apply to work of this section.

**1.2 DESCRIPTION OF WORK**

- A. Work under this section includes all material certificates; shop drawings; disinfection of all wetted parts of the total system; and field testing of all pipe, pipe fittings, piping specials, and valves in all sections of Division 33 necessary to complete and make serviceable the water supply system.
- B. Related Work Specified Elsewhere:
  - 1. Water Pipe and Pipe Fittings - Section 332110
  - 2. Water Pipe Accessories - Section 332130
  - 3. Water Valves - Section 332120

**1.3 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.
  - 1. AWWA: All applicable standards
  - 2. North Carolina Division of Health Services: All rules and regulations

**PART 2 - PRODUCTS - None****PART 3 - EXECUTION****3.1 DISINFECTION OF NEW WATER SYSTEMS**

Before being placed into service, and before certification of completion by the Engineer, all new water systems, or extensions to existing systems or valved section of such extensions, or any replacement in the existing water system, or any exposed section of the existing system shall be disinfected as follows:

## DISINFECTION OF NEW SYSTEMS

(a) All interior surfaces of new potable water supply systems, including wells, filters, storage tanks and distribution lines shall be thoroughly disinfected by means of hypochlorite or chlorine solutions, after which bacteriological test samples shall be collected.

(b) After disinfection the water supply shall not be placed into service until bacteriological test results of representative water samples analyzed in an approved laboratory are found to be satisfactory.

## DISINFECTION OF STORAGE TANKS AND DISTRIBUTION SYSTEMS

(a) Water distribution systems, including storage tanks and water mains, after flushing to remove sediment and other foreign matter, and after testing for leaks, shall be disinfected by the addition and thorough dispersion of a chlorine solution in concentrations sufficient to produce a chlorine residual of at least 100 milligrams per liter (or ppm) in the water throughout the distribution system, including all water mains and storage tanks.

(b) The chlorine solution shall remain in contact with interior surfaces of the water system for a period of 24 hours. Then the water system shall be flushed with fresh water from an approved water source until the chlorine solution is dispelled.

(c) Representative samples of the water shall then be collected. If bacteriological tests of the samples indicate that the water quality is satisfactory, the water mains and storage tanks may be placed in service.

(d) In unusual situations where large volume tanks are involved and where there is not sufficient water available to fill the tank or there is not available a suitable drainage area for the chlorinated water, an alternate disinfection procedure for tanks may be proposed. Such proposal must be submitted in writing completely describing the proposed disinfection procedure and substantiating the need for an alternate procedure in the particular circumstance. Such alternate procedure must be approved before being implemented. The conclusion of the department shall be final."

The Contractor shall be required to make arrangements for having tests conducted. All expenses incurred in making tests shall be borne by the Contractor and should be included in his bid.

### **3.2 TESTING NEW WATER LINES**

- A. The following test sequence shall be included in all water system extension specifications unless otherwise directed by the Engineer.
1. Perform pretest inspection.
  2. Clean the main.
  3. Perform the hydrostatic tests.
  4. Apply the proper dosage of chlorine.
  5. Allow chlorine solution to remain in the water main a minimum of 24 hours.
  6. Flush the main.
  7. Assist the Owner in taking bacteriological samples.



B. Pretest Inspection:

Prior to the commencement of hydrostatic testing and chlorination, the Engineer shall be contacted to request scheduling of inspection and testing. A Engineer's Representative shall visually inspect the installation prior to testing to insure that all fire hydrants, valves and other appurtenances are properly located, operable, and installed at the proper grade. All defects disclosed by the inspection shall be corrected prior to testing.

C. Cleaning Of The Main:

1. Cleaning of Water Mains 4" and Smaller in Diameter: Mains smaller than 4" in diameter shall be cleaned by flushing. Flushing velocity shall be adequate to remove all debris and other undesirable material and a minimum of 2-1/2 feet per second.
2. Cleaning of Water Mains 4" and Larger in Diameter: Mains shall be flushed only in the presence of Owner's Representative. No valves or hydrants shall be operated without the express permission of the Owner.

D. Cleaning of lines 4" and larger in diameter shall be accomplished by passing through the pipe a polyethylene "pig" of the appropriate size and density. Pig(s) shall be furnished by the Contractor. The procedure shall be as follows:

The Contractor shall prepare the main for the installation and removal of pig(s) as required:

1. In general, this will consist of furnishing all equipment, material, and labor to satisfactorily install and remove the pig(s).
2. Prior to scheduling a preconstruction conference, the Contractor shall submit a "pigging" plan to the Engineer for approval.
3. Where expulsion of the pig is required through a dead end main, Contractor shall prevent the backflow of purged water into the main after expulsion of the pig. For pipe 12" or less in diameter, purged water can be prevented from reentering into the pipe by the temporary installation of pipe and fittings as required to provide a riser with an above ground discharge. On larger pipe, additional excavation of the trench may serve the same purpose.
4. After expulsion of the pig, completion of flushing, and at the direction of the Engineer, the Contractor shall complete work at openings by plugging, blocking, backfilling and completion of all appurtenant work necessary to secure the system.
5. Under the supervision of the Inspector, pig(s) shall be propelled via water pressure through the main(s) from the point of insertion to the point of expulsion. Where mains are in the form of a loop, the Contractor shall "pig" the complete system.
6. As an alternate to "pigging", dead end pipe of less than 100 feet in length which are difficult to "pig" may be cleaned by flushing. Flushing shall be accomplished in the same manner as that required for pipes less than four inches in diameter.

E. Hydrostatic Test:

1. Unless otherwise permitted, testing shall be performed between each main line valve in accordance with AWWA C600. The Owner will, except when certain circumstances dictate otherwise, permit the lengths of test sections to be a maximum of 1500 feet in

subdivisions or other areas where the new main has closely spaced valves. Testing shall be done only in the presence of Owner's Representative unless directed otherwise. Testing shall be performed using a suitable pump and an accurate gauge graduated in 1.0 psi increments. The section of the main to be tested shall be subjected to a test pressure of 150 psi for a period of two (2) hours. The leakage of the test section shall be accurately determined and compared to the schedule shown below. All visible leaks shall be repaired regardless of the amount of leakage.

PIPE SIZE (inches)	ALLOWABLE LEAKAGE (Gallons per hour per 1000 feet of pipe)
2	0.16
4	0.33
6	0.50
8	0.66
10	0.83
12	0.99
14	1.29
16	1.47
18	1.66
20	1.84

2. If the leakage is greater than the allowable leakage as given by the above table, the Contractor shall replace any defective materials and perform all necessary work to insure that the installation is acceptable and a retest shall be performed subsequent to any repair work performed. Remedial repair work and retesting shall be repeated until the leakage occurring during the test period is less than or equal to the allowable leakage.
3. Chlorination:
  - a. Chlorination shall be performed only in the presence of Owner's Representative and shall be performed only after the line is complete and has tested satisfactorily for leakage.
  - b. Chlorination taps will be made within five (5) pipe diameters of the water main control valve at the upstream end of the line and at all extremities of the line.
  - c. Sufficient chlorine solution shall be applied to bring the concentration within the main to a minimum of 100 ppm free chlorine residual.
  - d. The chlorine solution shall be introduced to the main at a constant rate while regulating the flow of water through the main being chlorinated such that the required concentration of chlorine is achieved throughout.
  - e. All valves within the section of main being chlorinated shall be operated once during the contact period.
  - f. The chlorine solution shall remain in the lines for no less than twenty-four (24) hours, longer if so directed by the Engineer.

- g. Services shall be chlorinated at the same time and by the same method utilized for the main.
- h. Extreme care shall be taken to prevent contamination of existing water mains during the test period. If an existing main is contaminated, the section of main subjected to the possible contamination shall be flushed and chlorinated in accordance with the requirements for new mains.
- i. The Engineer will advise the Contractor when a suitable period of time has elapsed for chlorine contact. The main shall be flushed thereafter in the presence and under the direction of the Owner's Representative. The flushing of the main shall be considered complete when the chlorine concentration with the main is less than or equal to the lesser of the following values:
  - One (1) part per million (ppm) free chlorine.
  - The free chlorine concentration within the existing main to which the extension has been connected.
- j. The Contractor shall be responsible for insuring that high-strength chlorine solution is contained on-site and not allowed to make its way to any watercourse, stream, creek, lake, or other body of water.

F. Bacteriological Testing:

1. After completion of chlorination and flushing, the Contractor shall obtain sufficient bacteriological samples for complete testing.
2. The Owner shall determine the location of samples and the number of samples necessary to provide a test group which is representative of the section of main being tested.
3. A failure of any sample of a test group shall constitute failure of the entire test group from which the sample was taken. Such failure shall require two (2) successive passing test groups to substantiate that the main has been satisfactorily chlorinated. The second of the two successive test groups of samples will not be collected before nor unless the first group has passed.
4. The Contractor may, at his option, rechlorinate and retest the section of water main upon failure of the test group.
5. If two (2) successive bacteriological test groups fail, the section of main from which the group is taken shall be rechlorinated and retested until the main is shown to be properly chlorinated in accordance with the above requirements.

**3.3 TESTING NEW FORCE MAINS**

- A. The following test sequence shall be followed for sewer force mains unless otherwise directed by the Engineer.
  - 1. Perform pretest inspection (same as 3.2.B)
  - 2. Clean the main (same as 3.2.C)
  - 3. Perform the hydrostatic tests (same as 3.2.E).

**END OF SECTION 33 05 00**

**SECTION 33 21 10 – WATER PIPE AND PIPE FITTINGS****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

**1.2 DESCRIPTION OF WORK**

- A. The extent of work under this item includes providing and installing all pipe and pipe fittings as shown on the drawings and described herein necessary to make complete and serviceable the finished water main.
- B. Related Work Specified Elsewhere:
  - 1. Trenching, Backfilling and Compaction: Section 312200
  - 2. Common Work Results for Utilities: Section 330500
  - 3. Water Valves: Section 332120

**1.3 QUALITY ASSURANCE**

- A. General: Class numbers or pressure rating shall be clearly marked on the pipe and fittings at the factory. The materials used for the construction of water mains and all accessories and appurtenances thereof shall be new, free of defects in product and workmanship and of the highest quality available in the industry. Materials not specified but deemed equal to those specified may be approved for use provided the documentation and samples necessary for approval are provided to the Engineer thirty (30) days prior to the ordering of said materials. WRITTEN APPROVAL must be issued by the Engineer before such material may be used in construction. Current specifications (latest revisions) shall apply in all cases where materials are described by reference to published standards such as ASTM, AWWA, ANSI., etc.
- B. Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.
  - 1. AWWA: All applicable standards
  - 2. North Carolina Division of Environmental Management: All rules and regulations
  - 3. North Carolina Division of Health Services: All rules and regulations.

**1.4 SUBMITTALS**

- A. Material Certificates: Provide notarized materials certificates signed by the material manufacturer. Certify that each material item complies with the specified requirements, and was purchased for this project.

- B. Shop Drawings: Submit shop drawings on all flanged fittings.

## **PART 2 - PRODUCTS**

Water Main and Fittings: Water mains shall be constructed of polyvinyl chloride (PVC) or ductile iron pipe (DIP) at the option of the Contractor, except in instances where the plans or the Engineer specifically requires a particular pipe material be utilized for an installation. All plastic pipe shall bear the seal of the National Sanitation Foundation.

2" & 3" PVC Pipe: PVC water main and services shall be PVC Class 200 SDR 21 conforming to the latest revisions of ASTM D 1784 and ASTM D2241 with "push-on" joints. Pipe shall be furnished in nominal twenty foot (20') lengths. Fittings for service pipe shall be schedule 80 PVC with solvent weld joints.

PVC Water Mains 4 Inches and Larger in Diameter: PVC water main 4 inches and larger shall be manufactured in accordance with AWWA Standard C900. The pipe shall have push-on type joints with elastomeric gaskets. The pipe shall be pressure rated at 150 psi with a dimension ratio of 18 for both bell and pipe thickness. Pipe shall be furnished in nominal twenty foot (20') lengths.

Ductile Iron Pipe: Ductile iron pipe for water mains shall be manufactured in conformance with AWWA C151 and shall be cement-mortar lined with an asphaltic coating in accordance with AWWA C104. The exterior of the pipe shall be bituminous coated in accordance with AWWA C-151. The minimum thickness Class of pipe shall be Class 50. Pipe shall be furnished in nominal 18 to 20 foot lengths. Pipe joints for ductile iron pipe shall be "push-on" unless the additional pipe deflection allowed by mechanical joints is necessary or other considerations dictate the use of mechanical joints. The joints for ductile iron pipe shall conform to AWWA Standard C111 revision (ANSI A21.11).

Polyethylene Encasement: Polyethylene encasement shall be applied to all underground ductile iron pipe and fitting installations. Materials and installation procedures shall be in accordance with ANSI/AWWA C-105/A21.5-88.

Fittings: Tees, elbows and other fittings for PVC C-900 pipe and ductile iron pipe shall be of ductile iron unless otherwise permitted or required by the Owner. Standard dimension fittings or compact fittings may be used in accordance with the requirements of this Section.

The interior of all fittings shall be cement mortar lined with an asphaltic coating in accordance with AWWA Standard C-104 (ANSI 21.4). The exterior of all fittings shall have a one (1) mil bituminous coating in accordance with AWWA Standard C-110 (ANSI A21.10).

Compact fittings shall be ductile iron with either push-on or mechanical joints in accordance with ANSI/AWWA C153/A21.53-84. Cement lining with an asphaltic coating shall be provided in accordance with ANSI/AWWA C104/A21.4.

"Push-on" joints shall be used unless the additional deflection allowed by mechanical joints or other considerations dictate the use of mechanical joints.

Standard dimension fittings for PVC C-900 pipe and ductile iron pipe shall be of ductile iron with "push-on" joints unless the additional pipe deflection allowed by mechanical joints or other considerations dictate the use of mechanical joints. The fittings shall comply with all requirements of AWWA Standard C-110 (ANSI A21.10) and shall be designed for a minimum working pressure of 150 psi plus 100 psi surge pressure.

Restraint devices for use on ductile iron and C-900 PVC “push-on” joints: shall be constructed of high strength ductile iron, ASTM A536, Grade 65-45-12 and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength, low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Block Buster Series 1390-C, Star Pipe Products Allgrip series 3600 and Pipe Restrainers Series 1200S, or approved equal.

Restraint devices for use on mechanical joint to C-900 PVC: shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1500, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc GripRing or approved equal.

Restraint devices for use on mechanical joint ductile iron: shall be constructed of high strength ductile iron, conforming to the requirements of ASTM A536, Grade 65-45-12, and shall incorporate machined serrations on the inside diameter to provide positive restraint, exact fit, full circle contact and support of the pipe in an even and uniform manner. Bolts and connecting hardware shall be of high strength low alloy material in accordance with ANSI/AWWA C111/A21.11, latest revision thereof. All devices shall have a safety factor of no less than 2:1 at the full rated pressure of the pipe on which it is installed. They shall be UL listed and Factory Mutual approved. Restraining devices shall be Uni-Flange Series 1300-C, Star Pipe Products, Allgrip Series 3600, Romac Industries, Inc. GripRing or approved equal.

## **2.2 JOINTS AND JOINTING MATERIALS FOR LARGE PIPE**

General: Where the joint type is not indicated on the drawings, either push-on or mechanical joints shall be furnished for buried pipe.

Ductile Iron:

Push-on joints shall conform to applicable requirements of AWWA C111 (ANSI A21.11). Gaskets and lubricants for pipe fittings shall conform to applicable requirements of AWWA C111 (ANSI A21.11).

Mechanical joints, including pipe ends, glands, bolts and nuts, and gaskets, shall conform to applicable requirements of AWWA C111 (ANSI A21.11).

Pipe capable of joint deflection of up to 5 degrees per joint shall be provided.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Adherence to Standards and Instructions: All pipe, of whatever material, shall be transported, handled, stored, and installed in keeping with applicable AWWA, ASTM etc. standards and manufacturer's instructions for the particular pipe material involved. For PVC piping system, the latest edition of the CHEMTROL PLASTIC PIPING HANDBOOK as published by Celanese Piping Systems, Inc., Louisville, Kentucky, shall be the project reference manual and instructions contained therein shall be followed.
- B. Responsibility for Materials: During loading, transportation, unloading and storage, every precaution shall be taken to prevent injury to pipe, fittings and accessories and to keep them from dirt and foreign matter at all times. Particular care shall be taken to prevent damage to pipe and fitting linings and coatings. Pipe shall be protected during handling against impact shocks and free fall. Pipe shall be kept clean at all times, and no pipe shall be used in the work that does not conform to the appropriate specifications.
- C. Provide caps or plugs for open ends of pipe lines and equipment during installation to keep dirt and other foreign matter out of pipe and equipment.
- D. Expansion: All piping mains, branches, and runouts shall be so installed as to allow for free expansion and contraction without developing leaks or undue stressing of pipe. Stresses shall be within allowable limits of ASA Code B31.1 for pressure piping.

### 3.2 EXTERIOR

- A. General Pipe Laying: All pipe, special castings, valves, fittings, and the bells and/or spigots of same shall be thoroughly cleaned of all earth or other foreign matter before being fitted together. The spigot end shall be adjusted in the bell of the pipe, special casting or valve to allow for uniform gasket space, and the pipe shall be completely forced home and held there.

Prior to being lowered into the trench, each joint of pipe shall be carefully given a final inspection to see that each is clean, sound, and free of defects. Damaged sections shall be repaired to the satisfaction of the Engineer or removed from the Site.

- B. Pipe shall be laid accurately to the line and grade as designated on the job plans. Bell holes shall be excavated for each joint to assure bedding supports the barrel of the pipe and to facilitate making a perfect joint.
- C. Pipe shall be laid in perfect alignment between turns. No abrupt changes, either in grade or alignment, will be acceptable. At such locations where alignment changes are indicated on the plans, fittings and adjacent pipe shall be self restrained by harnesses or special fittings or external blocking. Do not bend or deflect pipe more than recommended by manufacturer.
- D. Cross above or below existing pipe a minimum of 12" unless otherwise directed by the Engineer.



- E. During construction of the line work the lines shall be kept free from debris. Trenches shall be kept free from water; and when work is not in progress, all open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substances will enter the pipe or fittings. At the end of each day's work, the pipe shall be inspected to insure that dirt, water, and other materials have not entered the pipe.

**3.3 PIPING JOINTS AND CONNECTIONS**

- A. Mechanical Joints: Make up with Style A plain rubber molded gaskets, unless otherwise specified. Preparatory to making pipe joints, all surfaces of the portion of the pipe to be jointed or of the factory-made jointing materials shall be clean and dry. Gaskets, whether for the mechanical joint type or push joint type, shall be clean, flexible, and, where lubrication is required, be lubricated with a lubricant recommended by the manufacturer. Provide special joints capable of up to 5 degrees deflection per joint where shown on the drawings. Do not deflect or bend pipe more than recommended by manufacturer.

**3.4 CLEANING**

- A. Piping systems shall be thoroughly cleaned as follows:  
Flush all pipe lines with clean water and perform visual inspection where possible to achieve a clean piping system clear of all debris, rust and dirt.

**3.5 THRUST RESTRAINT**

- A. All plugs, caps, tees and bends deflecting 11-1/4 degrees or more shall be provided with reaction blocking of 2,500 psi concrete or suitable metal harness to prevent movement. Blocking shall be placed between solid earth and the fitting to be anchored. The blocking shall be placed such that pipe and fitting joints are accessible for repair and/or future connections. Where space limitations will not permit installation of concrete blocking where necessary to insure accessibility, where shown on the drawings, or if the Contractor so elects, pipe and fittings may be self restrained in addition to or in lieu of concrete blocking. Pipe shall be designed to carry additional stresses of thrust restraint. Details pertinent to such self-restraining harness, tie rods, special pipe, etc., including design criteria and computations, must be submitted to the Engineer for evaluation prior to incorporating such devices into the work. Systems based on metal to metal friction, such as retainer glands, will not be allowed for pressures above 100 psi.
- B. Reaction Backing: The area of bearing of the concrete backing on the earth in each instance shall be at least equal to that shown in the table below. Minimum bearing area against undisturbed sand trench wall in square feet. Details of placement are shown in the drawing.
- C. Areas shown are for 150 psi test pressure. If test pressure is other than 150 psi, adjust area of reaction backing in direct proportion.

Pipe Size	Tees Plugs	Hydrant 90 Degree Els	Wyes 45 Degree Els	Wyes 22-1/2 Degree Els	Wyes 11-1/4 Degree Els
4"	1	2	1	1	1

6"	3	3	2	1	1
8"	4	6	3	2	1
10"	7	9	5	3	2
12"	9	11	6	3	2
14"	11	15	8	5	3
16"	13	20	10	6	3

Areas based on sand; for other soil conditions revise areas as indicated:

- Cemented Sand or Hardpan - multiply above by 0.5
- Gravel - multiply above by 0.7
- Hard Dry Clay - multiply above by 0.7
- Soft Clay - multiply above by 2.0

**3.6 TESTING PIPING SYSTEMS**

See Section 33 05 00

**3.7 DISINFECTION OF PIPING SYSTEMS**

See Section 33 05 00

**END OF SECTION 33 21 10**

**SECTION 332120 – WATER VALVES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

**1.2 DESCRIPTION OF WORK**

- A. The extent of work covering valves and gates includes furnishing, installing, and making operational all valves and gates as indicated on the drawings and specified herein.
- B. Related Work Specified Elsewhere:
1. Common Work Results for Utilities: Section 330500
  2. Water Pipe and Pipe Fittings: Section 332110
  3. Water Pipe Accessories: Section 332130

**1.3 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.

AWWA: All applicable standards

**1.4 SUBMITTALS**

- A. Shop Drawings: Submit shop drawings for all valves, valve boxes, tapping sleeves, and special items.

**PART 2 - PRODUCTS**

2" Ball Valve: Ball valves for two-inch services shall be bronze body with tee head. The turn required to travel from fully closed to fully open position shall be 90 degrees. Ball valves shall incorporate a check allowing a maximum turn of 90°. Ball valves shall be Hayes 4300, Ford B11-777, A Y McDonald 6101, Mueller B 20283, or approved equal.

Gate Valves (3" and Larger): Gate valves shall conform to the requirements of the latest revision of AWWA Specification C-509/C-515 for resilient seated gate valves. The valve body shall be ASTM A-126 Class B cast iron or ductile iron and shall conform to ASTM A395 or ASTM A536. In addition, ductile iron shall contain no more than 0.08 percent phosphorous. All interior valve parts and surfaces shall be of

corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Such coating shall be recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating. The valves shall open counterclockwise and have non-rising stem operation with 2-inch square operating nuts. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two. The stem shall be of corrosion resistant material and have "O" ring seals. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow. Valves shall have flange connections conforming to ANSI B16.1 Class 125 or mechanical joints conforming to AWWA C-111.

Valves shall be manufactured by Clow, American Flow Control, or Mueller.

Tapping Valves: Tapping valves shall conform to the requirements of the latest revision of AWWA Specification C-509 for resilient seated gate valves. The valve body shall be ASTM A-126 Class B cast iron. All internal valve parts and surfaces shall be of corrosion resistant materials or have an epoxy coating sufficient to prevent corrosion. Such coating shall be recognized by the AWWA for potable water use. Exterior valve parts and surfaces shall be epoxy coated or have the Standard AWWA coating. The valves shall open counterclockwise and have non-rising stem operation with a two inch square operating nut. The maximum number of turns required to fully open or close the valve shall equal three times the pipe diameter plus two. The stem shall be of corrosion resistant material and have O-ring seals. Valves shall provide zero leakage at a working pressure of 200 psi in either direction of line flow. Valves shall have a flange connection conforming to ANSI B16.1 Class 125 and a mechanical joint conforming to AWWA C-111. Valves shall be manufactured by Mueller, Clow or American Flow Control. Tapping valves shall be installed and pressure tested prior to tapping the water line.

Valve Boxes (valves 2" through 10"): Valve boxes shall be of cast iron suitable for H-20 loading. The manufacturer's name and part number shall be cast into each component of the box. The box shall be of the telescoping (slip) type consisting of a base section, center extensions as necessary, and a top section with a cover marked "WATER". Sections shall be selected such that a minimum of four inches (4") of future adjustment (upward and downward) will be possible without section removal or replacement and without the use of adapters. Valve boxes and extensions shall be either of the following:

Charlotte Pipe and Foundry: UTL-274 (valve boxes) and UTL-281 (extensions).

Tyler Pipe: 6855 Series (valve box and extensions). Lid shall be 5 1/4" Drop Lid having a minimum of 1 1/2" deep skirt.

Valve boxes shall be installed in accordance with the Standard Details.

Indicator Post: Cast iron indicator posts shall be provided in the locations shown on the drawings. Posts shall have two large window openings that are fitted with heavy clear plexiglass. Aluminum target plates, with the words OPEN and CLOSED cast in large, easy-to-read, raised letters shall be located behind each window in such a position that the appropriate word appears as the valve is operated. Stem, indicators, and all working parts shall be fully protected from moisture and weather damage by complete enclosure. The indicator posts shall be Clow F-5760, American Flow Control IP-71, Kennedy Valve Model 2945, or equal.

**PART 3 - EXECUTION****3.1 GENERAL**

- A. Install valves in the locations as shown on the drawings, plumb and centered and in absolutely true alignment. Support valves against settlement and misalignment with a suitable, lasting material as approved by the Engineer.
- B. Clean valve interior of all foreign matter before installation. Tighten stuffing boxes and inspect valve in open and closed position to assure that all parts are working properly.

**3.2 PAINTING**

- A. Paint all exposed ferrous metal with two coats of asphalt varnish such as 667 Utility Black by Tnemec, unless otherwise directed by the Engineer.

**3.3 BURIED SERVICE VALVES**

- A. Install valve boxes for gate valves as indicated on the drawings. Adjust length of valve box to bring valve box cover to finished grade elevation. Center valve box over operating nut so that it fits around the stuffing box and rests on compacted ground. Align valve box so that it is plumb. Place and compact material in layers around valve box so as to prevent misalignment or shifting of the valve box or cover.
- B. Where pavement is existing or proposed, the valve box shall be adjusted to finished street grade. When valve boxes are located in grassed or non-paved areas, install a pre-cast concrete collar (6" thick with 12" radius to the outer edge) to final grade.
- C. Valve boxes shall be installed so that a minimum of four inches (4") of upward and four inches (4") of downward (total of eight inches (8")) vertical adjustment is possible without disturbing the base or removal of any box sections unless directed otherwise by Engineer. Valve boxes for 2" ball valves shall be supported by two (2) bricks.
- D. The Contractor shall adjust valve boxes to final grade at the time designated by the Engineer. No additional compensation will be made for valve box adjustment.

**END OF SECTION 33 21 20**

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**SECTION 33 21 30 – WATER PIPE ACCESSORIES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

**1.2 DESCRIPTION OF WORK**

- A. The extent of work covering pipe accessories includes furnishing, installing, and making operational all accessories as indicated on the drawings and specified herein.
- B. Related Work Specified Elsewhere:
  - 1. Common Work Results for Utilities: Section 330500
  - 2. Water Pipe and Pipe Fittings: Section 332110
  - 3. Water Valves: Section 332120

**1.3 QUALITY ASSURANCE**

- A. Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.  
  
AWWA: All applicable standards
- B. Manufacturer's Capabilities: Supplier of accessory items shall be regularly engaged in the manufacture of products of types and sizes required, and which have been in satisfactory use for not less than one year in similar service.

**1.4 SUBMITTALS**

- A. Shop Drawings: Submit shop drawings or product data for all accessory items.

**PART 2 - PRODUCTS****2.1 GENERAL**

- A. Provide factory-fabricated piping accessories as hereinafter specified for use in the service indicated. Provide products of the type and pressure-rating indicated for each service or, if not indicated, provide proper selection as determined by the piping system installer to comply with

installation requirements. Provide sizes and connections matching pipe, tube, valve and equipment connections.

- B. Fire Hydrants: Fire hydrants shall be in accordance with AWWA Standard C502, latest revision thereof, suitable for an operating pressure of not less than 150 pounds per square inch and shall have a traffic breakable feature (safety flange and stem coupling), dry top, sealed lubrication reservoir and a main valve which is held closed with pressure. The hydrant body shall be of cast iron with "O" ring seals and bronze threads on the seat ring and drain ring, and shall have two (2) 2 1/2-inch nozzles and one (1) 4 1/2-inch nozzle with caps having National Standard threads. The hydrant main valve shall be a minimum of 5 1/4 inches in diameter. All continuously wetted hydrant parts and surfaces shall be of corrosion resistant materials or be epoxy coated with epoxy recognized by AWWA for potable water use. The epoxy coating shall be of a color other than black (unless the work "epoxy" is stenciled on the base) to permit distinction between standard and epoxy coatings to be made easily. Hydrants shall be American Flow Control B-84-B, Clow Medallion or Mueller A-423.

The inlet shoe for fire hydrant shall have a six inch (6") inside diameter and shall be cast or ductile iron with mechanical joint fittings in accordance with AWWA Standard C110.

Locked hydrant tees and fittings for fire hydrants shall meet the requirements of AWWA Standard C-111 (ANSI A21-11). Locked tees shall be as manufactured by American Cast Iron Pipe Company, Clow, U.S. Pipe, or approved equal.

- C. Detectable Marking Tape (Tracing Tape): Tape shall be three (3) inches in width with a minimum thickness of 0.5 millimeters (minimum solid center foil thickness of 0.35 millimeters). Color of the tape shall be blue meeting the American Water Works Association color code. Tape shall read: "Caution- Buried Water Line Below". Tape shall be manufactured by Lineguard, Inc., Pro-Line Safety products Co., Empire Level Mfg. Corp., or approved equal.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Install all piping accessories as shown on the drawings complying with all applicable portions of Section 02511 - Pipe and Pipe Fittings, manufacturers' instructions and as directed. Provide accessories of the sufficient size and ratings if not shown to complete and make ready for service all piping systems.
- B. Touch-up paint all surfaces where the primer paint has been damaged or scarred during installation.
- C. All ferrous-metal surfaces for underground installation shall be coated with a bitumastic paint.

**END OF SECTION 33 21 30**



**SECTION 33 31 00 - GRAVITY SANITARY SEWER SYSTEM****PART 1 - GENERAL****1.1 RELATED DOCUMENTS:**

- A. The general provisions of the Contract, including the General and Special Conditions and Division-1 Specification sections apply to work of this section.

**1.2 DESCRIPTION OF WORK:**

- A. The extent of sanitary sewer system work is shown on the drawings.
- B. Types of sanitary sewer facilities include the following:
  - 1. Service Laterals

**1.3 RELATED WORK SPECIFIED ELSEWHERE:**

- A. Clearing, Excavation and Trenching: Section 31 12 13
- B. Common Work Results for Utilities: Section 33 05 00

**1.4 QUALITY ASSURANCE:**

- A. Codes and Standards: Comply with applicable standards contained herein and with the requirements of NCDENR.
- B. Testing and Inspection: Contractor shall provide all necessary equipment and materials and shall perform the visual inspections, air testing and infiltration testing of the system in conformance with the requirements of this section.

**1.5 SUBMITTALS:**

- A. Material Certificates: Provide materials' certificates for pipe and fittings.
- B. Shop Drawings: Submit shop drawings and/or product data for all pipe and fittings, pipe gaskets, transitions, manhole covers and frames.

**PART 2 - PRODUCTS****2.1 SERVICES:**

- A. Sewer Service Pipe: Sewer service pipe shall be Schedule 40 PVC- Drain, Waste and Vent (DWV) pipe in accordance with ASTM D2665 and ASTM D1785. Cleanouts shall be constructed of pipe and fittings which also meet the ASTM requirements for Schedule 40 PVC-DWV pipe. Cleanout caps shall be Charlotte 110 or Jones BP134CSK flush cap.
- B. Service Fittings: Service fittings for use on PVC (SDR 35) pipe shall be standard gasketed wyes manufactured or approved by the pipe manufacturer and shall conform to the requirements of ASTM D3034.
- C. Transition Coupling: Pipe material changes may be permitted provided there is not a substantial difference in inside diameters, a smooth uniform flow line is maintained, and a watertight rubber sleeve or mechanical coupler conforming to ASTM C-425 is used to make the transition. All metal hardware shall be stainless steel. Transition sleeves shall be manufactured by Fernco or Indiana Seal.

**END OF SECTION 311213**

**SECTION 33 31 10 – PRESSURE SEWER SYSTEM****PART 1 - GENERAL****1.1 SCOPE:**

1. This work will include all labor, material and equipment necessary to construct a septic tank and pump system in accordance with these drawings and specifications including septic tank, pump tank, interconnecting piping/fittings, pump, controls, wiring, force main, testing, site cleanup, grading, seeding and all other necessary items for the complete installation ready to use.

**1.2 SHOP DRAWINGS, MATERIAL CERTIFICATES, AND PRODUCT DATA:**

- A. Engineering data covering all equipment and fabricated materials that will become a permanent part of the Work under this contract shall be submitted to ENGINEER for review. These data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; performance characteristics; electrical diagrams; and dimensions needed for installation and correlation with other materials and equipment.
- B. Engineer's review of drawings and data submitted by CONTRACTOR will cover only general conformity to the drawings and specifications, external connections, and dimensions which affect the layout. Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device, or item shown. Engineer's review of submittals shall not relieve CONTRACTOR from responsibility for errors, omissions, or deviations, or responsibility for compliance with the Contract Documents.
- C. Four copies (or one reproducible copy of large drawings) of each drawing and necessary data shall be submitted to ENGINEER.
- D. Operation and Maintenance Manual:
  1. The pump equipment manufacturer shall be responsible for supplying written instructions which shall be sufficiently comprehensive to enable the operator to operate and maintain the pump station and all equipment. Said instructions shall assume that the operator is familiar with pumps, motors, piping, and valves, but that he has not previously operated and/or maintained the exact equipment supplied.
  2. These instructions shall be prepared as a systems manual applicable solely to the pump station and equipment supplied by the manufacturer to these specifications, and shall include those devices and equipment supplied by him. However, items of equipment for which the station manufacturer has made mounting or other provisions, but which he has not supplied, may be excluded from these instructions.

3. The instructions shall include, but not be limited to, the following:
  - a. Description of, and operating instructions for, each major component of the pump station(s) as supplied.
  - b. Instructions for operation of the pump station(s) in all intended modes of operation.
  - c. Instructions for all adjustments which must be performed at initial start up of the pump stations(s), and adjustments which must be performed in the course of preventive maintenance as specified by the manufacturer.
  - d. Service instructions for major components not manufactured by the pump station manufacturer but which are supplied by him in accordance with these specifications. The incorporation of literature produced by the actual component manufacturer shall be acceptable.
  - e. Electrical schematic diagram of the pump station(s) as supplied, prepared in accordance with NMTBA and JIC standards.
  - f. Layout drawing of the pump station(s) as supplied, prepared in accordance with good commercial practice, showing the locations of all pumps, motors, valves, and piping.
  - g. Parts list and list of suppliers for components.
4. Operation and maintenance instruction which are limited to a collection of component manufacturer literature without overall pump station instructions shall not be acceptable.
5. Operation and maintenance instructions shall be specific to the equipment supplied in accordance with these specifications. Instruction manuals applicable to many different configurations and pump stations, and which require the operator to selectively read portions of the instructions, shall not be acceptable.

## **PART 2 – PRODUCTS**

### **2.1 MISCELLANEOUS MATERIALS (OTHER THAN PUMPING STATION MECHANICAL AND ELECTRICAL):**

#### **A. SEPTIC TANK AND PUMP TANK:**

1. Reinforced precast tanks shall be utilized for the tank structures. The tanks shall be of the dimensions required by the construction plans.

#### **B. MANHOLE AND FRAME COVER:**

1. Watertight manhole frame and covers shall be installed on the tank tops as shown on the plans. Manhole frame and covers shall be Vulcan Foundry, Inc. Model MH V-2384, East Jordan Iron Works Model 202701, or equal.

C. MORTAR:

Mortar utilized for grouting and building inverts shall conform to Mix No. 2 of Section 940-8 of the NC Department of Transportation Standard Specification as revised and mortar utilized in masonry work shall be Mix No. 1. Portland cement utilized in this mix shall conform to ASTM C-150 and the masonry cement in this mix shall conform to ASTM C-91, Type II.

D. PUMP TANK PIPING:

All piping inside of the dosing tank shall be Schedule 80 PVC.

E. SEPTIC TANK SERVICE PIPING:

Influent piping and fittings to the septic tank shall be Schedule 80 PVC.

F. SEPTIC TANK INTERNAL PIPING:

Piping and fittings inside the septic tank shall be Schedule 80.

G. EFFLUENT FILTER:

The effluent filter shall be a Zabel A300 filter with an 8"x26" filter cartridge as manufactured by Polylok, Inc. or approved equal.

H. FILTER ALARM SYSTEM:

The effluent filter alarm system shall be manufactured by the same company as the effluent filter. The alarm panel and switch shall provide a visual and audio alarm to alert the owner that the septic tank filter need cleaning.

I. FORCE MAIN PIPING:

Force main piping shall be Schedule 40 PVC as shown on the plans. PVC pipe shall be per ASTM D1785.

All underground piping shall have two stages of identification by tape and a tracer wire.

The first stage of identification shall be a buried non-detectable warning tape. The tape shall be 6" wide, and buried approximately 18" to 30" above the service pipe, but a minimum of 10" below finished grade. It shall consist of multiple layers of polyethylene with an overall thickness of 3 to 5 mils. It shall be installed continuous from valve box to valve box or manhole to manhole and shall terminate just outside of valve box or manhole wall. The black colored lettering on the warning tape shall be abrasion resistant and be imprinted on a color coded background that conforms to APWA color code standards.

The 2nd stage of identification shall be a detectable warning tape. This tape shall provide pipeline identification, be fully detectable from above grade utility locators and be able to provide a depth reference point to top of pipe. It shall be 6" wide, installed directly on top of the

pipeline and permanently secured to the pipeline at 10 ft intervals. The tape shall consist of aluminum foil core or stainless steel tracer wires laminated between multiple layers of polyethylene tape with an overall thickness of 4 to 6 mils. Detectable core or tracer wire "circuit" shall be continuous from valve box to valve box or manhole to manhole for complete pipeline detection and location. Tape manufacturers' approved splice kits shall be used for long runs. Warning tape shall terminate just inside of valve box cover or manhole ring cover and be easily accessible for "clip-on" type utility location meters. The black colored lettering on the warning tape shall be abrasion resistant and be imprinted on a color-coded background that conforms to APWA color code standards.

All non-metallic pipe lines installed underground shall have a tracer wire installed along the length of the pipe. The wire shall be taped to the bottom of the pipe at a maximum of 10 foot intervals and not allowed to "float freely" within the backfill. Tracer wire shall be 12 gauge minimum, copper single-conductor wire with type UF (Underground Feeder) insulation and shall be continuous along the pipeline passing through the inside of each valve box

J. PUMP DISCHARGE HOSE COUPLING:

Cam action couplers shall be provided for connection of the flexible pump discharge hose to the rigid force main piping. Coupler shall be manufactured from glass reinforced polypropylene with stainless steel cam arms and pins. Coupler shall have EPDM gaskets and be pressure rated for 125 psi minimum.

K. PUMP DISCHARGE VALVE:

1. ISOLATION VALVE: The pump discharge valve shall be PVC ball valve same as the pipe and located in the dosing tank as shown on the plans. The valve shall be of the true-union ball type with the plug rotating inside the valve body with equal flow block in both directions. Seats shall be Teflon with Viton or EPDM "O" rings. Use valve manufactured by WKM Division A.C.F. Company, Crane Company, Homestead Valve Manufacturing Company, Chemtrol Piping Systems, Inc. or equal.
2. CHECK VALVE: The pump discharge check valve shall be in-line PVC swing check.

L. STONE BEDDING:

Stone used for bedding of precast concrete tanks shall be granite stone (NCDOT Size No. 57) as per Section 905 of NC Department of Transportation Standard Specification as revised.

**2.2 PUMP STATION MECHANICAL AND ELECTRICAL:**

1. SCOPE:

The work shall include all labor, material, and equipment necessary to construct submersible effluent pump station in accordance with the plans and specifications including excavation, precast dosing tank, sewage pump, electrical wiring, controls, timer, manhole frame and cover, pump lifting rope, piping, valves, fittings, painting, testing, and all other items necessary for the complete installation.

2. OPERATING CONDITIONS:

The pumping station shall consist of duplex submersible effluent pumps, selected to perform in accordance with, and subject to, the provisions of Paragraph 3, hereafter entitled PUMP.

3. PUMP:1. Description:

The pumps shall be totally submersible electrically operated sewage effluent pumps, specifically designed for effluent pumping of wastewater with 3/4 inch diameter solids. The pumps shall be for a 2-inch NPT discharge. The pump shall be equipped with a 208 volt, three phase motor connected for operation.

Each pump shall be rated as follows:

<u>Parameter</u>	
Capacity (Average)	48 GPM
Motor Horsepower	1/2 HP
Total Dynamic Head	43 TDH

2. Pump Design:

Pump shall be of the centrifugal type with an integrally built in submersible type motor. The pump shall rest upright on the tank bottom.

3. Pump Motor:

Pump motor shall be of the submersible type rated 1/2 horsepower. Motor shall be for three phase 208 volts.

Stator winding to be of the open type with Class A insulation for operating in clean dielectric oil that lubricates bearings and seals and cools the windings. Motor stator to be pressed into housing for best alignment and maximum heat transfer.

Motor shall have two bearings, one lower ball bearing to support the rotor and take radial and thrust load and an upper sleeve bearing to prevent shaft deflection from radial thrust.

4. Pump Impeller

The pump impeller shall be of the two vane enclosed type. Impeller shall be of 81-3-7-9 bronze and shall be threaded onto stainless steel shaft.

5. Corrosion Protector

All iron castings shall be pre-tested with phosphate and chromic rinse and to be painted with high temperature bake epoxy before machining and all machined surfaces exposed to the sewage water to be re-painted with high temperature bake epoxy. All fasteners to be 302 stainless steel.

4. PUMP STATION CONTROL CENTER:

The contractor shall furnish and install a prewired control center consisting of the components listed herein. All components shall be U.L. labeled.

1. Enclosure: The enclosure to be furnished and installed by the Contractor shall be NEMA 4X, lockable, deadfront, for rack mounting switches, etc. The interior door shall be of such strength, thickness, and bracing (as required by enclosure manufacturer) to prevent any significant sagging or flexing after the holes have been cut and the equipment mounted.
2. Control Breaker: The control center shall be supplied with a properly sized control power circuit breaker. The breaker shall be accessible through the interior cabinet door and shall supply power to all control wiring within the enclosure. The circuit breaker shall be Square D, or approved equal.
3. Motor Starter: The control center shall contain a NEMA Size 00 combination circuit breaker type motor starter. The circuit breakers shall be 15 amp to protect the motor branch circuit against short circuits. The motor starters shall contain overload protection. The motor starter pilot circuit voltage shall not exceed a nominal 120 volts. The motor starter shall be Square D or approved equal.
4. Selector Switches: A separate heavy-duty, three-position, hand-off automatic selector switch shall be flush-mounted on the internal door of the control center for the operation of each motor starter. This selector switch shall operate the starter when it is in either the "Hand" position or the "Automatic" position and the automatic pump controls are calling for the operation of the equipment in the manner as herein described.
5. Operating Lights: A green "pump running" light shall be provided for each pump. The lights shall operate off a motor starter auxiliary contact and shall be of a dim-glow nature.
6. Power Light: A red "commercial power available" light shall be provided. The light shall operate off control circuit auxiliary contacts and shall be of a dim-glow nature.
7. Pump Required Lights: An amber "pump required" light shall be provided for each pump. The required light shall operate off the pump control relay and shall be of a dim-glow nature.
8. Pump Controller: A duplex pump controller/alternator with alarm contact shall be provided. The controller shall be mounted in the pump station control center cabinet. The controller shall be suitable for utilization with three level control float switches.

Control of the operation of the pump motor starters shall be through the hand-off-automatic selector switches by way of the pump controller.

9. Liquid Level Control Switches: Three "normally open" direct acting float switches for a pump-down operation shall be provided by the pump manufacturer for installation in the wet well by the Contractor. The float switches shall be compatible without modification to the pump controller and alarm systems.



Each float shall be sealed in a solid polyurethane floatball containing mercury switch and cable connections. The cable shall be fine-stranded wire with heavy-duty synthetic rubber jacket and supplied in ample length to provide a continuous, unspliced, run to the above ground electrical junction box. Each float shall be clamped to the float switch support in the wet well.

The switch within the float shall be mercury-to-electrode, tilt type, normally open contact for a pump-down application. On/off operation shall occur on differentials of less than 1 inch of liquid level change.

The Liquid level control switches shall operate as follows:

- 1) "Pump off" level
- 2) "Pump System Control Level"- level above which activate pump motor starter.
- 3) "High Water Alarm" level - activates pump station alarm system.

10. Alarm Systems: A 120 volt alarm system with a separate breaker, shall include a local audible alarm buzzer and alarm light with an alarm silence button. The local alarm buzzer shall be weatherproof. The buzzer shall be surface mounted on the top of the exterior of the pump station control center cabinet. The alarm light shall be watertight 100 watts. The light shall be surface mounted on the top of the pump station control center cabinet and be very noticeable during both night and day. The light shall continue until the alarm condition(s) return to normal status.

Conditions that cause a local alarm are:

- 1) Dosing Tank High Water Alarm Float Switch
- 2) Pump Motor Overload

11. Duplex Receptacle: A ground fault receptacle (120 volts) with a waterproof cover shall be mounted on the exterior of the pump station control center enclosure. Provide a separate 20 amp breaker inside of the control panel.
12. Labels: All switches, buttons, indicator lights, breakers, and meters shall be labeled with phenolic laminated plastic engraved plates when factory labeling is not provided, or not visible through the interior door of the control center cabinet. Plates shall be black with white letters and indicate switch identification and positions. Pump control center enclosure shall also be labeled.
13. Conduits: All above grade conduit outside the control center cabinet shall be rigid hot dipped galvanized. PVC electrical conduit may be used below grade. All conduits entering the control center cabinet shall be plugged with duct seal.
14. Methods: All controls and wiring shall be furnished and installed in accordance with the NEC and any applicable State and local address.
15. Safety Switch: Provide 60 amp, heavy duty, non-fused, NEMA 3R safety switch in electric supply feed at the control panel location.

**PART 3 – EXECUTION****3.1 INSTALLATION:**

1. The precast concrete sections shall be joined per the manufacturer's instructions. The Contractor shall exercise care during the construction to ensure that the installation is plumb.
2. Install the sewage pumps and lift out systems according to the manufacturer's instructions and then set access covers accordingly.
3. Set each component of work securely and accurately in place; plumb, level and properly aligned with other components and other work. Anchor as required for secure operation.

**3.2 TESTS:**

1. Leak Tests: The septic tank and pump tank shall be tested for leakage for 24 hours. The tanks shall not leak more than 20 gallons per 1000 gallon capacity over a 24 hour period from infiltration or exfiltration. Test tanks before backfilling by dewatering excavation and filling to top of access opening and measuring the loss of water after 24 hours. Allow water to saturate concrete walls prior to starting test. If leakage greater than that allowed is detected, locate and repair leaks, and retest.
2. Pump Startup: After complete installation of all equipment, the pump station equipment shall be started up by the Contractor and the Manufacturer's representative in the presence of the Owner and the Engineer. All equipment shall be operated in all modes to insure proper operation. An electrician shall be available to verify proper electrical connections.
3. Field Performance Tests: At the end of the pump start up, a field performance test shall be made on each pumping unit. Tests shall be conducted jointly by the Contractor, Supplier and the Owner. The pumping units and valves will be operated by Owner personnel; all other personnel and equipment necessary for proper conduct of tests shall be furnished by the Contractor.

All tests and test reports shall be made in conformity with the requirements and recommendations of the Hydraulic Institute and the IEEE Standards. The test setup procedures, schedule, and instrumentation shall be agreed upon by the Contractor and Owner. The flow shall be measured by computing the volume pumped out of the wet well in a specified time.

**END OF SECTION 33 31 10**

<b>LISTING OF DBE SUBCONTRACTORS</b>				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					

\* 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 \$ \_\_\_\_\_

\*\* 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.*

Percentage of Total Contract Bid Price \_\_\_\_\_ %

*If firm is a Manufacturer, show Dollar Volume as 100% of Agreed Upon Amount from Letter of Intent*

**For projects with non-zero goals, this form must be completed in order for the Bid to be considered responsive and be publicly read.**

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH, NC

BID BOND

Contract Number: 120956301 County: Currituck County

KNOW ALL MEN BY THESE PRESENTS, That we, the PRINCIPAL CONTRACTOR (hereafter, PRINCIPAL) and SURETY above named, are held and firmly bound unto the Department of Transportation in the full and just sum of five (5) percent of the total amount bid by the Principal for the project stated above, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

NOW, THEREFORE, the condition of this obligation is: the Principal shall not withdraw its bid within sixty (60) days after the opening of the bids, or within such other time period as may be provided in the proposal, and if the Board of Transportation shall award a contract to the Principal, the Principal shall, within fourteen (14) calendar days after written notice of award is received by him, provide bonds with good and sufficient surety, as required for the faithful performance of the contract and for the protection of all persons supplying labor, material, and equipment for the prosecution of the work. In the event the Principal requests permission to withdraw his bid due to mistake in accordance with the provisions of Article 103-3 of the Standard Specifications for Roads and Structures, the conditions and obligations of this Bid Bond shall remain in full force and effect until the Department of Transportation makes a final determination to either allow the bid to be withdrawn or to proceed with award of the contract. In the event a determination is made to award the contract, the Principal shall have fourteen (14) calendar days to comply with the requirements set forth above. In the event the Principal withdraws its bid after bids are opened except as provided in Article 103-3, or after award of the contract has been made fails to execute such additional documents as may be required and to provide the required bonds within the time period specified above, then the amount of the bid bond shall be immediately paid to the Department of Transportation as liquidated damages.

IN TESTIMONY WHEREOF, the Principal and Surety have caused these presents to be duly signed and sealed.

This the \_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_

\_\_\_\_\_  
Surety

By \_\_\_\_\_  
General Agent or Attorney-in-Fact Signature

Seal of Surety

\_\_\_\_\_  
Print or type Signer's Name

**BID BOND**  
**CORPORATION**

SIGNATURE OF CONTRACTOR (Principal)

\_\_\_\_\_  
Full name of Corporation

\_\_\_\_\_  
Address as prequalified

By \_\_\_\_\_  
Signature of **President, Vice President, Assistant Vice President**  
*Select appropriate title*

\_\_\_\_\_  
Print or type Signer's name

*Affix Corporate Seal*

Attest \_\_\_\_\_  
Signature of **Secretary, Assistant Secretary**  
*Select appropriate title*

\_\_\_\_\_  
Print or type Signer's name

**BID BOND**

**LIMITED LIABILITY COMPANY**

SIGNATURE OF CONTRACTOR (Principal)

Name of Contractor

\_\_\_\_\_

Full name of Firm

\_\_\_\_\_

Address as prequalified

**Signature of Member/  
Manager/Authorized Agent**

\_\_\_\_\_

Individually

\_\_\_\_\_

Print or type Signer's name

**BID BOND**

**INDIVIDUAL DOING BUSINESS UNDER A FIRM NAME**

SIGNATURE OF CONTRACTOR (Principal)

Name of Contractor

\_\_\_\_\_ Individual Name

Trading and doing business as

\_\_\_\_\_ Full name of Firm

\_\_\_\_\_ Address as prequalified

Signature of Contractor

\_\_\_\_\_ Individually

\_\_\_\_\_ Print or type Signer's name

\_\_\_\_\_ Signature of Witness

\_\_\_\_\_ Print or type Signer's name

**BID BOND**

**INDIVIDUAL DOING BUSINESS IN HIS OWN NAME**

SIGNATURE OF CONTRACTOR (Principal)

Name of Contractor

\_\_\_\_\_   
 Print or type Individual Name

\_\_\_\_\_   
 Address as prequalified

Signature of Contractor

\_\_\_\_\_   
 Individually

\_\_\_\_\_   
 Print or type Signer's name

\_\_\_\_\_   
 Signature of Witness

\_\_\_\_\_   
 Print or type Signer's name



**BID BOND**

**PARTNERSHIP**

SIGNATURE OF CONTRACTOR (Principal)

\_\_\_\_\_

Full name of Partnership

\_\_\_\_\_

Address as prequalified

By \_\_\_\_\_

Signature of Partner

\_\_\_\_\_

Print or type Signer's name

\_\_\_\_\_

Signature of Witness

\_\_\_\_\_

Print or type Signer's name

**BID BOND**  
**JOINT VENTURE (2 or 3)**  
SIGNATURE OF CONTRACTORS (Principal)

Instructions to Bidders: **2 Joint Ventures**, Fill in lines (1), (2) and (3) and execute. **3 Joint Venturers** Fill in lines (1), (2), (3), (4) and execute. Line (1), print or type the name of Joint Venture. On line (2), print or type the name of one of the joint venturers and execute below in the appropriate manner required by Article 102-8 of the *Specifications*. On Line (3), print or type the name of second joint venturer and execute below in the appropriate manner required by said article of the Specifications. On Line (4), print or type the name of the third joint venturer, if applicable and execute below in the appropriate manner required by said article of the Specifications. This form of execution must be strictly followed.

Signature of Witness or Attest	By	Signature of Contractor
Print or type Signer's name		Print or type Signer's name

and

Signature of Witness or Attest	By	Signature of Contractor
Print or type Signer's name		Print or type Signer's name

and

Signature of Witness or Attest	By	Signature of Contractor
Print or type Signer's name		Print or type Signer's name

**EXECUTION OF BID**

**NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN  
CERTIFICATION**

**CORPORATION**

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder 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 bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of 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 CONTRACTOR**

\_\_\_\_\_  
Full name of Corporation

\_\_\_\_\_  
Address as Prequalified

Attest \_\_\_\_\_

Secretary/Assistant Secretary  
*Select appropriate title*

By \_\_\_\_\_

President/Vice President/Assistant Vice President  
*Select appropriate title*

\_\_\_\_\_  
Print or type Signer's name

\_\_\_\_\_  
Print or type Signer's name

**CORPORATE SEAL**

**AFFIDAVIT MUST BE NOTARIZED**

Subscribed and sworn to before me this the

\_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

**NOTARY SEAL**

\_\_\_\_\_  
Signature of Notary Public

of \_\_\_\_\_ County

State of \_\_\_\_\_

My Commission Expires: \_\_\_\_\_

**EXECUTION OF BID  
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN  
CERTIFICATION**

**PARTNERSHIP**

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder 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 bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of 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 CONTRACTOR**

_____ Signature of Witness	By	_____ Signature of Partner
_____ Print or type Signer's name		_____ Print or type Signer's name

**AFFIDAVIT MUST BE NOTARIZED**

Subscribed and sworn to before me this the \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

**NOTARY SEAL**

\_\_\_\_\_  
Signature of Notary Public

of \_\_\_\_\_ County

State of \_\_\_\_\_

My Commission Expires: \_\_\_\_\_

**EXECUTION OF BID  
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN  
CERTIFICATION**

**LIMITED LIABILITY COMPANY**

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder 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 bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of 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 CONTRACTOR**

\_\_\_\_\_ 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

**AFFIDAVIT MUST BE NOTARIZED**

Subscribed and sworn to before me this the \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

**NOTARY SEAL**

\_\_\_\_\_ Signature of Notary Public

of \_\_\_\_\_ County

State of \_\_\_\_\_

My Commission Expires: \_\_\_\_\_

EXECUTION OF BID
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN
CERTIFICATION

JOINT VENTURE (2) or (3)

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder 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 bidder has not been convicted of violating N.C.G.S. § 133-24 within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of 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 CONTRACTOR

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.

Signature of Witness or Attest By Signature of Contractor
Print or type Signer's name
If Corporation, affix Corporate Seal and
Signature of Witness or Attest By Signature of Contractor
Print or type Signer's name
If Corporation, affix Corporate Seal and
Signature of Witness or Attest By Signature of Contractor
Print or type Signer's name
If Corporation, affix Corporate Seal

NOTARY SEAL
Affidavit must be notarized for Line (2)
Subscribed and sworn to before me this
day of 20
Signature of Notary Public
of County
State of
My Commission Expires:

NOTARY SEAL
Affidavit must be notarized for Line (3)
Subscribed and sworn to before me this
day of 20
Signature of Notary Public
of County
State of
My Commission Expires:

NOTARY SEAL
Affidavit must be notarized for Line (4)
Subscribed and sworn to before me this
day of 20
Signature of Notary Public
of County
State of
My Commission Expires:

**EXECUTION OF BID  
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN  
CERTIFICATION**

**INDIVIDUAL DOING BUSINESS UNDER A FIRM NAME**

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder 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 bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of 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 CONTRACTOR**

Name of Contractor

\_\_\_\_\_ Individual name

Trading and doing business as

\_\_\_\_\_ Full name of Firm

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Signature of Contractor, Individually

\_\_\_\_\_  
Print or type Signer's name

\_\_\_\_\_  
Print or type Signer's name

**AFFIDAVIT MUST BE NOTARIZED**

Subscribed and sworn to before me this the

**NOTARY SEAL**

\_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

\_\_\_\_\_  
Signature of Notary Public

of \_\_\_\_\_ County

State of \_\_\_\_\_

My Commission Expires: \_\_\_\_\_

**EXECUTION OF BID  
NON-COLLUSION AFFIDAVIT, DEBARMENT CERTIFICATION AND GIFT BAN  
CERTIFICATION**

**INDIVIDUAL DOING BUSINESS IN HIS OWN NAME**

The person executing the bid, on behalf of the Bidder, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee of the bidder 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 bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the Bidder intends to do the work with its own bonafide employees or subcontractors and is not bidding for the benefit of another contractor.

In addition, execution of this bid in the proper manner also constitutes the Bidder's certification of 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 CONTRACTOR**

Name of Contractor \_\_\_\_\_  
Print or type Individual name

\_\_\_\_\_  
Address as Prequalified

\_\_\_\_\_  
Signature of Contractor, Individually

\_\_\_\_\_  
Print or type Signer's Name

\_\_\_\_\_  
Signature of Witness

\_\_\_\_\_  
Print or type Signer's name

**AFFIDAVIT MUST BE NOTARIZED**

Subscribed and sworn to before me this the \_\_\_\_\_  
\_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

**NOTARY SEAL**

\_\_\_\_\_  
Signature of Notary Public

of \_\_\_\_\_ County

State of \_\_\_\_\_

My Commission Expires: \_\_\_\_\_



**DEBARMENT CERTIFICATION**

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 filed 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: 120956301**

**County: Currituck County**

ACCEPTED BY THE DEPARTMENT

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**Contract Officer**

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Date

Signature Sheet (Bid) - ACCEPTANCE SHEET

FORM OF PROPOSAL

North Carolina Department of Transportation
Currituck County Ferry Welcome Center
SCO ID# 120956301

Contract:
Bidder:
Date:

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder proposes and agrees if this proposal is accepted to contract with North Carolina Department of Transportation in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of Currituck County Ferry Welcome Center in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the state of North Carolina Department of Transportation and JKF ARCHITECTURE PC with a definite understanding that no money will be allowed for extra work, except as set forth in the General Conditions and the contract documents, for the sum of:

GENERAL CONSTRUCTION CONTRACT(Single-Prime):

Base Bid:

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

List Subcontractors:

Lump Sum Masonry Subcontractor: \_\_\_\_\_
Plumbing Subcontractor: \_\_\_\_\_ License No. \_\_\_\_\_
Mechanical Subcontractor: \_\_\_\_\_ License No. \_\_\_\_\_
Electrical Subcontractor: \_\_\_\_\_ License No. \_\_\_\_\_

General Contractor shall complete all sections for Alternates and Unit Prices for Single-Prime Proposal.

The General contractor shall act as project expediter for all prime contracts. See Supplementary General Conditions.

UNIT PRICES (See Specification Section 012200 for complete description and time requirements)

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work all in accordance with the contract documents.

Unit Price No. 1- Remove and replace unsuitable soils in building pad or parking areas with suitable fill material including compacted sand.

Total: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_ per CY).

Unit Price No. 2- Remove and replace unsuitable soils in building pad or parking areas with suitable fill material including #57 stone.

Total: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_ per CY).

Unit Price No. 3- Remove and replacement unsuitable soils in footings, foundations, and utility trenches with suitable fill material including compacted sand or #57 stone.

Total: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_ per CY).

Unit Price No. 4 - Provide geotechnical fabric, geogrid, or other suitable stabilization material.

Total: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_ per SY).

**PROPOSAL SIGNATURE PAGE**

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bond within ten (10) consecutive calendar days after written notice being given of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

**Attach certified check, cash or bid bond to this proposal.**

Respectfully submitted this day of \_\_\_\_\_

\_\_\_\_\_  
(Name of firm or corporation making bid)

WITNESS:

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

\_\_\_\_\_  
(Proprietorship or Partnership)

Name: \_\_\_\_\_  
Print or type

Title \_\_\_\_\_  
(Owner/Partner/Pres./V.Pres)

Address \_\_\_\_\_

ATTEST:

\_\_\_\_\_

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

License No. \_\_\_\_\_

Title: \_\_\_\_\_  
(Corp. Sec. or Asst. Sec. only)

Federal I.D. No. \_\_\_\_\_

(CORPORATE SEAL)

Addendum received and used in computing bid:

- Addendum No. 1 \_\_\_\_\_
- Addendum No. 2 \_\_\_\_\_
- Addendum No. 3 \_\_\_\_\_
- Addendum No. 4 \_\_\_\_\_
- Addendum No. 5 \_\_\_\_\_
- Addendum No. 6 \_\_\_\_\_
- Addendum No. 7 \_\_\_\_\_
- Addendum No. 8 \_\_\_\_\_