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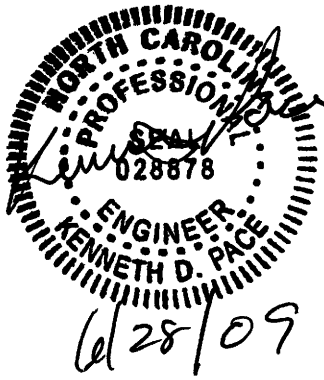


## PLANTING

Furnish, deliver, plant bed preparation and the planting of trees, shrubs, ground covers, bedding plants and seedlings at locations shown on the plans or as directed , in accordance to NCDOT Standard Specification 1670.

**Basis of Payment:** Landscape Planting will be paid for at the contract "lump sum' unit price per each location (NBL and SBL).

**Landscape Planting (NBL).....EACH**
**Landscape Planting (SBL).....EACH**

## SEASONAL LIMITATIONS

The initial planting and replacement of plants shall be done from October 15 thru March 31. See Standard Specifications Sections 1060 - Landscape Development Materials and 1670 - Planting.

## HERBICIDES

Post-emergence herbicidal treatment and Pre-emergent herbicidal treatment will consist of the following products and rates unless otherwise approved by the Engineer. Follow guidelines noted in the Standard Specification Section 1670.

### Herbicide Chart

| Herbicide Brand Name | Common Name | Formulation | Oral LD/50 (MG/KG) | Amount of Formulation per Acre | Lbs. of Active Ingredient per Acre | Adjuvants | Remarks |
|---|---|---|---|---|---|---|---|
| ***Stump Control*** | | | | | | | |
| *Garlon* | Triclopyr | 3 S | 2,574 | 1 gal./1 gal. of water | 3 # | 1 - 2 qts. Surfactant/ acre | Paint or spray, add bullseye dye. |
| ***Pre-emergent*** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Pennant* + *Endurance* + *Gallery* | Metolachlor + Prodiamine + Isoxaben | Liquid (5G) + 65 WDG + 75 DF | 3750 + >5,000 + 5,000 | 2 - 3 pts. (40#) + 2# + 1# | 1.95 - 2.93# (2#) + 20 lbs. + 1# | NA | Spring application; use tank agitation when mixing. |
| ***Post-emergent*** | | | | | | | |
| *Roundup* | Glyphosate | 4 S | >5,000 | 2 - 4 qts. | 2 - 4 # | 2 - 4 qts. Surfactant/ 100 gals. | NA |

**Basis of Payment:** Pre-emergent herbicidal treatment and Post-emergent herbicidal treatment will be measured and paid for in square yards of plant bed measured along the surface of the ground.

**Pre-Emergent Herbicidal Treatment For Plant Beds..... Square Yards**
**Post-Emergent Herbicidal Treatment For Plant Beds..... Square Yards**

## LANDSCAPE METAL EDGING

**General**
The work covered by this item will consist of furnishing and installing the metal landscape edging in locations as directed by the engineer.

Landscape Metal edging construction will conform to Commercial Grade Metal Edging by "Col-Met", "Permaloc",or "Sure-Loc" ,or "Approved Equal" Metal Edging will be 3/16" (4.8mm) hot rolled low carbon steel (ASTM–A-36, ASTM-A-283, ASTM-A-569) with a 6" width. Edging will include a minimum of 4 stakes per 10' length. Stakes will be 16" long. Color will be a black electrostatic powder coated finish resistant to cracking, chipping, corrosion and UVA damage.

**Compensation**
The work of installing landscape metal edging as approved by the Engineer, when completed and accepted, will be paid for at the unit price per linear foot for "Landscape Metal Edging". Such price and payment will be full compensation for all work covered by this special provision; including but not limited to furnishing all labor, materials, and equipment and any other incidentals necessary or required to complete the work.

***Payment will be made under:***
**Landscape Metal Edging ..... LF**

## MULCH FOR PLANTING

Mulch for planting shall consist of double shredded hardwood mulch or pine straw mulch (as noted on plans or directed by the Engineer) . All mulch and the work associated in placing the mulch during planting shall conform to article 1060-11 of the Standard Specifications.

**Mulch for Planting:** Mulch will be double shredded hardwood bark or pine straw each from a single source unless otherwise approved by the Engineer. **Submit sample for approval prior to placement.**

Install mulch to a finished depth of 4 inches (unless otherwise noted), rake and compact to create a uniform finish.

Payment will be made under:

**Hardwood Mulch .....CY**
**Pine Straw.....CY**

## WATER FOR PLANTING

**Water for Planting:** Water for Planting will be applied in accordance with the standard specifications. Water for Planting will be furnished as described herein. It is anticipated that installation of the landscape planting and sod, and therefore watering of plant materials and sod, will occur after the site water system has been installed, connected and is functional. Consequently the water for this project will be provided to the contractor through the on site water system. All applicable sections of Section 1060, 'Landscape Development Materials' and Section 1670, 'Planting' of the Standard Specifications will apply.

Payment will be made under:

**Water for Planting .....M / G**

## TREE PRESERVATION / PROTECTION FENCE

**General Requirements and Restrictions**

The aesthetics and comfort of the rest area is greatly enhanced by the maturing trees on the site. The Department has dedicated much effort to preserve all the existing trees possible during this renovation project. This will require the utmost care during the construction process since the construction is located very close to many of the trees we desire to preserve. The contractor will assist the department by educating its employees, subcontractors and any utility companies conducting work in the vicinity, of the efforts and the preservation measures required herein.

Tree Preservation/Protection Fence consist of furnishing, installing, maintaining, and removing wood slat, polyethylene, or polypropylene fence as specified or as directed by the Engineer and in accordance with the special provisions included herein.

Install tree protection fence prior to any demolition. All construction unless approved by the Engineer will occur within the construction fence. *Do not trespass* with vehicles or machinery in the areas indicated for tree preservation. Do not park, refuel, repair or maintain vehicles or equipment in the tree preservation areas. Do not stockpile materials or store equipment in the tree preservation areas.

Do not release petroleum products, fuels, paints, or lubricants anywhere within this project in the vicinity of the tree preservation areas or in areas that drain into this vicinity. Do not apply or release herbicides, fertilizers or chemicals of any kind that may be toxic to plant life and do not 'clean out' concrete trucks in the vicinity of the tree preservation areas, or into areas that drain into this vicinity. Do not burn trash, debris or vegetation in the vicinity of tree preservation areas.

Demolition, ground disturbing activities and construction that occurs within the drip line of the tree(s) or within a radius three times the drip line of the tree(s) will be done with utmost care. Accomplish all grading in such a manner as to avoid standing water or saturated soils around root systems of trees that are to remain. Install erosion control devices in a timely manner to prevent sedimentation of the tree root zone in the tree preservation areas. In areas to be 'cut' by grading or where utility trenches or building footings occur, prevent shredding, tearing or exposing roots by excavating a trench not less than 6" wide and to the maximum depth of the cut up to 24" deep. Hand saw any roots 2" or greater in diameter that are encountered to make a clean smooth cut. If necessary, dig out enough soil to reach an undamaged portion of the root to make the smooth cut. To prevent drying out of roots, immediately cover any exposed root surfaces with 6" of approved mulch or soil until 'finish' construction operations dictate removal. Supplemental irrigation may be necessary during periods of drought or stress. Irrigate as directed and approved by the Engineer.

Branches that protrude into the construction area that interfere with construction operations will be tied back if possible or pruned if not. Follow proper pruning techniques as established in American National Standards Institute ANSI Z133.1 and

perform pruning by a professional arborist. Submit description of proposed work along with arborist credentials to the Engineer for approval prior to conducting work.

Violation of any of these tree preservation measures will result in suspension of all work until the violation is resolved or repaired to the satisfaction of the Engineer. Such suspension of work will not be considered justification for additional compensation in accordance with Section 104 of the Standard Specifications or extension of the contract time.

**Materials**
Posts will be nominal 2" x 4" or 4" x 4", lengths as required, structural light framing, grade no. 2, southern yellow pine or steel posts will be a minimum of 1 3/8" wide measured parallel to the fence, with a weight of 1.25 lbs/ft of length. Wood posts will be treated with a preservative in accordance with Section 1082-3 of the Standard Specifications.

Fence fabric will be a barricade or safety barrier type highly visible orange polyethylene or polypropylene mesh that is approved by the Engineer. Fabric will be UV stabilized, flexible and inert to most chemicals and acid.

Signs will be fabricated of a durable, weatherproof lightweight material. Signs will have a white background with red lettering. They will be a minimum of 4.5 square feet and clearly display the following message in both English and Spanish:

**TREE PROTECTION ZONE**

**DO NOT ENTER**

Submit sample for approval prior to placing.

**Installation**
Erect fence to conform to the general contour of the ground. Do not remove existing plant material in order to install fence unless directed by the Engineer.

Set post and maintain in a vertical position. Post may be hand set or set with a post driver. If hand set, thoroughly tamp all backfill material, if power driven, wood posts may be sharpened to a dull point. Remove and replace any post damaged by power driving prior to final acceptance. Cut the tops of all posts at a 30-degree angle. The posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected. Contractor is responsible for locating all utilities prior to installation of fence posts.

Stretch fence fabric taut and attach to post with appropriate means according to post type utilized. In sections where signs will be located, reinforce top of fabric by weaving a 12 gauge galvanized wire in the fabric and firmly attach to the post at each end of section. Place signs every 100 linear feet with a minimum of one sign for each segment facing in

a different direction. Secure sign to fence fabric at all four corners placing near the top of the fence fabric where clearly visible.

**Tree Protection Fence Maintenance**
At any time during the duration of the project if the tree protection fence is not in an upright secure position with no gaps and properly signed, work on the project will be suspended wholly until the fence is properly repaired and determined to be in satisfactory condition by the Engineer. Remove tree protection fence, fill post holes, weed/mow and dispose of debris off site as a last item of work on the project.

**Compensation**
Tree Protection / Preservation Fence will be paid for as 'Tree Protection Fence' in linear feet as measured along the surface of the installed and accepted work.

Such payment will be full compensation for the work described above including furnishing, installing, and removing; fence post, fence bracing, fence fabric, staples, tie wires; all tools, equipment and any other incidentals necessary to complete the work. Mulch and/or watering required herein will be incidental to the completion of the work.

***Payment will be made under.***
**Tree Protection Fence ..... LF**

## CONSTRUCTION FENCE (TEMPORARY)

**General**
The work covered by this provision consist of furnishing, erecting, maintaining and removing (72") temporary chain link fence and gates at locations shown on the plans and/or as directed by the Engineer.

Unless at the direction of the Engineer, the entire rest area is closed and rest area access ramps are barricaded, install construction fence prior to beginning construction and as indicated on the Construction Limits and Staging Plan and Phase Chart.

The estimated quantity of chain link construction fence may be increased, decreased, or eliminated entirely by the Engineer based upon the contractor's approved work schedule and status of rest area - open or closed to the public at the time of construction. Such variations in quantity will not be considered an alteration in the plans or detail of construction that materially change the character of the work and the cost of performing the work. Standard Specifications Section 104-5 pertaining to overruns and underruns of contract quantities will not be applicable to the item of construction fence.

Construction fence and gate will conform to all applicable sections of the Standard Specifications and Standard Drawings Section 866.

**Materials**
Construction fence will be chain link 72 inch fabric. Double gates will be chain link, 72 inches high and 8 feet wide with a 16 foot opening.

**Installation**
Erect fence to conform to the general contour of the ground. When determined necessary by the Engineer, perform minor grading along the fence line to provide for installation and proper drainage. Set all posts in a true vertical position and thoroughly tamp to secure position.

Stretch fence fabric taut and securely attach to each post. Do not splice fabric between posts.

Maintain the construction fence in a satisfactory condition until directed by the Engineer to remove. Upon removal all fence materials will become the property of the Contractor and will be removed from the project promptly.

**Compensation**
Construction Fence (Temporary) will be paid for as 'Chain Link Fence, 72" Fabric' measured in linear feet satisfactorily installed and accepted and 'Double Gates, 72" High, 8' Wide, 16' Opening' for each satisfactorily installed and accepted. Double gates will be measured as one gate. No direct payment will be made for gate posts, terminal posts, post bracing and other miscellaneous materials necessary to construct the fence as these will be considered incidental to the fence installation. There will be no additional compensation for construction fence and gates relocated to another area on site during different phases of the project. Should relocation to accommodate a subsequent phase require additional length, thus additional materials, payment will be made for the additional length measured in linear feet and/or actual number each of gates at the contract prices as provided herein.

Such payment will be full compensation for the work as described above, including but not limited to clearing and grading; furnishing, installing, relocating and removing gates, fence fabric with necessary posts, bracing, staples, tie wires, fittings, tools, equipment and all incidentals necessary to complete the work.

***Payment will be made under:***

**Temporary 72"Chain Link Fence .....LF**
**Temporary Double Gates, 72" High, 8' Wide, 16' Opening .....EA**

## SITE DEMOLITION

**General**

Site demolition consists of the removal and disposal of all paving,concrete, structures, site amenities and vegetative material designated to be removed as indicated on the plans and as directed by the Engineer. Vegetative material includes trees and shrubs with stumps, and plant beds as designated on the plans and as directed by the Engineer on site. Others will remove selected structures, site amenities and any trees or shrubs to be salvaged prior to the construction. Picnic tabletops, benches, recycle bins, and trash receptacles noted on plans or as directed by the engineer, are to be removed by contractor, salvaged and stockpiled (on site) for reuse by NCDOT. **Demolition for the purpose of rest area building renovations is covered elsewhere in the Special Provisions.**

All methods and operations used for removal of paving, structures, site amenities and vegetative material will meet prior approval of the Engineer. Make a **saw cut** providing a clean edge at locations where concrete paving is removed.

Satisfactorily complete vegetative removal operations prior to building and landscape grading operations. Vegetation removal consists of below ground removal of root masses as well as above ground growth. Perform all work so as to cause minimum soil erosion and comply with the requirements of Section 107-13. Conduct vegetation removal operations in a manner to prevent limb, bark or root injuries to trees, shrubs, or other types of vegetation that are to remain. Should damage occur to adjacent trees or shrubs to remain take all steps necessary as directed by the Engineer to repair or minimize the effects of the damage to the tree or shrub. Remove any tree or shrub that is to remain that is damaged to the extent that its value as a desirable landscape tree is compromised in the opinion of the engineer. There will be no further compensation for removal of a tree or shrub damaged by the contractor. Furthermore, the contractor will reimburse the owner for the aesthetic value of the tree or shrub, as determined by a certified arborist using the current International Society of Arboriculture plant appraisal standards.

All materials removed that are not noted for recycling or reinstallation on the project will become the property of the Contractor and will be properly disposed of by the Contractor off site.

Prevent damage to adjacent property and structures during the removal and demolition operations. The contractor is responsible for repairing any and all damaged areas to its original condition and/or to the satisfaction of the Engineer.

**Compensation**

Payment for the work of removing and disposing of all paving, structures, site amenities and vegetation as described above, indicated on plans and directed by the Engineer, will be paid for at the contract unit price for 'Site Demolition'.

Such price and payment will be full compensation for all work covered by this provision; including but not limited to furnishing all labor, tools and equipment and any other incidentals necessary or required to complete the work.

***Payment will be made under:***
**Site Demolition (NBL) ..... Lump Sum**
**Site Demolition (SBL) ..... Lump Sum**
**Picnic Table Removal and Stockpile.....Each**

## LANDSCAPE AND SITE GRADING

### General

Landscape and Site grading consists of placing topsoil material within seeding and planting beds, and cutting and backfilling around buildings, sidewalks, etc., to provide proper drainage and elevations as indicated on the grading plans, cross-sections, and as directed by the Engineer.

### Topsoil Material

Topsoil will be as specified herein and will be utilized for all fill/backfill operations as directed by the Engineer.

Topsoil will be a sandy loam, silt loam or clay loam that contains a reasonable amount of humus material. Topsoil will be of good texture, loose and friable and will be representative of topsoil in the general vicinity. It will be reasonably free from sod, hard lumps, subsoil, large roots, rocks and gravel, noxious weed seeds and/or toxic substances or other material, which would be harmful to plant growth. Topsoil when delivered to the job site will be approved by the Engineer prior to placement, whether or not the source of topsoil has been previously approved.

Fill material to bring building site to finished grade will be as specified in the building specifications under earthwork.

### Installation

Place building fill and compact as described in the building specifications. Place topsoil fill and spread evenly to a depth of 18 inches or as directed by the Engineer, which after settlement, constitutes finish grade. Do not place topsoil when the ground is frozen, is excessively wet, or is in a condition that the soil cannot be worked easily and dressed smoothly. Compact fill material under elevated sidewalks/concrete paving to a density equal to or greater than undisturbed soil in the area.

Where fill material is needed within wooded areas, precautionary measures will be taken to prevent damage to trees and the roots of trees to be retained for landscape purposes. When placing or compacting fill material in or adjacent to wooded areas heavy

machinery will not be allowed. Equipment for placing fill material will be approved by the Engineer prior to any grading work.

**Compensation**
'Landscape and Site Grading' will be paid for at the contract lump sum price for the work detailed in this section that has been successfully accomplished and accepted. Building fill will be included as part of the building lump sum payment. 'Topsoil' will be paid for in the actual number of cubic yards of topsoil placed and accepted. Topsoil will be measured by truck measurement. Each truck will be measured and will have a legible identification mark indicating its capacity. Load each truck to at least its measured capacity at the time it arrives at the point of delivery. The recorded capacity will be adjusted by making a 25 percent deduction to allow for shrinkage, and the adjusted capacity will be the quantity to be paid for.

Such price and payment will be full compensation for furnishing, all labor, equipment and all incidentals necessary to complete the work satisfactorily.

***Payment will be made under:***
**Landscape and Site Grading (NBL) ..... LS**
**Landscape and Site Grading (SBL) ..... LS**

**Topsoil ..... CY**

## SITE STORMWATER DRAINAGE

Applicable parts of the supplementary General Conditions and the Standard Specifications govern work under this division which includes all labor, materials, equipment and services necessary for the proper completion of storm drainage and related work indicated on the drawings or in the specifications in general as follows:

- Landscape Drainage Drop Inlets, Catch Basins, and Junction Boxes
- Storm Drainage Pipe
- Sidewalk Trench Drains
- Storm drainage system from building downspouts to catch basin as shown on grading
- Adapters at each building downspout
- Cleanouts in drain lines

**General**
The work covered by this provision consists of excavation, fabrication, furnishing, installing drop inlets, junction box and drainage pipe, and making proper connections to the existing storm water drainage system as shown on the plans and as directed by the Engineer.

***Masonry Drainage Structures***

**Materials**
Masonry drainage structures will be as specified in Section 840 of the Standard Specifications. Concrete Drop Inlet will be as shown in Roadway Standard Drawing 840.14 with pedestrian grate(s) as indicated on the plans/ details.

**Installation**
Exact placement of structures will be optimized in the field to align with existing drainage structures and necessary connections. Invert elevations will be determined/adjusted in the field based on existing drainage structures.

***Downspout Connections***

**Downspout Conversion Unit**
Building downspout to drain pipe adapter will consist of metal downspout conversion unit to adapt from rectangular downspout to drain pipe as shown on drawings. These conversion units will be incidental to drain pipe installation and there will be no separate compensation

**Cleanouts**
Cleanouts will be proper shape, length, and degree of bend, to fit conditions. Cleanouts will be set at locations shown on the plans but not more than 50 feet apart. Cleanout plugs will be minimum of 4", with finish elevation at proposed finish grades for lawn, plant bed or sidewalk. Cleanouts in sidewalks will be brass stem and cap mounted flush with sidewalk.

***Storm Drainage Pipe***
**Materials**
Storm drainage pipe will be corrugated plastic pipe (CPP) meeting requirements of ASTM as noted below. Specified CPP 4-10" shall be singled walled corrugated pipe (unless otherwise noted on plans). Specified CPP 12" and greater shall be double walled with smooth/corrugated exterior pipe. All fittings, adapters, and connection shall be installed according to applicable ASTM, NCDOT, and manufacturers specifications.

| For General Construction | For Highway Construction |
|---|---|
| Single Wall<br>(3"-6") CPP ASTM-F-405-"C"<br>(8"-24") CPP ASTM-F-667-"C" | Single Wall<br>(3"-10") CPP AASHTO-M-252-"C"<br>(12"-60") CPP AASHTO-M-294-"C" |
| Smooth Core<br>(3"-6") CPP ASTM-F-2306-"S"<br>(12"-60") CPP ASTM-F-2306-"S" | Smooth Core<br>(3"-10") CPP AASHTO-M-252-"C"<br>(12"-60") CPP AASHTO-M-294-"C" |

**Installation**

*a)* Excavate trench to a sufficient width to receive pipe and allow for tamping equipment and to the depth established by the Engineer. Follow precautions under 'Tree Preservation' if working in the vicinity of trees to be preserved.

*b)* Join pipe sections and fittings together in accordance with manufacturer's recommendations.

*c)* Where the pipe foundation material is found to be of poor supporting value or of rock the foundation will be conditioned by removing the existing foundation material. Remove existing foundation material by undercutting one foot or to a depth as directed by the Engineer, and backfill with either a suitable local material or a foundation condition material. Foundation condition material consists of crushed stone or gravel or a combination of sand and crushed stone and will be approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill to be used for foundation conditioning will be made by the Engineer.

*d)* Connect to existing or proposed drainage structures as indicated on the plans and as directed by the Engineer.

*e)* Backfill material will be carefully placed so that the pipe will not be disturbed after it has been laid. Firmly tamp the Engineer approved earth backfill material in 6 inch layers to a density equal to that of the surrounding undisturbed soil.

*f)* Maintain all drainage installations in a continuously functioning condition from the time the pipe is installed until the project is accepted.

**Compensation**

Site Stormwater Drainage system shall include all labor, equipment and all incidental services and materials necessary for the proper completion of storm drainage as indicated on the drawings and/or specifications.

***Payment will be made under:***

**Site Stormwater Drainage (NBL) ..... Lump Sum**
**Site Stormwater Drainage (SBL) ..... Lump Sum**

## SITE WATER DISTRIBUTION SYSTEM

The work covered by these provisions consists of constructing waterlines within the rest area as required by the plans and provisions herein or directed by the Engineer. The Contractor will furnish all materials, labor, equipment, and incidentals necessary to complete the proposed utility work.

***General Construction Requirements***

**Specifications**

The proposed utility construction will meet the applicable requirements of the N. C. Department of Transportation's "Standard Specifications for Roads and Structures" (latest edition) July 2006 and the following provisions:

**Plumbing Ordinances**
All plumbing work in connection with the water distribution system installation will be done in accordance with local and State ordinances, and will be subject to inspection by the particular County Health Authorities or by authorities of the Sanitary Engineering Section, Division of Health Services, Department of Human Resources and/or authorities of the Water quality Section's, Division of Environmental Management, Department of Natural Resources and Community Development.

**Trenches and Backfill for Utility Pipe Line Construction**
The utility excavations will be made and the pipes will be laid in accordance with Section 300 of the Standard Specifications and as specified herein.

**Clearing and Grading**
The Contractor will limit his clearing to only that absolutely necessary to construct the water system (lines for distribution, etc.).

**General**
The Contractor will furnish and install all material for the water distribution system within the rest area as shown on the Site Development drawings and as specified herein, consisting of water lines, fittings, gate valves, stop and drain valves and valve boxes. Also included will be water line tests, sterilization and flushing of the entire water system and all other items not specifically mentioned but necessary to complete the work. Type of pipe material to use in the water line distribution system will be PVC Schedule 80 or SDR-21 PVC All pipe tees and bends will be ductile iron (incidental to water line installation).

**Polyvinyl Chloride Water Pipe**
PVC water pipe will be schedule 80 or SDR-21 with a minimum of 200 psi pressure rating, and sized as shown on the plans. The pipe, when used for conveying drinking water, will meet the requirements of the National Sanitation Foundation Seal of approval for potable water.

**Gate Valves**
Gate valves in the water system where shown on the plans will be bronze, non-rising stem type, with body conforming to ASTM B62; stem will be of best silicon brass and the threads conforming to ANSI B2.1.

**Valve Boxes**
Valve boxes will be Cast Iron, constructed. Valve box assembly will be constructed in two sections: bottom, and cap. Bottom section of valve box assembly will be adjustable for height and variances. Install valve box with cap flush with the proposed finished grade. Place three inches of crushed stone (No. 67 aggregate under valve and bottom section. Valve box size will accommodate valves and piping as shown on the plans and approved by the Engineer. Submit shop drawing for approval by Engineer.

**Construction**
Piping will consist of 1/2 inch thru 4 inch pipe, which will be installed as shown on the plans. Pipe fittings needed to complete the work and not individually noted herein will be considered part of the work of 1/2 inch thru 4 inch pipe.

The limits of clearing for installing water lines will be held to a maximum of 6 feet, except in critical areas where the Engineer may establish greater limits. Trees and shrubs, which are damaged, will be repaired and/or removed in accordance with applicable provisions of Section 894-4 of the Standard Specifications.

All PVC pipe must be installed according to manufacturer's recommendations. Pipe will be cut square, burrs removed from cut end, cleaned and dried. Apply cement to pipe and fitting with rapid and thorough coverage, assemble parts quickly, using 1/8 to 1/4 turning motion. Hold in place for two minutes to offset tendency to move out of fittings.

Pipe will be laid in a snaking manner to allow for expansion and contraction, and in such a way to avoid bumps, boulders, and holes that might result in stress on the pipe.
If, at any time before completion of the contract, any broken pipe or any defects are found in the lines or in any of their fittings or appurtenances, they will be replaced or corrected. All pipe, fittings and appurtenances will be carefully examined for defects before placing and any found defective will not be used.

The pipe trenches will be conditioned by removing the existing foundation material by undercutting one foot or to a depth as directed by the Engineer, and backfilling with either suitable local material or foundation condition material consisting of clean sand as approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill to be used for foundation conditioning will be made by the Engineer. **(Note: Foundation material is 6" around pipe incidental to water line installation).**

Pipe will not be laid upon a foundation into which frost has penetrated, or at any time, that in the opinion of the Engineer, there is danger of the formation of ice or frost at the bottom of the excavation. The Engineer may at his discretion allow construction of the pipeline to continue under freezing conditions provided the Contractor promptly backfills the trench as directed.

PVC pipe will have its location marked by using a detectable marking tape, installed 12 to 18 inches below finished grade. Such tape will be as approved by the Engineer.
The proposed pipe will be laid in trenches not less than 24 inches in depth below the finished grade. After the installation of pipe has been tested, inspected, and approved by the Engineer, it will be promptly backfilled and compacted to a density equal to that of the surrounding undisturbed soil.

The locations for water lines and valves with valve boxes, as shown on the plans, are substantially correct; however, the Engineer will establish the exact location.

**Water Line Test**
Prior to backfilling the Contractor will test all waterlines in the water system for eight (8) hours under a water pressure of 150 PSIG. Leaks will be repaired by tightening the joint or by remaking the joint if the tightening fails to stop the leak.

**Sterilizing and Flushing Piping System**
All water piping will be sterilized with chlorine concentration. All lines will be filled with water and chlorine concentration so that an overall chlorine residual to the water of at least 100-ppm will result. During the filling all trapped air through drinking fountains, yard hydrants, valves, etc., will be released. After the lines have been filled with water and chlorine, the pipe system will be valved off and the chlorinated water allowed to remain in the system for a 24-hour period. At the end of this period, the chlorine residual count should be at least 10 ppm. The lines will then be thoroughly flushed to insure the removal of all sediment, pipe seals, etc. This process will be subject to inspection and/or supervision by the local Health Authorities.

**Compensation**
The work of furnishing and installing ½ inch thru 4 inch water lines with sand bedding as described above when completed, tested, and accepted will be paid for at the contract unit price per linear foot measured in place. The work of furnishing and installing Gate valves and boxes will be paid for at the contract unit price per each for 'Gate Valve and Box' in the sizes shown below complete in place and accepted. The work of repairing existing water pipe, any size up to 4", complete, tested, and accepted will be paid for at the contract unit price per linear foot for 'PVC, Water Pipe, SCH 80 Repair'.

***Payment will be made under:***
**3/4" PVC Water Line, SCH 80 ..... LF**
**3" PVC Water Line ,SDR-21..... LF**
**3/4" Gate Valve / Box .....EA**
**3" Gate Valve / Box .....EA**

## SITE SANITARY SEWER SYSTEM

**Polyvinyl Chloride (PVC) Sewer Pipe and Fittings**
Polyvinyl chloride (PVC) sewer pipe and fittings will conform to ASTM D-3034 - (SDR-35) specifications. The pipe will be installed in accordance with the applicable utility provisions herein, and as shown on the utility plans and as directed by the Engineer. PVC sewer pipe will be of the size and wall thickness (SDR) as noted on the utility plans, and will be installed in accordance with approved bedding methods.

PVC sewer pipe will be of sufficient wall thickness and strength to withstand the various earth and impact loads that bear on the installed pipe. The pipe will be circular in shape

with no appreciable distortion. The pipe will have a gasket joint, used in conjunction with an integral bell, which will be a homogeneous part of the pipe.

The joints for PVC sewer pipe will be of the push-on-type, with flexible elastomeric seals conforming to ASTM D-1784 Specifications. Other types of seals may be used, if approved by the Engineer. The PVC pipe bells made as an integral part of the PVC pipe will conform to ASTM D-3212 Specifications. The pipe will be assembled in accordance with the recommendations of the manufacturer and in accordance with the specifications. Compression type couplings may be used to joint plain-end PVC sewer pipe sections, if approved by the Engineer. However, such joints will allow for pipe expansion.

Polyvinyl (PVC) sewer pipe installed in accordance with the plans utility provisions herein and accepted will be measured along the pipe and paid for at the contract unit price per linear foot '6" PVC (SDR-35) Gravity Sewer Line'. Such prices and payments will be full compensation for furnishing all labor, equipment, material, pipe accessories, fittings, gaskets, seals, excavation, bedding material, backfill, leakage tests, and incidentals necessary to complete the work as required.

***Payment will be made under:***
**6" PVC (SDR-35) Gravity Sewer Line ..... LF**

**Sanitary Sewer Clean Out**
Contractor will install sanitary sewer cleanouts where shown on the plans but not less than every 50', with screw type brass covers, encased in 4"x 12"x 12" concrete pad flush with ground. Sanitary Sewer Cleanouts will be paid for at the contract unit price for each upon satisfactory completion of the work.

Payment will be made under:
**4" - Sanitary Sewer Cleanout ..... EA**

**Connection to Existing Sewer Manhole/Sewer Line**
The contractor will install Sanitary Sewer Line and connect to existing sanitary sewer manhole/Sewer Line as shown on the plans and as directed by the Engineer.

Connection to the sewer manhole/sewer line will be paid for at the contract unit price for each upon satisfactory completion of the work.

***Payment will be made under:***
**Connection to Sewer Manhole/Sewer Line ..... EA**

**RELOCATION OF POST TOP LIGHTS on CONCRETE FOUNDATIONS and RELOCATION OF OUTDOOR PAY PHONES on CONCRETE PADS**

**General**

Relocate existing Post Top Lights with Concrete Foundations and existing exterior Payphones/Booths as shown on the plans and as directed by the Engineer. Relocation will include, but not be limited to, dismounting the light and pole or phone and pedestal booth , removing the existing concrete foundation/pad , storing items during construction, constructing a new concrete foundation for Light Pole or concrete pad for Phone Booth with subbed –up conduit and anchor bolts, reinstallation of the light and pole base or phone and booth pedestal and connecting to existing / new Lighting circuit, new electrical source ,and a new phone line. as shown on the drawings or as directed by the Engineer.

**NOTE:** Underground Electric / Phone Lines damaged during construction must be repaired within ....48 – Hours.

Install / Repair Underground Electric Service (120/240- V- w/ ground ) (2"-pvc Conduit)
Install / Repair Underground Phone Service (10-Pair- Level- 3 ) (2"-pvc Conduit)

Service will be reconnected immediately after the area where they are to be relocated to is available and prepared.

3" –PVC Utility Sleeve-- shall be installed where shown on the plans or when requested by the Engineer in locations where proposed utility lines will cross under proposed sidewalks or other structures.

Relocation of post top light and pole on concrete foundation and relocation of payphone and pedestal on 4" – concrete pad or repair of any damaged underground site lighting electrical lines or underground phone lines will be paid for at the contract unit price each successfully relocated, installed , repaired and accepted

Such price and payment will be full compensation for all work covered by this special provision; including but not limited to furnishing all labor, materials, equipment and any other incidentals necessary or required to complete the work and restore service.

***Payment will be made under:***

**Relocate Post Top Light and Pole on Concrete Foundation.....EA**
**Relocate Payphone and Pedestal ..... .....EA**
**Electric Line - Install / Repair .....LF**
**Phone Line - Install / Repair .....LF**
**3"- PVC Utility Sleeve.....LF**

## RELOCATION OF EXISTING VENDING BUILDINGS

### General

On these sites there are existing vending buildings. The Vending building on the North Bound Lane must be temporarily relocated within the site as shown on the drawings prior to beginning construction of the new restroom building. The contractor is to disconnect the existing utilities and relocate the building on the site ,Connect a temporary underground electrical service from the existing Service Building so that the Vending building remains in service at the temporary location. The building on the South Bound Lane can stay in place until renovation of the existing rest area building has been completed and vendor has moved in.

At such time as directed by the Engineer, the Contractor is to disconnect the temporary utilities (water, power) from the NBL vending building, prepare the building for transport ,obtain the necessary permits to move the building on the Highway , then transport the building to the new location . At the new location the Contractor shall construct a 6" reinforced concrete pad for the transported building to rest in a new location, relocate the building to the new location, and properly tie in place with foundation bolts 24" O.C. No power service will be reconnected at this time.

New Permanent Location for North bound lane vending building:

NCDOT
I-85 Southbound Lane Rest Area
Near exit ramp storage building (Exact location to be determined on site by the Engineer)

### Materials and Construction

**Site Preparation**
After proposed building site is located, elevation is established and staked by the Engineer, the Contractor will perform necessary clearing and grubbing in accordance with Section 200 "Clearing and Grubbing" of the Standard Specifications.

**Excavation and Grading**
Remove root mat, rough grade and fill and compact embankment material to obtain building concrete slab elevation. Topsoil for backfill around the slab, is covered elsewhere in the proposal.

After rough grading, perform all necessary excavation for concrete slab. Remove all excavated material in excess of the amount required for finish grading off site. The Contractor may dispose of excess on site only if directed to do so by the Engineer.

Construct finished grade around concrete slab at a depth of 3 inches below finished floor. Slope grade away from building at 2 percent for a distance of 10 feet or as shown on drawings.

**Concrete and Steel**

Use class "A" concrete in the reinforced concrete slab. All applicable portions of Section 825, 'Incidental Concrete Construction – General'; Section 1000, 'Portland Cement Concrete Production and Delivery'; Section 1070 'Reinforcing Steel'; and Section 1072 'Structural Steel', of the Standard Specifications will apply.

Concrete slab will be 6 inches thick. Reinforced with 6 inch by 6 inch, 10/10 welded wire mesh. (Note: Any additional *Temporary pad* necessary for NBL vending building may be constructed and paid for as 4 inch concrete sidewalk.) Subgrade will consist of undisturbed soil or a thoroughly compacted earth fill, well drained and leveled to proper grade. Place a 4-inch layer of coarse gravel or crushed stone over subgrade; screen to a true and level surface and thoroughly tamp. Place vapor barrier, consisting of 6 mil. polyethylene membrane after tamping.

Pour concrete to proper grade and level with a straight edge. After floating, bring the concrete to a smooth finish with a steel trowel.

**Metals**

Install as indicated on drawings and details and as required herein. Form metal work to required shape and size with clean lines and angles. Avoid screws and bolts where possible. Where screws and bolts are used, countersink heads, screw up tight and pick threads to prevent loosening. Conceal fastenings where possible. Anchors built into concrete or masonry will be galvanized.

**Note**

At the existing site all existing electrical connections to the buildings will be disconnected and properly terminated underground. Plug electrical conduit with waterproof mastic.

**Compensation**

The work of temporarily and permanently relocating the Vending Buildings, when completed and accepted, will be paid for at the contract unit price each for 'Relocation of Vending Building' and 'Temporary Relocation of Vending Building'. Such price will be full payment for this work; including, but not limited to, preparing , clearing and grubbing, filling, grading, installing temporary electric and water service, installing temporary concrete pad, removing temporary concrete pad, , installing permanent concrete pad at off site location ,obtaining moving permits, transporting on highway , installing building in new location and connecting to new concrete pad , furnishing all labor, materials, and any other incidentals necessary or required to complete the work.

***Payment will be made under:***

**Permanent Relocation of Vending Building . . . . . .EA**
**Temporary Relocation of Vending Building (On Site) . . . . . .EA**

## 6" CONCRETE REINFORCED PAD - CLASS A CONCRETE

General: The work covered by this item shall consist of furnishing and constructing 6" concrete reinforced pad in accordance with the dimensions as shown in the drawings and as described herein.

6" Concrete reinforced pad construction shall conform to all applicable requirements of Section 848 (Sidewalks and Driveways) of the Standard Specifications.

6" concrete reinforced pad shall conform to all applicable requirements of Section 1070-3 (welded wire fabric) of the Standard Specifications and ASTM A-185.

Method of Measurement

The quantity of 6" concrete reinforced pad to be paid for shall be the actual number of square yards of 6" concrete reinforced pad, measured complete in place and accepted.

Basis of Payment

The quantity measures as provided above, shall be paid for at the contract unit price per square yard for "6" Concrete Reinforced Pad" complete in place and accepted, which

price and payment shall be full compensation for furnishing and installing, and for all labor, equipment, tools and incidentals necessary to complete the work.

Payment will be made under:

**6" Concrete Reinforced Pad ..... SY**

## 4" CONCRETE SIDEWALKS

General: The sidewalks indicated on the plans shall be 4" concrete. The sidewalks and patio shall be as specified in Section 848 and as shown on the plans.

Where it is noted on the plans where 4" concrete sidewalk is to meet and/or match existing concrete sidewalk. Install sidewalk according plans, details and specifications. The existing sidewalk shall have a clean **saw cut** edge provided, at the match locations and/or where concrete paving is removed.

Scoring patterns shall be as shown on plans or as directed by the Engineer in field, and as specified in Section 825-10. Control joints indicated on plans shall be as specified for Grooved Contraction Joints.

Method of Measurement and Basis of Payment

The quantities of sidewalk to be paid for will be the actual number of square yards measured along the surface which have been completed and accepted. This quantity of concrete includes all noted 4" sidewalk and the concrete banding associated with installation of decorative concrete pavers. The quantity of sidewalk measured as indicated above, will be paid for at the contract unit price per square yard for "4" Concrete Sidewalk". There will be no additional compensation for control and expansion joints.

Payment will be made under:

**4" Concrete Sidewalk ..... SY**

## DECORATIVE CONCRETE PAVERS

General: The work covered by this section shall consist of furnishing and installing the Concrete Pavers in accordance with dimensions and finishes as shown on the plans, the details, and as described herein.

Materials and Construction

Paver shall be "Belgard -Urbana" or "Paverstone –Venetian" or "Unilock-Riverstone" or "Approved Equal" – 3 1/8" Thick , with varying width and lengths layed in a Modular Pattern (10-15% Large Square). Specified Color : fieldstone blend of gray and earthtones. Concrete edging (see 4" Concrete Sidewalk Spec) shall be installed as noted on the plans and details. Edging shall be placed in line and plumb with proposed grades and sidewalks. Contractor shall be an experienced contractor with installing landscape edging. Contractor shall supply references and paver samples to engineer prior to construction.

Method of Measurement and Basis of Payment

The work of furnishing and installing Decorative Concrete Pavers as shown on the plans or as approved by the Engineer, when completed and accepted, will be paid for at the unit price per square feet for "Decorative Concrete Pavers". Such price and payment will be full compensation for all work covered by this special provision; including but not limited to furnishing transport, all labor, materials, equipment, excavation and grading, and any other incidentals necessary to complete the work.

Payment will be made under:

**Decorative Concrete Pavers .....SF**

## SEGMENTED RETAINING WALL

General: Work includes furnishing and installing modular concrete block retaining wall units, with 4" capstone by "Allan Block AB Europa (Abbey Blend Pattern) or Versalock ( Mosaic-Weathered )or Anchor Wall System ( Highland Stone ) or Approved Equal - to the lines and grades designated on the construction drawings and as specified herein.

Contractor shall be an experienced contractor with installing segmented retaining wall systems. Contractor shall supply references and samples to engineer prior to construction.

Reference Standards

ASTM C1372 Standard Specification for Segmental Retaining Wall Units.
ASTM 1262 Evaluating the Freeze thaw Durability of Manufactured CMU's and Related concrete Units
ASTM D698 Moisture Density Relationship for Soils, Standard Method
ASTM D422 Gradation of Soils
ASTM C140 Sample and Testing concrete Masonry Units

Delivery, Storage, and Handling

A. Contractor shall check the materials upon delivery to assure proper material has been received.

B. Contractor shall prevent excessive mud, wet cement, and like construction debris from coming in contact with the materials.

C. Contractor shall protect the materials from damage. Damaged material shall not be incorporated in the project (ASTM C1372).

Materials and Construction

**Modular Wall Units**

A. Wall units shall be Allan Block Retaining Wall units as produced by a licensed manufacturer.

B. Wall units shall have minimum 28 day compressive strength of 3000 psi (20.7 MPa) in accordance with ASTM C1372. The concrete units shall have adequate freeze-thaw protection in accordance with ASTM C1372 or an average absorption rate of 7.5 lb/ft3 (120 kg/m3) for northern climates and 10 lb/ft3 (160 kg/m3) for southern climates.

C. Exterior dimensions shall be uniform and consistent. Maximum dimensional deviations on the height of any two units shall be 0.125 in. (3 mm).

D. Wall units shall provide a minimum of 110 lbs total weight per square foot of wall face area (555 kg/m2). Fill contained within the units may be considered 80% effective weight.

E. Exterior face shall be textured. Color as specified by owner.

**Wall Rock**

A. Material must be well-graded compactable aggregate, 0.25 in. to 1.5 in., (6 mm - 38 mm) with no more than 10% passing the #200 sieve. (ASTM D422)

B. Material behind and within the blocks may be the same material.

**Infill Soil**

A. Infill material shall be site excavated soils when approved by the on-site soils engineer unless otherwise specified in the drawings. Unsuitable soils for backfill (heavy clays or organic soils) shall not be used in the reinforced soil mass. Fine grained cohesive soils (f<31 ) may be used in wall construction, but additional backfilling, compaction and water management efforts are required. Poorly graded sands, expansive clays and/or soils with a plasticity index (PI) >20 or a liquid limit (LL) >40 should not be used in wall construction.

B. The infill soil used must meet or exceed the designed friction angle and description noted on the design cross sections, and must be free of debris and consist of one of the following inorganic USCS soil types: GP, GW, SW, SP, SM, SM-SC meeting the following gradation as determined in accordance with ASTM D422.

| Sieve Size | Percent Passing |
|---|---|
| 4 inch | 100 - 75 |
| No. 4 | 100 - 20 |
| No. 40 | 0 - 60 |
| No. 200 | 0 - 35 |

C. Where additional fill is required, contractor shall submit sample and specifications to the wall design engineer or the on-site soils engineer for approval and the approving engineer must certify that the soils proposed for use has properties meeting or exceeding original design standards.

## WALL CONSTRUCTION

### Excavation

A. Contractor shall excavate to the lines and grades shown on the construction drawings. Contractor shall use caution not to over-excavate beyond the lines shown, or to disturb the base elevations beyond those shown.

B. Contractor shall verify locations of existing structures and utilities prior to excavation. Contractor shall ensure all surrounding structures are protected from the effects of wall excavation.

### Foundation Soil Preparation

A. Foundation soil shall be defined as any soils located beneath a wall.

B. Foundation soil shall be excavated as dimensioned on the plans and compacted to a minimum of 95% of Standard Proctor (ASTM D698) prior to placement of the base material.

C. Foundation soil shall be examined by the on-site soils engineer to ensure that the actual foundation soil strength meets or exceeds assumed design strength. Soil not meeting the required strength shall be removed and replaced with acceptable material.

### Base

A. Base material shall be placed as shown on the construction drawing. Top of base shall be located to allow bottom wall units to be buried to proper depths as per wall heights and specifications.

B. Base material shall be installed on undisturbed native soils or suitable replacement fills compacted to a minimum of 95% Standard Proctor (ASTM D698).

C. Base shall be compacted at 95% Standard Proctor (ASTM D698) to provide a level hard surface on which to place the first course of blocks. The base shall be constructed to ensure proper wall embedment and the final elevation shown on the plans. Well-graded sand can be used to smooth the top 1/2 in. (13 mm) on the base material.

D. Base material shall be a 4 in. (100 mm) minimum depth for walls under 4 ft (1.2 m) and a 6 in. (150 mm) minimum depth for walls over 4 ft (1.2 m).

**Unit Installation**

A. The first course of wall units shall be placed on the prepared base with the raised lip facing up and out and the front edges tight together. The units shall be checked for level and alignment as they are placed.

B. Ensure that units are in full contact with base. Proper care shall be taken to develop straight lines and smooth curves on base course as per wall layout.

C. Fill all cores and cavities and a minimum of 12 in. (300 mm) behind the base course with wall rock. Use approved soils to backfill behind the wall rock and in front of the base course to firmly lock in place. Check again for level and alignment. Use a plate compactor to consolidate the area behind the base course. All excess material shall be swept from top of units.

D. Install next course of wall units on top of base row. Position blocks to be offset from seams of blocks below. Perfect "running bond" is not essential, but a 3 in. (75 mm) minimum offset is recommended. Check each block for proper alignment and level. Fill all cavities in and around wall units and to a minimum of 12 in. (300 mm) depth behind block with wall rock. For taller wall application the depth of wall rock behind the block should be increased; walls from 15ft (4.57m) to 25ft (7.62m) should have a minimum of 2ft (0.61m) and walls above 25ft (7.62m) should have a minimum of 3ft (0.91m). Spread backfill in uniform lifts not exceeding 8 in. (200 mm) in uncompacted thickness and compact to 95% of Standard Proctor (ASTM D698) behind the consolidation zone.

E. The consolidation zone shall be defined as 3 ft (1 m) behind the wall. Compaction within the consolidation zone shall be accomplished by using a hand operated plate compactor and shall begin by running the plate compactor directly on the block and then compacting in parallel paths from the wall face until the entire consolidation zone has been compacted. A minimum of two passes of the plate compactor are required with maximum lifts of 8 in. (200 mm). Expansive or fine-grained soils may require additional compaction passes and/or specific compaction equipment such as a sheepsfoot roller. Maximum lifts of 4 inches (100 mm) may be required to achieve adequate compaction within the consolidation zone. Employ methods using lightweight compaction equipment that will not disrupt the stability or batter of the wall. Final compaction requirements in the consolidation zone shall be established by the engineer of record.

F. Install each subsequent course in like manner. Repeat procedure to the extent of wall height.

G. As with any construction work, some deviation from construction drawing alignments will occur. Variability in construction of SRWs is approximately equal to that of cast-in-place concrete retaining walls. As opposed to cast-in-place concrete walls, alignment of SRWs can be simply corrected or modified during construction. Based upon examination of numerous completed SRWs, the following recommended minimum tolerances can be achieved with good construction techniques.

**Vertical Control** - ±1.25 in. (32 mm) max. over 10 ft (3 m) distance.
**Horizontal Location Control** - straight lines ±1.25 in. (32 mm) over a 10 ft (3 m) distance.
**Rotation** - from established plan wall batter : 2.0°
**Bulging** - 1.0 in. (25 mm) over a 10 ft (3.0 m) distance

**Additional Construction Notes**

A. When one wall branches into two terraced walls, it is important to note that the soil behind the lower wall is also the foundation soil beneath the upper wall. This soil shall be compacted to a minimum of 95% of Standard Proctor (ASTM D698) prior to placement of the base material. Achieving proper compaction in the soil beneath an upper terrace prevents settlement and deformation of the upper wall. One way is to replace the soil with wall rock and compact in 8 in. (200 mm) lifts. When using onsite soils, compact in maximum lifts of 4 in. (100 mm) or as required to achieve specified compaction.

B. Filter fabric use is not suggested for use with cohesive soils. Clogging of such fabric creates unacceptable hydrostatic pressures in soil reinforced structures. When filtration is deemed necessary in cohesive soils, use a three dimensional filtration system of clean sand or filtration aggregate.

C. Embankment protection fabric is used to stabilize rip rap and foundation soils in water applications and to separate infill materials from the retained soils. This fabric should permit the passage of fines to preclude clogging of the material. Embankment protection fabric shall be a high strength polypropylene monofilament material designed to meet or exceed typical Corps of Engineers plastic filter fabric specifications (CW-02215); stabilized against ultraviolet (UV) degradation and typically exceeding the values on Table 1 (see pg. 8 of Spec Book)

D. Water management is of extreme concern during and after construction. Steps must be taken to ensure that drain pipes are properly installed and vented to daylight and a grading plan has been developed that routes water away from the retaining wall location. Site water management is required both during construction of the wall and after completion of construction.

E. Installation of the cap course, and any other partial placement of block in systematic arrangement of the last exposed course, shall be adhered in place with construction grade adhesive, as specified by the 'block' manufacturer and approved by the engineer.

Method of Measurement and Basis of Payment

The unit of measurement for furnishing and fabricating the Segmented Retaining Wall shall be the vertical square foot of wall surface from the top of the leveling pad to the top of the wall or wall coping. The accepted quantities of Segmented Retaining Wall will be paid at the contract unit price, which shall be full compensation for design, supply, and installation of the "Segmented Retaining Wall" including but not limited to furnishing all labor, materials, equipment and any other incidentals necessary or required to complete the work.

*Payment will be made under:*

**Segmented Retaining Wall..... Square Foot**

## CONCRETE STAIRS AND HANDRAILS

**General**
This provision consists of constructing concrete stairs and handrails as shown on the plans and details, including all materials, labor, equipment and grading to complete the work.

All applicable requirements of Incidental Concrete Construction-General, Section 825, Reinforced Brick Masonry Construction – General, Section 832 and Fabricating and Placing Reinforcement, Section 425 of the Standard Specifications will apply.

**Materials**
Concrete will be Class B. Brick, if necessary, will be the same as Rest Area building face brick. Handrails will be Schedule 40, 1 ½" outside diameter aluminum pipe with a clear brushed anodized finish.

**Construction/Installation**
Construct concrete in accordance with Section 825, except as otherwise noted herein. Furnish and place reinforcement, as shown on the plans and details, in accordance with the provisions of Section 425. Give formed surfaces of the concrete a rubbed finish. Give unformed surfaces a float finish.

Erect handrails as shown on the details, straight and true to line and grade. They will be core mounted into pipe sleeve as recommended by manufacturer. All welds will be filed smooth to the touch.

Compact backfill to a degree comparable to the adjacent undisturbed material.

**Compensation**
Concrete steps will be paid for as 'Concrete Steps' in cubic yards of concrete, computed from the dimensions shown on the plans or established by the Engineer, which has completed and accepted.

Handrails will be paid for as 'Handrails' in linear feet as measured along the surface of the completed and accepted work.

Such price and payment will be full compensation for all work covered by this special provision; including but not limited to furnishing all labor, materials, equipment and any other incidentals necessary or required to complete the work.

***Payment will be made under:***
**Concrete Steps ..... CY**
**Handrail on Steps ..... LF**

## 6' PARK BENCH

**General**
This special provision consists of furnishing and installing a 6' Park Bench as noted on the plans and as described herein. Provide Park Bench by (but not limited to) Durable Plastic Design LLC, Barco Products, Belson Outdoors or Approved Equal.

Provide 'cut sheet' for approval.

**Materials**

The prefabricated slatted park bench shall be constructed of UV resilient recycled plastic. The black legs and the integral cedar shaded bench and back are a flow molded, solid profile recycled (High Density Polyethelyne) HDPE plastic with colorant and UV inhibitors.

Concrete base pad is quantified as 4" Concrete sidewalk (see 4" Concrete Sidewalk spec).

**Installation**
Anchor park bench to concrete pad with galvanized expansion hardware or as instructed by manufacturer.

Drop-in Anchor Installation: Drill ¼ inch hole into pre-marked holes on the concrete surface with a carbide tipped masonry drill bit conforming to ANSI B94, 12-77, matching the bit size with the outside diameter of the drop-in anchor being used. Make sure hole depth exceeds minimum embedment. Set and attached anchor to bench foot. Confirm final installation with NCDOT Engineer.

**Compensation**
Park bench will be paid for as '6' Park Bench' per each installed, completed and accepted. Such price and payment will be full compensation for all work covered by this special provision; including but not limited to furnishing all labor, materials, equipment and any other incidentals necessary or required to complete the work.

***Payment will be made under:***
**6' Park Bench. . . . . . EA**

## RELOCATED PICNIC SHELTER

**General**
The work covered by this provision consists of removing and re-installing the existing handicap picnic shelter, handicap picnic table and benches as shown on the drawings and herein specified; including all labor, materials, services and incidentals required to complete the work.

Coordinate dismantling, removal and relocation of picnic shelter, picnic table and bench with the demolition and removal of the existing concrete base. It is the full intention of this specification to re-use all existing materials. If, through the removal, relocation or reconstruction process, any of the materials are damage or compromised the contractor shall provide an equal replacement, in kind, as approved by the engineer, defined in the detailed picnic shelter details and/or specification herein.

Prepare new site according all specification and drawings

***Site Preparation***
After picnic shelter and table location and orientation is staked and approved by the Engineer, perform any necessary clearing and grubbing in accordance with Section 200 "Clearing and Grubbing" of the Standard Specifications. Grade area for the concrete pad level with drainage swale cut on high side and fill on low side as shown on the details to achieve positive drainage around the pad.

***Picnic Shelters***

**Concrete and Steel**
Use Class "B" concrete in all footings and concrete pad. All concrete and all structural and reinforcing steel will comply with applicable portions of Section 825 'Incidental Concrete Construction – General'; Section 1070, 'Reinforcing Steel'; and Section 1072 'Structural Steel' of the Standard Specifications.

Include all fasteners, anchors, ties, gusset plates, etc., as required. Use ½ inch hot-dip galvanized steel thru bolts in diameter and length as required. Install with steel galvanized washers under both bolt head and nut, except for gusset plates; galvanizing will conform to all applicable requirements of Section 1076 of the Standard Specifications.

**Carpentry and Millwork**
Grading of all lumber, plywood and trim will conform to the association under whose rules it is graded. Moisture content will not exceed 18 percent for framing lumber and 12 percent for millwork and trim.

All lumber in contact with concrete or masonry, and/or soil will be treated with water borne pentachlorophenol or CCA (Chromated Copper Arsenate) in accordance with standards of the American Wood Preserver's Association. Minimum retention will be

0.25 pcf for material 2 inches and smaller and 0.40 pcf for materials greater than 2 inches.

Store all lumber and millwork in a manner that will keep it dry and well ventilated, well off the ground, and adequately covered.

All timbers, rafters and fascia will be full size, rough-cut No. 1 southern yellow pine, thru-bolted where shown on drawings and securely spiked together at all other joints. Stain all timbers, rafters, fascia and underside of roof decking. The Engineer will select color from samples furnished by the contractor.

Coat section of treated wood columns in footing with asphalt paint as shown on drawings. Asphalt paint shall not be visible above concrete footing.

Roof decking will be single tongue and groove, 2 inches by 6 inches with vee joints on face side, kiln-dried No. 1 southern yellow pine. Double spike each member at every rafter.

Framing rafters and fascia will be cut square on bearings, closely fitted, accurately set to required lines and levels, and rigidly secured in place.

**Moisture Protection**
Use #15 asphalt-saturated felt conforming to ASTM D-226 for roofing felt. Shingles will be the same brand, color, and type as those approved for the rest area service building. Lay one layer of #15 roofing felt to sheathing, lapping horizontally 6 inches, prior to placing shingles. Furnish and install, where shown on drawings, all items of flashing and caulking as required to properly and completely weatherproof the building. Flashing, drips, etc., will be galvanized steel, 26 Ga. Or aluminum, .019-inch sheeting, unless otherwise shown on details. Caulking will be installed in accordance with the manufacturer's specifications. Use Dap 'Flex Seal', Dow Corning '790', or Pecora GC-9 'Synthacalk' or approved equal.

***Picnic Table (Terrazzo and Steel)***

**General**
The picnic table will include site preparation, grading, concrete footing, welded tubular steel frame with a terrazzo table top and wood benches, all hardware required for assembly and other incidentals as necessary for complete installation in accordance with the details and as described herein.

The Engineer reserves the right to inspect the frames and tops at the place of manufacture in accordance with Section 106-6 of the Standard Specifications.

**Submittal**
Submit color chart (four copies) on epoxy glaze coatings for color selection by the Engineer to be used on table bench seats and steel frames.

**Concrete and Steel**
Use class "B" concrete in all table footings and concrete pad. All concrete and all structural and reinforcing steel will comply with applicable portions of Section 825, 'Incidental Concrete Construction – General'; Section 1000, 'Portland Cement Concrete Production and Delivery'; Section 1070 'Reinforcing Steel'; and Section 1072 'Structural Steel' of the Standard Specifications.

**Benches**
Aluminum 2" x 10",

**Terrazzo Tops**
Terrazzo tabletops will conform to the following specifications:

1. Scope: provide pre-cast terrazzo tops for picnic tables. Include inserts and bolts as indicated on drawings.

2. Materials:
   A. Portland Cement will comply with all applicable requirements of Section 1024, 'Materials for Portland Cement Concrete', of the Standard Specifications.
   B. Sand will be clean and free from organic matter and will meet the requirements of 4S mortar sand, from Table 1005-1, 'Aggregate Gradation', of Section 1005, 'General Requirements for Aggregate' of the Standard Specifications.
   C. Marble chips will be of the size, colors and kinds required by the color plate as specified herein; chips will have abrasive hardness not less than 13 as determined by the method described in the National Bureau of Standard BMS Report No. 98.
   D. Terrazzo sealing solution will produce a waterproof film on surface and seal moisture in terrazzo. Cleaning solution will not cause yellowing of terrazzo or leave tacky finish on the surface after buffing.
   E. Terrazzo cleaning solution will be a neutral chemical cleaner that will not change the color of the terrazzo or damage it in any way.

3. Terrazzo Composition and Colors:
   A. Terrazzo tops will be of colors and composition as shown in Terrazzo Plant Catalog of the National Terrazzo and Mosaic Association, Inc. Mix terrazzo in accordance with formulas and specifications for Plate 129.

4. Production of Tops:
   A. Mix chips so that the finish surface has 80 percent aggregate showing.
   B. Perform initial and final grinding with abrasive grit stone of proper size to obtain the finish specified. After curing terrazzo topping, by keeping damp for 6 days (or less if it has set enough to grind without loosening of chips), grind surfaces with electric machine. After initial grinding or

rubbing, grout surfaces with neat Portland Cement paste of creamy consistency, filling all voids; use Portland Cement and coloring corresponding to existing topping for grouting. Let grout remain on surfaces until final grinding, but not less than 2 days.

C. Final grinding will produce surface of same color and texture as Plate 129 as specified in Item 3 above. Surfaces will be smooth and free from imperfections. In no case will terrazzo show a wave exceeding 1/16" when tested with straight edge.

5. Cleaning and Sealing Terrazzo:
   A. After final grinding, apply cleaning solution to terrazzo in accordance with the manufacturer's directions. After surfaces are dry, wash and rinse terrazzo and apply a coat of sealing solution. Buff terrazzo with electric machine and leave in clean and finished condition.

6. Installation of Table Tops:
   A. Bolt top in place without binding.
   B. Clean tops of grease, dirt, etc., and apply two (2) additional coats of sealing solution, buff with electric machine and leave in clean and finished condition.
   C. Leave top in good condition. Chipped tops, rough or chipped edges and cracked slabs will not be accepted.

7. Painting of Table, Wood Benches and Steel Frame:
   A. Bench – Use one coat of epoxy glaze coating mixed with one part of epoxy thinner, then use two coats of epoxy glaze coating, gloss finish.
   B. Exterior Steel – Use one coat factory priming exterior rust resistant metal primer, then use two coats of epoxy glaze coating, gloss finish.

      NOTE: Painter will spot check a small area with a second coat to determine if primer "lifts off". If it does, obtain from the paint factory a second coat that will not lift from the priming coat actually used by the factory.

**Concrete Pad**

Use Class "B" concrete. All concrete and structural and reinforcing steel will comply with applicable portions of Section 825 'Incidental Concrete Construction – General'; Section 1070, 'Reinforcing Steel'; and Section 1072 'Structural Steel' of the Standard Specifications.

Form and pour concrete pad to dimensions and with slope as shown in details. Give concrete pad the same finish as sidewalks. Do not place backfill until at least 3 curing days have elapsed. Compact backfill to a degree comparable to the adjacent undisturbed material.

**Compensation**
The work removing, transporting and reconstructing the picnic shelter with table, benches and concrete pad, when completed and accepted, will be paid for at the contract unit price each for 'Relocated Picnic Shelter".

Such price will be full payment for each picnic shelter with table and concrete pad, including but not limited to, all labor, materials, and any other incidentals necessary or required to complete the work. There will be no separate payment for the concrete pad.

***Payment will be made under:***

**Picnic Shelter Relocation .....EA**
**Phone / Display Shelter Remove & Stockpile.....EA**

## FLAGPOLE

General: The work covered by this section consists of furnishing and installing 40' satin finished aluminum flagpole at locations as shown on the drawings.

Materials: The flagpoles shall be 40' exposed height (44' overall length) standard cone tapered aluminum flagpoles .Provide a ball bearing revolving truck assembly with a 8" gold anodized ball finial. Provide an aluminum flash collar and all components recommended by the manufacturer for a ground-set installation. Cabling will be set up to hold two flags.

Installation: Follow the manufacturer's recommendations concerning ground set mounting for a 80 M.P.H. design a wind load. Coordinate the installation of the flagpole with the placement of the flagpole light and all site work and utilities.

Compensation: The Tapered Aluminum Flagpoles will be paid for a the contract unit price for each "Flagpole". Such payment will be full compensation for all work covered by this section including, but not limited to, furnishing and installing the flagpole, flash collar, halyard, cleats, flag snaps, and all parts recommended by the manufacturer for a ground-set installation; and all labor, materials and equipment necessary to complete the work.

Payment will be made under:

**Flagpole ..... Each**

## FLAGPOLE LIGHT

**General**
The work covered by this section consists of furnishing and installing an in-ground spotlight (2 at each flagpole) and site electrical service for each flagpole at locations as shown on the drawings and as directed by the Engineer.

**Materials**
120 Volt power supply in conduit. Direct Burial fixture with tempered glass lens, watertight seal and rock guard louver. Can be rotated 358 degrees, tilted and adjusted up and down for aiming flexibility. Accommodate up to a 150 watt bulb, with built in thermal protector safeguard against overheating. Photocell control shall be included. Contractor to submit Manufacturer and model for approval.

**Installation**
Follow the manufacturer's recommendations for in-ground installation.
Work to be completed by a licensed electrician.

**Compensation**
The work of furnishing and installing the flagpole lighting, when completed and accepted, will be paid for at the contract unit price each for 'Flag Pole Light'.

Such payment will be full compensation for all work covered by this section including, but not limited to, furnishing and installing the flagpole light, and all parts recommended by the manufacturer for a proper ground-set installation; and all labor, materials and equipment necessary to complete the work.

*Payment will be made under:*
**Flag Pole Light..... EA**

## LANDSCAPE LIGHTING SYSTEM

The Contractor shall provide all materials and labor to install the low-voltage landscape accent lighting system Lighting shall be shall be manufactured by Cast , Kichler , Hadco outdoor lighting system components or Approved Equal.

The work shall include the installation of a 12 volt light system, as described herein, and such items for the proper installation of the landscape light system:

- 600 watt transformer
- Sixteen (16) - 20 watt spot lights
- marine grade lead wire
- junction boxes/ spider splices

The contractor shall provide A scaled drawing of the proposed landscape light system layout, installation and placement of the system light fixtures, wire runs, splice(s) and transformer location, along with information 'cut sheets' on the transformer, and samples of the specified light fixtures shall be provided by the contractor to the engineer for final approval prior to installation.

12 Volt Transformer: Provide and install a 12-volt (min 600 watt) U.L. listed transformer. Transformer shall be mounted following specifications in the transformer stand detail drawing. Transformer installation shall include Romex strain relief connectors on all secondary wiring entering the transformer. Should contractor choose to install hard pipe conduit, a valve box shall be placed directly under transformer where hard pipe conduit will terminate. Valve box will allow slack wire collection point to allow future servicing and cleaner installation. Transformer cabinet shall be constructed of stainless steel with manufacturer applied black powder coating

Transformer shall include quick connect feature to allow the quick installation of a photo cell or 20' remote photo cell if required at a later date. Transformer shall include plug point for timer or x-10 unit for on/off control. Transformer shall include 125 Amperage rated terminal block secondary field wiring connection point. No wire nut secondary wiring connections shall be allowed at the transformer. All internal transformer wiring shall be 140°C rated high temperature tin-coated wire. No internal wiring less than 140°C tin-coated shall be allowed. Transformer shall be capable of loading 100% of the load of the transformer on any of the secondary field taps 12V thru 15V. Transformer shall have voltage taps of 12V, 13V, 14V, & 15V. The 600 watt transformers shall incorporate secondary magnetic circuit breaker protection. Any transformers from 900 to 1500 watts shall incorporate both primary and secondary circuit breaker protection. Transformer shall be fully potted with 180°C rated encapsulant to fully protect winding from environmental degradation. No vented and exposed single dipped epoxy coated transformer windings are acceptable. Transformer shall have drop-down removable wiring compartment for ease of installation. Mount transformer box to noted location on exterior of building and as directed/approved by the Engineer.

120 Volt Electric Service: Connection to 120 V circuit, for low voltage lighting system and noted transformer, is via 'plug-in' pre-installed GFC exterior outlet on buildings. Contractor shall install field circuit wiring for low voltage lighting system to all specifications. In the event alterations are made during final adjustments, contractor shall under no circumstances exceed the following amperage ratings of any low voltage wiring. In the event the amperage ratings exceed below ratings, then a new wire shall be run to split up the load on the circuit.

Wire Gauge: Max. Amp Load

- #18-2: **4 amps,**
- #16-2: **7 amps,**
- #12-2: **14 amps,**

- #10-2: **22 amps,**
- #8-2: **25 amps**

Contractor shall install spider splice wire junction boxes in all splice locations. Splices shall be placed in planting beds and areas not subject to damage from maintenance equipment. All installed fixtures shall come pre-wired with 25 foot #16-2 tin coated marine grade lead wire as part of the fixture (factory installed). All field splices shall be made with 20 amperage rated Teflon filled waterproof wire nut splices. No grease filled direct burial splices are acceptable. Wire splices shall use only Teflon filled 20 amperage rated direct burial wire nut wire splice. #61335 and #61135. Other acceptable splice techniques include soldering and crimping. All connections must be UL approved for the application. Contractor shall take operating amperage readings on the primary when done with the installation and record the readings on the inside of transformer cover on the sticker provided with a fine point permanent marker.

Electrical Junction Box / Spider Splice and Record Tag: Provide and install electrical junction box/ Spider Splice in locations shown on the plans. The below grade box shall be NEMA rated for underground use and sized to house all wiring and record tags. Contractor shall include within each Junction Box / Spider Splice a tag noting each as built wire run to and from the box.. The tag shall be constructed of non-degradable waterproof material. Notation on each tag can be stamped and/or written in legible waterproof ink.. As-built records shall indicate off-grade information, the wire run number, transformer number, lamp installed, and the individual numbered fixture on the wire run and total fixtures on the wire runs. The As-Built Record Tags will insure that the long-term maintenance of the system is carried out following the original design of the system.

Fixtures: Contractor shall provide and install bronze metal fixtures, lamps, stakes and mount as directed by the project landscape architect. Contractor shall install sealed front-glass covered MR 16 lamps in all fixtures where required. No uncovered MR16 lamps shall be allowed. All wattages and beam spreads as detailed on the lighting design. Final adjustment of the system is the responsibility of the contractor at the discretion the Engineer. Final adjustment will be done at no additional expense to the client. All lamps shall operate in the acceptable range of between 10.8 to 12 volts. Ideal operating voltage is 11.5 volts. Contractor is required to submit in writing all final field operating voltages at the splice locations to architect prior to completion of the project. If required, contractor shall demonstrate in the field the operating voltages of the system to the the Engineer.

General: Contractor shall take amperage readings on all secondary field circuit wires when done with the installation and record the readings on the inside of the transformer cover on the sticker provided with a fine point permanent marker. Contractor shall bury all secondary wires 12" depth from surface. Contractor shall sleeve all wires entering planting beds from turf or under walks within pre-installed 2" PVC. Review landscape plans, and confirm with the Engineer, on exact locations of sleeves . Contractor shall

leave all excess fixture wire at the fixture to allow easy field adjustment of the fixture if required.

Method of Measurement and Basis of Payment
(Landscape Lighting System)

The work of furnishing and installing landscape lighting system when completed and accepted, will be paid for at the contract Lump Sum price "Landscape Lighting System" for individual northbound lane (NBL) and southbound lane (SBL) facility. Such price to be considered as full payment for this work, including, but not limited to, furnishing all labor, materials, and any other incidentals necessary or required to complete the work.

Payment will be made under:

- **Landscape Lighting (NBL) ..... Lump Sum (LS)**
- **Landscape Lighting (SBL) ..... Lump Sum (LS)**

## WASTE CONTAINER

General: Waste container shall be furnished and installed on 4"- 5'x5'concrete pad in accordance with detail plans and shall be located as shown on the plans or as directed by the Engineer.
Waste container unit shall be the product of a manufacturer regularly engaged in the design and manufacture of precast exposed aggregate waste containers. (See Waste Container Detail Plan Sheet for size, design, material, etc.) Finish color shall be "Blue-gray" hood and "Blue-gray" body. Provide model TF30(A-2-color) by Wausau Tile or Belson Outdoor Products or Highland Products or Approved Equal - Submit six (6) copies of shop drawings or submittal data to Engineer for approval.

Method of Measurement

Waste Container units complete in place and accepted

Basis of Payment

Waste container, measured as provided above, shall be paid for at the contract unit price each for each "Waste Container (Precast conc.)". Such price and payment will be full compensation for the work of furnishing and installing the waste container, including but not limited to, furnishing all labor, materials, tools, equipment and all incidentals necessary to complete the work.
Concrete pad will be paid for as '4" Concrete Sidewalk', see appropriate special provision.

Payment will be made under:

**Waste Container ..... EA**

## 3/4 INCH POST-TYPE YARD HYDRANT

General: The work covered by this item shall consist of furnishing, connecting and installing 3/4 inch post-type yard hydrants complete with 4" x 5'x 5' concrete pad, valve(s), and waste drainage to catch basin as shown on the plans and as specified herein.

The Contractor shall supply six (6) copies of shop drawings and specifications for the post-type yard hydrant proposed to furnish, for approval by the Engineer.

Materials and Construction

Post-type yard hydrants shall be a non-freeze proof design for a minimum burial depth of 30 inches. (Note: Each hydrant shall have a screw on vacuum break at the nozzle).

Gate valve, valve box, and pipe shall be provided to complete the installation of yard hydrant.

The locations for post-type yard hydrants as shown on the plans are substantially correct; however, the exact location will be established by the Engineer.

Details showing dimensions, mounting height, foundation slab, pipe sizes, waste drainage and other items are as shown on the plans.

Sterilizing and Flushing 3/4 Inch Post-Type Yard Hydrants

Sterilizing and flushing as specified for "Water Line Construction" shall be done as part of the work of completing 3/4 inch post type yard hydrants.

Method of Measurement

The quantity of post type yard hydrants to be paid for will be the actual number of 3/4 inch post type yard hydrants with 4"x5'x5' concrete pad ,Gate valve, valve box, and water supply pipe and waste drainage piping to catch basin ,complete in place and accepted.

Basis of Payment

3/4 inch Post-Type Yard Hydrants measured as provided above will be paid for at the contract unit price each for "3/4 Inch Post-Type Yard Hydrants", including but not limited to, furnishing all labor, materials, tools, equipment, and all other incidentals necessary to complete the work.

Payment will be made under:

**3/4 " Post-Type Yard Hydrant . . . . . EA**

## SODDING

### Sodding (Tall Fescue/Bluegrass Mixture)

General: The sodding shall be prepared in accordance with all applicable requirements of Section 1663 of the Standard Specifications and the following provisions:

The Contractor shall obtain a certificate or limited permit issued by The N.C. Department of Agriculture (1-800-206-9333) or (919-733-6932) stating that the sod has been found to be free of injurious plant pests.

Materials:

Only "approved sod" (trade designation) consisting of tall fescue/bluegrass shall be used. The sod, machine cut to the suppliers standard width and length, shall be 5/8 inch (16 mm) minimum thickness, excluding top growth and thatch, at the time of cutting. Before cutting, the sod shall be uniformly mowed at a height of 2 to 3 inches (52-78 mm). Standard sod sections shall be sufficiently strong to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10% of the section.

| APPROVED TALL FESCUE CULTIVARS: | | | |
|---|---|---|---|
| ADVENTURE | ADVENTURE II | AMIGO | ANTHEM |
| APACHE | APACHE II | ARID | BROOKSTONE |
| BONANZA | BONANZA | CHESAPEAKE | CHIEFTAIN |
| CORONADO | CROSSFIRE II | DEBUTANTE | DUSTER |
| FALCON | FALCON II | FINELAWN PETITE | FINELAWN |
| FINELAWN I | GENESIS | GRANDE | GUARDIAN |
| HOUNDOG | JAGUAR | JAGUAR III | KENTUCKY 31 |
| KITTY HAWK | MONARCH | MONTAUK | MUSTANG |
| OLYMPIC | PACER | PIXIE | PYRAMID |
| REBEL | REBEL JR. | REBELL II | RENEGADE |
| SAFARI | SHENANDOAH | TITAL | TOMAHAWK |
| TRAILBLAZER | TRIBUTE | WRANGLER | |
| **APPROVED KENTUCKY BLUEGRASS CULTIVARS:** | | | |
| KENBLUE | GLADE | ADELPHI | BARON |
| BRISTOL | CHALLENGER | COLUMBIA | FYLKING |
| MERIT | PLUSH | RAM I | RUGBY |
| SYDSPORT | TOUCHDOWN | VANTAGE | |

Sod shall be delivered on site within 24 hours of being cut and be covered by acceptable means during delivery. A certificate from the sod producer stating the date and time of sod cutting shall accompany the sod when it arrives at the project site.

Soil Preparation:

Remove litter and other debris. Satisfactorily dispose of weeds or other unacceptable growth on the areas to be sodded.

Prior to beginning preparation of the soil to receive sod, all eroded, uneven and rough areas shall be contour graded and/or filled with soil as directed by the Engineer. The soil shall be scarified or otherwise loosened to a depth of not less than 5 inches (130 mm) with a maximum width of 48 inches (1145 mm). Clods shall be broken and the top 2 to 3 inches (52 to 78 mm) of soil shall be worked into an acceptable soil bed by the use of soil pulverizers, drags, or harrows.

The Contractor shall be responsible for taking sufficient soil samples (at least one sample per planting area for testing by The Department of Agriculture, Soil Testing Division, to determine the soil pH. Samples shall be taken in the presence of the Engineer. Results shall be received by the Engineer directly from the North Carolina Department of Agriculture and Consumer Services.

Limestone: Based on these results the Contractor shall add limestone, if required, to bring the soil pH to 5.5 to 6.5 (opt. 6.0). The amount of limestone to be applied will be approved by the Engineer prior to application. Application of limestone will be considered incidental to the work of "Sodding" and no direct payment will be made for such.

Sulfur: Based on these results the Contractor shall add sulfur if the pH is greater than 7.0, to bring the soil pH to 5.5 to 6.5 (opt. 6.0). The amount of sulfur to be applied will be approved by the Engineer prior to application. Application of sulfur will be considered incidental to the work of "Sodding" and no direct payment will be made for such.

After soil preparation, lime or sulfur (if necessary), shall be uniformly distributed by mechanical means using a drop type spreader and thoroughly mixed with the top five inches (130 mm) of the soil by discing, harrowing, or other approved methods.

The area shall then be harrowed, dragged, raked, or prepared by other approved methods which will give a lawn type finish. All trash, debris and stones larger than 1-1/2 inch (38 mm) in diameter or other obstructions that could interfere with the placing of the sod shall also be removed. The finished surface shall be moistened with water prior to placing the sod as directed by the Engineer.

Placement:

Sod handling and placement shall be a continuous process of cutting, transporting and installing including repairing seams and voids. Sod shall always be installed within 48 hours after being cut. Sod shall be watered within 2 hours of installation.

Any sod or portions of sod rejected by the Engineer during the initial placement shall be removed from the project and replaced with acceptable sod immediately. The Contractor shall cease any and all other placement of sod on the project until rejected sod has been replaced.

After sod has been placed, and staked where necessary, according to Section 1663, it shall then be rolled or tamped carefully and firmly by means acceptable to the Engineer to ensure proper soil contact. If rolled, roller shall weigh 150#/ft (224kg/m) of roller width. Use of rubber tired equipment to roll shall not be allowed. Metal staples, 12 inches (305 mm) long unless otherwise approved, shall be made of 11 gauge (3.0 mm diameter) new steel wire so as not to bend when pinned or driven through the sod. Extreme care shall be taken to prevent the installed sod from being torn or displaced. After rolling or tamping the sod, it shall be watered uniformly and thoroughly with a minimum of 1 inch of water (5.6 gallons per square yard (25 liters per square meter) applied immediately after installation of sod. In no case shall the time interval between sod placement and initial watering exceed 2 hours. Water shall be placed to the required quantity through sequential passes to insure proper coverage and to prevent runoff. A minimum of ¼ inch (6.4 mm) should be placed on each pass.

Maintenance:

The Contractor shall be responsible for all watering and other maintenance required to maintain the livability and health of the sod from installation until completion of the 60 day observation period. Additional water shall be applied as needed and as directed by the Engineer to maintain the livability of the sod. Each additional watering event shall be a minimum of 0.5 inch of water (2.8 gallons per square yard (13 liters per square meter)) uniformly applied over the sodded area and may be placed in a series of passes to prevent runoff, with a minimum of ¼ inch (6.4 mm) on each pass.

Any sod or portions of sod rejected by the Engineer after placement but prior to beginning the observation period, shall be removed from the project and replaced with acceptable sod. Satisfactory replacement of sod shall begin within 10 days of notification. Failure to replace and repair damaged or dead sod as directed by the Engineer may result in sanctions under Article 108-7 or Article 108-8.

Observation Period:

The Contractor shall maintain responsibility for the sod for a 60 day observation period beginning upon the satisfactory completion and acceptance of all work required in the plans or as directed by the Engineer. The Contractor shall guarantee the sod under the payment and performance bond, refer to Article 109-10 in the standard specifications.

*Upon satisfactory completion of work and acceptance by the Engineer, the 60 day observation period shall begin.*

*The Contractor shall be responsible for all watering and other maintenance required to maintain the livability of the sod from installation until final acceptance including monitoring the sod to ensure all watering and other maintenance is performed as required.*

*After the first 30 days of the 60 day observation period, the Contractor and Engineer shall meet to review the project and identify dead or damaged sod to be replaced. The Contractor, at no additional expense to the Department, shall satisfactorily replace any sod that is not in a living and healthy condition as determined by the Engineer. Replacement sod shall be furnished and installed in accordance with the same requirements as for initial sodding operation, except that the amounts of limestone, sulfur, and water may be readjusted as directed by the Engineer. Satisfactory replacement of sod shall begin within 10 days of notification. Failure to replace and repair damaged or dead sod as directed by the Engineer may result in sanctions under Article 108-7 or Article 108-8. Upon completion and acceptance of the sod repairs, the remaining 30 days of the observation period shall begin.*

Acceptance:

At the end of the 60 day observation period, the sod furnished and installed under this contract must be in a living and healthy condition, as determined by the Engineer.

Acceptance of sod will be at the end of the 60 day observation period.

Sodding shall be inspected by the Area Roadside Environmental Engineer to begin and end the 60 day observation period. The sod shall be weed free at time of final acceptance.

Payment:

Payment and measurement to be in accordance with Section 1663 of the Standard Specifications.
Payment will be made under:

**Sodding . . . . . .Square Yard**

## SEEDING AND MULCHING

**General**
Prepare seedbed, furnish, place and incorporate limestone, fertilizer, and seed; rake, mulch, mow and perform other operations necessary for the permanent establishment of vegetation from seed on areas exposed due to construction operations. Adapt operations to variations in weather or soil conditions as necessary and as directed by the Engineer for the successful establishment and growth of the turf.

Fertilizer, limestone, seed and mulch will meet all applicable requirements of Section 1060 of the Standard Specifications.

Fertilizer - 10-20-20 analysis or equivalent 1-2-2 ratio if approved by Engineer at a rate of 300 pounds per Acre
Limestone - at a rate of 2600 pounds per Acre
Seed - Centipede Cultivar approved by Engineer at 10 pounds per Acre

**Installation**
Remove existing vegetation. Remove all construction debris, concrete, rocks, wood, brick, etc. that will interfere with turf establishment. Loosen soil to a depth of not less than 5 inches. Break up any clods and work top 2 to 3 inches of soil to prepare an acceptable seedbed. Shape and smooth any uneven or rough surfaces. Do not prepare soil when ground is frozen, extremely wet or in an otherwise unfavorable working condition. Fertilizer and Limestone may be applied as part of or after the seedbed preparation. If applied after seedbed has been prepared, rake to thoroughly mix into soil.

Distribute seed uniformly over the seedbed at the required rate of application and immediately rake to cover seed with a layer of soil. Apply mulch in a light but uniform layer that allows some sunlight penetration and air circulation but heavy enough to provide some shade to the soil/seed layer and conserve soil moisture. Hold mulch in place with a binding material specifically manufactured for this purpose if requested by the Engineer.
Maintain areas in a satisfactory condition until the project is completed. Repair any areas that are disturbed with subsequent construction operations to the satisfaction of the Engineer.

## SEEDING AND MULCHING OF ROADWAY AND WASTE AND BORROW LOCATIONS

**Seeding and Mulching** **(East)**
The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, will be as stated below. During periods of overlapping dates, the kind of seed to be used will be determined. All rates are in pounds per acre.

All Roadway Areas

| **March 1 - August 31** | | **September 1 - February 28** | |
|---|---|---|---|
| 50# | Tall Fescue | 50# | Tall Fescue |
| 10# | Centipede | 10# | Centipede |
| 25# | Bermudagrass (hulled) | 35# | Bermudagrass (unhulled) |
| 500# | Fertilizer | 500# | Fertilizer |
| 4000# | Limestone | 4000# | Limestone |

Waste and Borrow Locations

| **March 1 – August 31** | | **September 1 - February 28** | |
|---|---|---|---|
| 75# | Tall Fescue | 75# | Tall Fescue |
| 25# | Bermudagrass (hulled) | 35# | Bermudagrass (unhulled) |
| 500# | Fertilizer | 500# | Fertilizer |
| 4000# | Limestone | 4000# | Limestone |

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

| | | | |
|---|---|---|---|
| Adventure | Brookstone | Guardian | Red Coat |
| Adventure II | Bonanza | Houndog | Renegade |
| Airlie | Bonanza II | Inferno | Safari |
| Amigo | Bulldog 51 | Jaguar | Shelby |
| Anthem | Chapel Hill | Jaguar III | Shenandoah |
| Anthem II | Chesapeake | Kentucky 31 | Southern Choice II |
| Apache | Chieftain | Kitty Hawk | South Paw |
| Apache II | Coronado | Monarch | Tempo |
| Arid | Crossfire II | Montauk | Titan |
| Arid II | Debutante | Mustang | Tomahawk |
| Arid III | Duster | Olympic | Tacer |
| Aztec II | Falcon | Pacer | Trailblazer |
| Barfexas | Falcon III | Pixie | Tribute |
| Barfexas II | Finelawn | Pyramid | Wolfpack |
| Barrera | Finelawn I | Quest | Wrangler |
| Barrington | Finelawn Petite | Rebel | |
| Bingo | Genesis | Rebel Jr | |
| Bravo | Grande | Rebel II | |

On cut and fill slopes 2:1 or steeper Centipede will be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from January 1 - December 31.

Fertilizer will be 10-20-20 analysis. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis.

**Temporary Seeding**
Fertilizer will be the same analysis as specified for *Seeding and Mulching* and applied at the rate of 400 pounds and seeded at the rate of 50 pounds per acre. Sweet Sudan Grass, German Millet or Browntop Millet will be used in summer months and Rye Grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

**Fertilizer Topdressing**
Fertilizer used for topdressing on all roadway areas except slopes 2:1 and steeper will be 10-20-20 written approval of the Engineer, a different analysis of fertilizer may be used provided grade and will be applied at the rate of 500 pounds per acre. Upon the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 10-20-20 analysis.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas will be 16-8-8 grade and will be applied at the rate of 500 pounds per acre. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis.

**Supplemental Seeding**
The kinds of seed and proportions will be the same as specified for *Seeding and Mulching*, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding may vary from 25# to 75# per acre. The actual rate per acre will be determined prior to the time of topdressing and the Contractor will be notified in writing of the rate per acre, total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder will be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

**Mowing**
The minimum mowing height on this project will be 4 inches.

**Minimize Removal of Vegetation**
The Contractor will minimize removal of vegetation at stream banks and disturbed areas within the project limits as directed.

**Stockpile Areas**
The Contractor will install and maintain erosion control devices sufficient to contain sediment around any erodible material stockpile areas as directed.

**Compensation**
The work described above will be measured over the surface of the ground and will be paid for at the contract unit price per acre for 'Seeding and Mulching' when properly installed and accepted. Repair of seeded and mulched areas will be incidental to this work and additional compensation will not be made.

*Payment will be made under:*
**Seeding and Mulching ..... ACRE**

**RIVER STONE**

**General:** The work covered by this item consist of furnishing and installing 'River Stone' as shown on the plans, the details, and as described herein.

Materials: River Stone will consist of washed river jacks, Tennessee river gravel, or approved equal available from local North Carolina sources in a size range of approximately 4 to 10 inches in length by 2 to 6 inches in width and no more than 3 inches in depth. The River Stone will be applied at a depth of 6 inches at locations shown on the plans and as directed by the engineer in the field. The River Stone mulched areas will be underplayed with landscape fabric (sample to be approved by the engineer). The cost of the landscape fabric will be incidental to the cost of the River Stone.

**A representative sample and the source of the River Stone will be submitted for the Engineer's approval prior to delivery and placement.**

**Method of Measurement and Basis of Payment:** The work of furnishing and installing the River Stone mulch as shown on the plans and as approved by the Engineer, when completed and accepted, will be paid for at the unit price per ton for "River Stone". Such price and payment will be full compensation for all work covered by this special provision; including but not limited to furnishing all labor, materials, equipment for installation, coordination with engineers and any other incidentals necessary or required to complete the work.

*Payment will be made under:*
**River Stone ..... Cubic Yard**

**#57 WASHED STONE**

**Method of Measurement and Basis of Payment:** The work of furnishing and installing the # 57 Washed Stone as approved by the Engineer, when completed and accepted, will be paid for at the unit price per ton for "#57 Washed Stone". Such price and payment will be full compensation for all work covered by this special provision; including but not limited to furnishing all labor and materials. (see Section 1005 –Standard Specification)

*Payment will be made under:*
**#57 Stone ..... Ton**

## BOULDERS

**General**
This special provision consists of furnishing and installing the boulders as shown on the plans and details and as described herein.

**Materials**
Boulders will be of natural stone. Size, color and shape will be the selection of the Engineer at a source to be approved by the Engineer. A common size, approximately 2-3 ton. Boulder shape may vary. Backfill will be as specified for landscape grading.

**Installation**
Placement of boulders will be at the direction of the Engineer and will require the cooperative effort of the contractor to maneuver into the desired position. Excavate and place boulder so that it sits embedded in the plant bed and not on top. Backfill around boulder with plant bed media.

**Compensation**
'Boulders' will be paid for in tons, measured by weighing in truck or on palette on certified platform scales or other certified weighing devices that have been delivered to site, installed and accepted.

The work of furnishing and installing boulders, when completed and accepted, will be paid for at the contract unit price per ton for 'Boulders'.
Such price and payment will be full compensation for all work covered by this special provision; including but not limited to furnishing all labor, materials, equipment and any other incidentals necessary or required to complete the work.

***Payment will be made under:***
**Boulders .....Ton**

## SPLIT RAIL FENCING RELOCATION

General: The work covered by this special provision consist of removing existing split rail fence, stockpiling and then re- installing it at locations shown on the plans or as directed by the Engineer.

If the fence is damaged during any stage of its relocation, the contractor shall provide (free of charge), equal and matching fence for the length of locations noted.

Replacement Materials: Fence posts and rails shall be locust- wood post and cedar- wood rails. They shall be free of major defects or chips or splinter pieces that may cause injury to pedestrians. Post and rails shall be straight and true to line and grade.

Installation: Fence shall be erected as shown on the plans and according to manufacture's recommended installation. Post installation shall be set in a concrete collar with an aggregate base set plum. Rails shall be straight and true to line and grade. Installer shall be an experienced fence builder .

## Method of Measurement

The quantity of split rail fencing will be the actual number of linear feet measured along the top rails between post (Approximately 8') which has been satisfactorily installed and accepted.

## Basis of Payment

The quantity of split rail fencing relocated, measured as specified above, will be paid for at the contract unit price per linear foot for "Split Rail Fencing Relocation". There will be no separate pay item for post or concrete footings. Such prices and payments will be full compensation for furnishing and installing the split rail fencing; including and not limited to all materials, labor, and equipment necessary to satisfactorily complete the work.

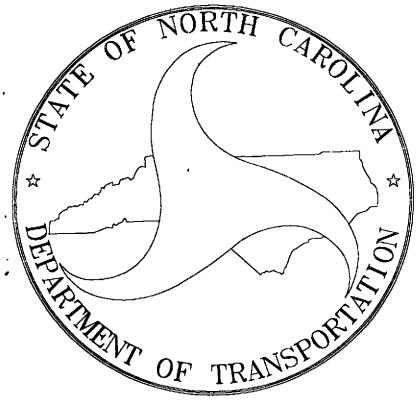
Payment will be made under:

**Split Rail Fence Relocation ..... Linear Feet**

**SPECIFICATIONS FOR:** 76

# I-85 REST AREA & VENDING BUILDINGS
## DAVIDSON COUNTY, NORTH CAROLINA

| | |
|---|---|
| Contract ID | C202161 |
| TIP No. | K-4905 |
| **Project No. WBS** | **39886.3ST.1** |
| Federal-Aid No. | STM-085-3(200)100 |




**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION**

Architect / Engineer:

**FACILITIES DESIGN**
**GENERAL SERVICES DIVISION, NCDOT**
**1 SOUTH WILMINGTON STREET**
**RALEIGH, NORTH CAROLINA 27601**

30 April 09

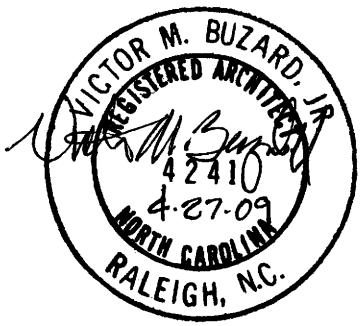
SET NO.___

**PROJECT:** **I-85 REST AREA & VENDING**
NC Department of Transportation
Davidson County, NC

**PROJECT NO.:** **39886.3ST.1**

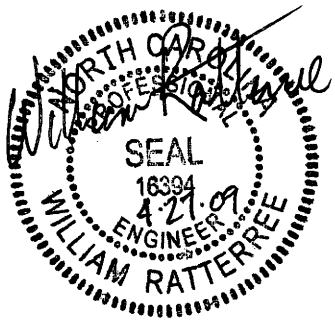
**OWNER:** NC Department of Transportation

**ARCHITECT:** Facilities Design, NCDOT
Raleigh, NC (919) 715-0400
Victor M. Buzard, Jr., Architect




**ENGINEERS:**

**STRUCTURAL:** Facilities Design, NCDOT
Raleigh, NC (919) 715-0400
W. E. Ratterree, PE




**MECHANICAL & ELECTRICAL:** Burke Design Group, PA
Raleigh, NC (919) 771-1916
Ben Burke, PE

## TABLE OF CONTENTS

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# DIVISION 1 - GENERAL REQUIREMENTS

# SECTION 01010 - SUMMARY OF WORK

80

## PART 1 - GENERAL

### 1.01 SUMMARY

A. The owner is: North Carolina Department of Transportation, 1 S. Wilmington St., Raleigh, NC.
B. Section Includes:
   1. Project description.
   2. Access to the site.
   3. Contractor's use of the premises.
   4. Coordination requirements.
   5. Pre-construction meeting.

### 1.02 PROJECT DESCRIPTION

A. The project consists of the construction of a new Rest Area Buildings as **Phase 1** and **Phase-2** as converting the existing Rest Area buildings for Vending usage (approximately 2,720 and 1,557 sq. ft. respectively).
   1. At I-85 south of Thomasville, NC, in DAVIDSON County, NC.
   2. As shown in contract documents for the North and Southbound I-85 Rest Area & Vending buildings prepared by Facilities Design, NCDOT.
      a. Dated 30 April 09.
B. The Work consists of:
   1. Two (2) new one story, wood framed w/ brick veneer, unprotected construction, slab-on-grade building with matching exterior materials to the existing Rest Area buildings, and remodeling of the two (2) existing Rest Area buildings into Vending buildings.
      a. No asbestos containing building material was located in the existing buildings by asbestos inspection dated 4-24-97.
   2. Concrete entrance sidewalks (see Landscape Spec's).
   3. Building and immediate site rough and finish grading of all disturbed areas (see Landscape Spec's).

### 1.03 ACCESS TO THE SITE AND USE OF THE PREMISES

A. The space available to the contractor for the performance of the work, either exclusively or in conjunction with others performing other construction as part of the project, is an outdoor space sufficient for storage trailers and access to the construction area from the exit ramps on the lanes of I-85 away from the Public's use of the temporary restroom facilities.
B. Exit ramps, drives and parking spaces shall remain open for the public's use.
C. The existing rest area building will remain in use for the public during the Phase 1 construction. Phase 2 can not start until Phase 1 is complete and is opened for the public's use.
D. The construction limits and storage areas will be separated from the public by 5' high chain link safety fencing provided by the Contractor and adjusted for each of the project Phases.
E. Signs: Do not install, or allow to be installed, signs other than specified sign(s) and signs identifying the principal entities involved in the project.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 PRECONSTRUCTION MEETING

A. A pre-construction meeting will be held at a time and place designated by the Architect / Engineer, for the purpose of identifying responsibilities of the Owner's and the Architect's personnel and explanation of administrative procedures.

## 3.02 SECURITY PROCEDURES

A. Limit access to the site to persons involved in the work, see item 1.03 D. above.
B. Provide secure storage for materials for which the owner has made payment and which are stored on site.
C. Secure completed work as required to prevent loss.

## 3.03 COORDINATION

A. If necessary, inform each party involved, in writing, of procedures required for coordination; include requirements for giving notice, submitting reports, and attending meetings.
   1. Inform the Owner when coordination of his work is required.
B. See other requirements in other portions of the contract documents.
C. Conduct meetings for the specific purpose of coordination, at least once a month.
   1. Attendees shall include:
      a. Contractor.
      b. Subcontractors currently working at the site.

# END OF SECTION 01010

# SECTION 01026 - PAYMENT AND COMPLETION PROCEDURES

## PART 1 - GENERAL

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### 1.01 SUMMARY

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

### 1.02 CONTRACT CONDITIONS

A. See the conditions of the contract for additional requirements.
B. Progress payments will be made on or about the 25th of each month.
C. The Architect/Engineer will act upon the Contractor's application for payment within 5 days after receipt.
D. The Owner will act upon the application for payment within 15 days after receipt.
E. The Owner will retain from each progress payment an amount equal to 10 percent of the value of the work covered by the progress payment.
   1. At substantial completion the contractor may apply for release of retainage, bringing the total of payments to 100 percent of the contract sum, less those amounts that are withheld to cover incomplete or incorrect work and unsettled claims, as defined elsewhere.
F. No payment will be made for materials or equipment stored off site unless specifically approved in advance, in writing by the owner. Submit copy of the owner's agreement to pay for such materials and equipment with the application for payment covering such materials and equipment.
G. Payments may be withheld if the contractor fails to make dated submittals within the time periods specified.

### 1.03 DEFINITIONS

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

### 1.04 SUBMITTALS

A. Schedule of Values: First application for payment will not be reviewed without schedule of values.
   1. Submit in size not larger than 8-1/2 by 11 inches.
   2. Submit 5 copies.
   3. Identify with:
      a. Project name, Project number, Architect's name, Owner's name, Contractor's name and address, and Submittal date.
B. Applications for Progress Payments: Submit sufficiently in advance of date established for the progress payment to allow for the processing indicated.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION



### 3.01 SCHEDULE OF VALUES

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

### 3.02 APPLICATIONS FOR PAYMENT

A. Application for Payment Forms: Use AIA original current editions of G702, Application and Certificate for Payment, and AIA G703, Continuation Sheet.
B. Preparation of Applications for Payment: Complete form entirely.
   1. Make current application consistent with previous applications, certificates for payment, and payments made.
   2. Base application on current schedule of values and contractor's construction schedule.
   3. Include amounts of modifications issued before the end of the construction period covered by the application.
   4. Include signature by person authorized by the contractor to sign legal documents.
   5. Notarize each copy.
   6. Submit in 5 copies.
   7. Attach revised schedule of values, if changes have occurred, unless application forms already show entire schedule of values.
   8. Attach copy of the owner's agreement to pay for materials and equipment stored off site, and any other supporting documentation required by the owner or the contract documents.
C. Provide the following information with every application for payment which involves work completed on a time and material basis:
   1. Detailed records of work done, including:
      a. Dates and times work was performed, and by whom.
      b. Time records and wage rates paid.

c. Invoices and receipts for products.
2. Provide similar detailed records for subcontracts.

D. Transmit application for payment with a transmittal form itemizing supporting documents attached.
1. Transmit to the Architect/Engineer.

## 3.03 FIRST PAYMENT PROCEDURE

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

## 3.04 SUBSTANTIAL COMPLETION PROCEDURES

A. The architect will perform a Pre-Final Inspection with the contractor two weeks before substantial completion inspection, upon request of the contractor. Plumbing, Mechanical, & Electrical subcontractors shall be present for all Final Inspections.

B. The architect will perform a Final Inspection with the contractor for substantial completion and verification that the Pre-Final Inspection Punchlist is complete, upon request of the contractor.
1. Only one certificate of substantial completion will be issued, for the entire project.

C. Submit the following with application for payment following substantial completion:
1. Certificate of Substantial Completion; use AIA original current editions of G704.
4. Final Inspection list of incomplete work.
5. Other data required by the contract documents.

## 3.05 FINAL COMPLETION PROCEDURES

A. Request for Final Inspection and final application for payment may coincide.

B. The architect will perform inspection for final completion, upon request of the contractor.
1. Submit the following with request for inspection:
a. Previous inspection lists indicating completion of all items.
b. If any items cannot be completed, obtain prior approval of such delay.

C. Do not submit request for final inspection until the following activities have been completed:
1. Completion of all work, except those items agreed upon by the owner.
2. Final cleaning.
3. All activities specified to occur between substantial completion and final completion.

D. Do not submit request for final inspection until the following submittals have been completed:
1. Startup reports.
2. Operation and maintenance data.
3. Demonstration reports.
4. Instruction reports.
5. Project record documents.
6. All other outstanding specified submittals.

E. Submit the following with the final application for payment:
1. Certified copy of the previous list of items to be completed or corrected, stating that each has been completed or otherwise resolved for acceptance.
2. Contractor's Affidavit of Payment of Debts and Claims; use AIA original current editions of G706
3. Contractor's Affidavit of Release of Liens; use AIA original current editions of G706A.
4. Consent of surety to final payment; use AIA original current editions of G707.
5. Final liquidated damages statement.
6. Certification that financial obligations to governing authorities and public utilities have been fulfilled.
7. Description of unsettled claims.
8. Other data required by the contract documents.

# END OF SECTION 01026

# SECTION 01151 - CONSTRUCTION AND DEMOLITION MATERIALS RECYCLING REQUIREMENTS

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## PART 1 GENERAL

### *1.01 SUMMARY*

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

### *1.02 DEFINITIONS*

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

### *1.03 SUBMITTALS*

A. Contractor's Construction Waste and Recycling Plan
   1. Review Contract Documents and estimate the types and quantities of materials under the Work that are anticipated to be feasible for on-site processing, source separation for re-use or recycling. Indicate the procedures that will be implemented in this program to effect jobsite source separation, such as, identifying a convenient location where dumpsters would be located, putting signage to identify materials to be placed in dumpsters, etc.

2. Prior to commencing the Work, submit Contractor's Construction Waste and Recycling Plan. Submit in format provided (Section 01151A). The Plan must include, but is not limited to the following:
   a. Contractor's name and project identification information;
   b. Procedures to be used;
   c. Materials to be re-used and recycled;
   d. Estimated quantities of materials;
   e. Names and locations of re-use and recycling facilities/sites;
   f. Tonnage calculations that demonstrate that Contractor will re-use and recycle a minimum 50% by weight of the construction waste materials generated in the Work.
   g. Cost of local tip fees for non-recycled material/ton
   h. Cost or revenue generated from recycled material, per category, per ton (note: cost and revenue are to be managed by the General Contractor as part of the Work; tonnage, cost, and savings information are to be provided to the Architect for tracking purposes only)
2. Contractor's Construction Waste and Recycling Plan must be approved by the Architect prior to the start of Work.
3. Contractor's Construction Waste and Recycling Plan will not otherwise relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures.



B. Contractor's Reuse, Recycling, and Disposal Report
   1. Submit Contractor's Reuse, Recycling, and Disposal Report on the form provided (Section 01151B) with each application for progress payment. Failure to submit the form and its supporting documentation will render the application for progress payment incomplete and delay progress payments. If applicable, include manifests, weight tickets, receipts, and invoices specifically identifying the Project for re-used and recycled materials:
      a. Reuse of building materials or salvage items on site
      b. Salvaging building materials for reuse
      c. Recycling source separated materials on site, with approval
      d. Recycling source separated material at an off site recycling center
      e. Delivery of soils or mixed inerts to an inerta landfill for disposal (inert fill).
      f. Disposal at a landfill or transfer station (where no recycling takes place).
      g. Other (describe).

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

   1. Report disposal or recycling either in tons or in cubic yards: if scales are available at disposal or recycling facility, report in tons; otherwise, report in cubic yards. Report in units for salvage items when no tonnage or cubic yard measurement is feasible.
   2. Indicate locations to which materials are delivered for reuse, salvage, recycling, accepted as daily cover, inert backfill, or disposal in landfills or transfer stations.
   3. Provide legible copies of weigh tickets, receipts, or invoices that specifically identify the project generating the material. Said documents must be from recyclers and/or disposal site operators that can legally accept the materials for the purpose of re-use, recycling, or disposal.
      a. Indicate project title, project number, progress payment number, name of the company completing the Contractor's Report and compiling backup documentation, the printed name, signature, and daytime phone number of the person completing the form, the beginning and ending dates of the period covered on the Contractor's Report, and the date that the Contractor's Report is completed.
   4. NCDOT General Services Division will provide a list of waste recycling sites, sorted by County and by Highway Division. It is the responsibility of the General Contractor to confirm the locations and manage the waste material.

## PART 2 PRODUCTS (not used)

## PART 3 EXECUTION

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

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

### *3.2 DISPOSAL OPERATIONS AND WASTE HAULING*

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

### *3.043 REVENUE*

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

## END OF SECTION

SECTION 01151A

# CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING PLAN

*(Submit after award of Contract and prior to commencing work)*

| | | |
|---|---|---|
| Project Title: | | |
| Contractor's Name: | | |
| Street Address: | | |
| City: | State: | Zip: |
| Phone: ( ) | Fax: ( ) | |
| E-Mail Address: | | |
| Prepared by: (Print Name) | | |

| | | |
|---|---|---|
| Date Submitted: | | |
| Project Period: | From: | To: |

## SECTION I - RE-USED/RECYCLED MATERIALS

*Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.*

| Type of Material | Type of Activity | Facility to be Used/Location | Total Truck Loads | Total Quantities Tons | Cubic YD | Cost/Reven. |
|---|---|---|---|---|---|---|
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| | | | | | | |
| a. Total Diversion | | | | | | |

## SECTION II - DISPOSED MATERIALS

*Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.*

| Type of Material | Type of Activity | Facility to be Used/Location | Total Truck Loads | Total Quantities Tons | Cubic YD | Cost |
|---|---|---|---|---|---|---|
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| b. Total Disposal | | | | | | |

## SECTION III - TOTAL MATERIALS GENERATED

*This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation*

| | | | | Tons | Cubic YD | Other Wt. |
|---|---|---|---|---|---|---|
| a. Total Reused/Recycled | | | | | | |
| b. Total Disposed | | | | | | |
| c. Total Generated | | | | | | |

SECTION 01151B

# CONTRACTOR'S CONSTRUCTION WASTE AND RECYCLING REPORT

*(Submit with each Pay Application)*

| | | |
|---|---|---|
| Project Title: | | |
| Contractor's Name: | | |
| Street Address: | | |
| City: | State: | Zip: |
| Phone: ( ) | Fax: ( ) | |
| E-Mail Address: | | |
| Prepared by: (Print Name) | | |

| | | |
|---|---|---|
| Date Submitted: | | |
| Project Period: | From: | To: |

## SECTION I - RE-USED/RECYCLED MATERIALS

*Include all recycling activities for source separated or mixed material recycling centers where recycling will occur.*

| Type of Material | Type of Activity | Facility to be Used/Location | Total Truck Loads | Total Quantities Tons | Cubic YD | Cost/Reven. |
|---|---|---|---|---|---|---|
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| a. Total Diversion | | | | | | |

## SECTION II - DISPOSED MATERIALS

*Include all disposal activities for landfills, transfer stations, or inert landfills where no recycling will occur.*

| Type of Material | Type of Activity | Facility to be Used/Location | Total Truck Loads | Total Quantities Tons | Cubic YD | Cost |
|---|---|---|---|---|---|---|
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| b. Total Disposal | | | | | | |

## SECTION III - TOTAL MATERIALS GENERATED

*This section calculates the total materials to be generated during the project period (Reuse/Recycle + Disposal = Generation*

| | | | | Tons | Cubic YD | Other Wt. |
|---|---|---|---|---|---|---|
| a. Total Reused/Recycled | | | | | | |
| b. Total Disposed | | | | | | |
| c. Total Generated | | | | | | |

# SECTION 01200 - PROGRESS DOCUMENTATION AND PROCEDURES

## PART 1 - GENERAL

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### 1.01 SUMMARY

A. Section Includes:
   1. Progress documentation requirements:
      a. Contractor's construction schedule.
   2. Progress procedures:
      a. Progress meetings.

B. Contract time is indicated elsewhere.

### 1.02 SUBMITTALS

A. Contractor's Construction Schedule.
   1. Submit within 14 days after execution of contract.
   2. Submit revised schedule with application for payment to Highway Division 9 Resident Engineer.

### 1.03 FORM OF SUBMITTALS

A. Schedules - General:
   1. Provide legend of symbols and abbreviations for each schedule.
   2. Use the same terminology as that used in the contract documents.
   3. When transparencies are submitted, use only media which will not fade or lose contrast over time.

B. Bar Charts:
   1. Provide individual horizontal bars representing the duration of each major activity.
   2. Coordinate each element on the schedule with other construction activities.
   3. Show activities in proper sequence.
   4. Show percentage of completion of each activity.
   5. Include cost bar at top of chart, showing estimated and actual costs of work performed at the date of each application for payment.
   6. Use vertical lines to mark the time scale at not more than one week intervals.
   7. Prepare on reproducible transparency.
   8. Use sheets of sufficient number and width to show the full schedule clearly.

### 1.04 COORDINATION

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

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Prepare and submit a construction schedule.

B. Provide construction schedule in the form of bar charts:
   1. Where related activities must be performed in sequence, show relationship graphically.
   2. Indicate activities separately for:
      a. Each separate building.
   3. Incorporate the submittal schedule specified elsewhere.
   4. Show dates of:
      a. Each activity that influences the construction time.
      b. Ordering dates for products requiring long lead time.
      c. All submittals required.
      d. Completion of structure.
      e. Completion of permanent enclosure.
      f. Instruction of the owner's personnel in operation and maintenance of equipment and systems.
      g. Substantial and final completion, with time frames for the Engineer's completion procedures.

5. In developing the schedule take into account: 91
   a. Work by owner.
   b. Need for temporary heating, ventilating, or air-conditioning.

C. The Engineer will notify the contractor if schedule is not satisfactory; revise and resubmit.
   1. Resubmit within 7 days.

D. Make and distribute copies of schedule to the Engineer, to subcontractors, and to other entities whose work will be influenced by schedule dates.
   1. Hang a copy of the schedule up in each field office or meeting room.

E. Update the schedule whenever changes occur or are made, or when new information is received, but not less often than at the same intervals at which applications for payment are made.
   1. Indicate changes made since last issue; show actual dates for activities completed.
   2. Submit updated schedule with application for payment.
   3. Issue updated schedule with report of meeting at which revisions are made.
   4. Issue updated schedule in same manner as original schedule.

## 3.02 PROGRESS MEETINGS

A. Schedule and conduct periodic progress meetings during construction period.
   1. Have meetings once a month.
   2. Notify the Engineer at least one week in advance of date of meeting; the Engineer.

B. The following are required to attend:
   1. Project superintendent.
   2. Major subcontractors and suppliers.
   3. Others who have an interest in the agenda.
   4. State inspectors.

C. Prepare and distribute agenda prior to meetings; cover the following topics when applicable:
   1. Review minutes of previous meeting.
   2. Status of submittals and impending submittals.
   3. Actual progress of activities in relation to the schedule.
   4. Actual and anticipated delays, their impact on the schedule, and corrective actions taken or proposed.
   5. Actual and potential problems.
   6. Status of change order work.
   7. Status of corrective work ordered by the Engineer.
   8. Progress expected to be made during the next period.

# END OF SECTION 01200

# SECTION 01300 - SUBMITTALS 92

## PART 1 - GENERAL

### 1.01 SUMMARY

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

### 1.02 DEFINITIONS

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

### 1.03 FORM OF SUBMITTALS

A. Sheets Larger Than 8-1/2 by 14 Inches:
   1. Maximum sheet size: 36 by 48 inches.
      a. Exception: Full size pattern or template drawings.
   2. Number of copies:
      a. Submittals for review:
         1. One correctable reproducible print, not folded and 6 copies] of blue- or black-line print(s).
         2. Reproducible will be returned.
B. Small Sheets or Pages:
   1. Minimum sheet size: 8-1/2 by 11 inches.
   2. Maximum sheet size for opaque copies: 8-1/2 by 14 inches.
   3. Number of copies:
      a. Transparencies: Same as for larger sheets.
      b. Opaque copies:
   1. For review: 6 copies.
      a. 4 copies will be retained.
C. Samples: 2 sets] of each.
   1. 1 set will be returned.

D. If additional sets are needed by other entities involved in work represented by the samples, submit with original submittal.
E. Copies in excess of the number requested will not be returned.

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### 1.04 COORDINATION OF SUBMITTALS

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

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 TIMING OF SUBMITTALS

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

### 3.02 SUBMITTAL PROCEDURES - GENERAL

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

   Provide blank space on the label or on the submittal itself for action marking; minimum 4 inches wide by 5 inches high.
D. Transmittal of Submittals:
   1. Submittals will be accepted from the contractor only. Submittals received from other entities will be returned without review or action.
   2. Submittals received without a transmittal form will be returned without review or action.
   3. Transmittal form: Similar to AIA G810.
   4. Fill out a separate transmittal form for each submittal; also include the following:
      a. Other relevant information.
      b. Requests for additional information.

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## 3.03 SHOP DRAWINGS

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

## 3.04 PRODUCT DATA

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

## 3.05 SAMPLES

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

## 3.06 REVIEW OF SUBMITTALS

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

## 3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

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

# END OF SECTION 01300

# DIVISION 2 - SITE WORK



# SECTION 02072 - MINOR DEMOLITION FOR REMODELING

## PART 1 - GENERAL

### *1.01 SUMMARY*

A. Section Includes:
   1. Demolition and removal of portions of the existing Rest Area buildings or structures; including the tile / masonry entrance walls, floor tile, brick & block walls, roof truss sections at solar panels, plumbing, mechanical heating and cooling equipment, electrical systems, louver, and doors.
      a. Site Clearing including sidewalks, tree and stump removal are by the Contractor; (see Landscape Spec's).
      b. See Section 01151 for the Construction and Demolition Materials Recycling Requirements.
   2. Owner shall have the right to salvage the Contractor removed toilet fixtures, and toilet partitions.
      a. Removal of existing small shrubbery (may be by NCDOT, Division 9).
      b. New landscaping (grass and shrubbery) by Owner.

### *1.02 SUBMITTALS*

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

### *1.03 PROJECT CONDITIONS*

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

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### *3.01 EXAMINATION*

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

### *3.02 PREPARATION*

A. Traffic: Do not obstruct walks or public ways without the written permission of governing authorities and of the owner. Where routes are permitted to be closed, provide alternate routes if required.
B. Protection:
   1. Provide for the protection of persons passing around or through the area of demolition.
   2. Perform demolition so as to prevent damage to adjacent improvements and facilities to remain.
C. Construct and maintain shoring, bracing, and supports as necessary to ensure the stability of structures.
D. Damages: Without cost to the owner and without delay, repair any damages caused to facilities to remain.

### *3.03 UTILITY SERVICES*

A. Arrange with utility companies and shut off indicated utilities serving structures; maintain utilities at existing site lighting, storage building, vending building (existing Rest Area building), and new Rest Area building.

B. Disconnect and cap indicated utilities before starting demolition operations.
C. Identify location of capped utilities on project record documents.

### *3.04 POLLUTION CONTROLS* 96

A. Control as much as practicable the spread of dust and dirt.
B. Observe environmental protection regulations.
C. Do not allow water usage that results in freezing or flooding.
D. Do not allow adjacent improvements to remain to become soiled by demolition operations.

### *3.05 DEMOLITION - GENERAL*

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

### *3.06 DEMOLITION ON OR BELOW GRADE*

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

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

A. Below-grade areas and voids resulting from demolition of structures shall be filled or excavated further, as appropriate, according to requirements specified elsewhere in Division 2.

### 3.08 DISPOSAL OF DEMOLISHED MATERIALS

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

### 3.09 CLEANING

A. Clean soil, smudges, and dust from surfaces to remain.
B. Return structures and surfaces to remain to condition existing prior to commencement of demolition.

## END OF SECTION 02072

# SECTION 02200 - EARTHWORK 97

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Earth moving and excavation.
   2. Grading.
   3. Backfilling.
   4. Filling.
   5. Compacting.

### 1.02 SUBMITTALS

A. Test Reports: NCDOT testing laboratory will submit the following reports directly to the Engineer and shall copy the contractor:
   1. Analysis of soil materials, whether procured on or off site, and including fill, backfill, and borrow materials.
   2. Verification of each footing subgrade.
   3. Moisture-density relationship test reports.
   4. Compressive strength or bearing test reports.

### 1.03 QUALITY ASSURANCE

A. Testing Laboratory Services:
   1. The Owner, NCDOT, Division 9, will provide services to classify new structural fill soil materials, to recommend and to classify proposed borrow materials when necessary, to verify compliance of materials with specified requirements, and to perform required field and laboratory testing.

### 1.04 SITE CONDITIONS

A. Traffic: The construction site will be open to the contractor for use at all times.
B. Site Utilities:
   1. Advise utility companies of excavation activities before starting excavations. Locate and identify underground utilities passing through work area before starting work.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Topsoil: Friable clay loam surface soil.
B. Satisfactory Topsoil: Fertile agricultural soil, typical for locality, capable of sustaining vigorous plant growth; free of subsoil, rocks larger than 2 inches in diameter, clay, toxic matter, plants, weeds, and roots.
C. Any structural fill or backfill placed at the site shall utilize a low plasticity soil (liquid limit less than 50, plasticity index less than 25) free of organic material or debris. All fill shall be placed in 8 to 10 inch loose lifts and shall be compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D 698). The soils shall be aerated or moistened as necessary to maintain the moisture content within 3 percentage points of optimum moisture content.
D. Capillary Water Barrier: Clean, crushed rock or gravel or uncrushed gravel; 100 percent passing a 1-1/2-inch sieve; not more than 2 percent passing a No. 4 sieve.
E. Subbase Material: Well-graded, clean, sound, durable particles of crushed stone, crushed blast furnace slag, or crushed gravel, and screenings. Obtain the Engineer's approval of source, quality, and gradation.

# PART 3 - EXECUTION

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## 3.01 PREPARATION

A. Protection: Provide markers indicating limits of work and clear identification of items and areas requiring protection.
B. Provide barricades, warning signs, and warning lights around open excavations as necessary to prevent injury to persons.

## 3.02 PROTECTION OF TREES

A. Provide temporary guards to protect trees and vegetation to remain. Place guards so as to prevent all forms of vehicular traffic or parking within drip lines.
B. Promptly repair any damaged trees to prevent death or loss of vigor.

## 3.03 CLEARING AND GRUBBING

A. Remove dredge material from site and replace with approved structural fill per Roadway's requirement before excavating for the building footings.

## 3.04 DEWATERING

A. Do not allow surface or ground water to flow into or accumulate in excavations.

## 3.05 EXCAVATION

A. General: Excavation includes the removal of any materials necessary to achieve the required subgrade elevations and includes reuse or disposal of such materials.
B. Excavation for Structures:
   1. Excavate beyond footings and foundations so as to allow proper construction and inspection of concrete formwork and other materials. Excavate to the required elevation.
C. Excavation for Footings and Foundations:
   1. Delay excavation to final grade and final compaction until just before concrete will be placed.

## 3.06 STORAGE

A. Stockpile materials to be used for filling and backfilling, including excavated materials classified as satisfactory soil materials, at locations indicated or as directed. Stockpile in a manner to freely drain surface water; cover if necessary to prevent wind-blown dust.

## 3.07 BACKFILLING

A. Installation: Place approved soil materials in layers to required elevations.
B. Installation: Place satisfactory soil materials in layers to required subgrade elevations.

## 3.08 FILLING

A. Preparation: Verify that area has been stripped of vegetation including roots below grade. Remove and dispose of any unsatisfactory soils.
   1. When filling slopes steeper than 1 in 4 rise, plow, step, or break up surfaces to promote bond of new to existing material.
B. Installation: Place fill materials to required elevations in lifts of required depth. Provide fill materials beneath each area as indicated.
   2. Building slabs: Capillary water barrier material.

## 3.09 BUILDING SLAB AREAS

A. Place fill or backfill lifts such that compaction true to grade and level is accomplished with a minimum of surface disturbance and segregation or degradation of materials. Maintain grade control and cross section by means of line and grade stakes. Maintain moisture content within prescribed limits during placing and compacting.

1. Capillary water barrier: Under slabs on grade, place capillary water barrier material directly on subgrade, shape surface to within the required tolerances and compact.

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## 3.10 COMPACTION

A. Place material simultaneously on opposite sides of walls, small structures, utility lines, etc. to avoid displacement or overstressing.
B. In-Place Density Requirements: Compact soil to not less than the values given below, expressed as a percentage of maximum density at optimum moisture content.
   1. Exterior steps and ramps: Top 8 inches of subgrade and subsequent lifts: 95 percent.
   2. Building slabs and structures: Top 12 inches of subgrade and subsequent lifts: 95 percent.

## 3.11 GRADING

A. General: Smooth grade to a uniform surface that complies with compaction requirements and required lines, grades, and cross sections and is free from irregular surface changes.

## 3.12 FIELD QUALITY CONTROL

A. Testing Laboratory Services: Provide timely notice to testing laboratory. Do not proceed with construction until testing of each subgrade and lift of fill or backfill has been performed and required inspections and approvals have been obtained.
B. Maximum Density at Optimum Moisture Content: Determine in accordance with ASTM D 698.
   1. For each subgrade, fill, and backfill material, perform one moisture-density relationship test for each 1500 cubic yards, or fraction thereof, of material used.
C. If testing service reports indicate that subgrade or fills are below specified density, scarify or remove and replace to the required depth, recompact, and retest at no cost to the owner.

## 3.13 MAINTENANCE

A. Completed Areas: Protect from damage by pedestrian or vehicular traffic, freezing, erosion, and contamination with foreign materials.

## 3.14 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Stockpile any excess satisfactory topsoil in locations on site as directed by the Engineer.
B. Stockpile or spread any excess satisfactory soil in location on site as directed by the Engineer.
C. Remove any unsatisfactory soil, trash, debris, and other materials not required for use on the project and legally dispose of it off the owner's property.
D. On-site burning is not permitted.

# END OF SECTION 02200

# SECTION 02280 - SOIL TREATMENT

## PART 1 GENERAL

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### 1.01 SUMMARY

A. Section Includes:
   1. Subterranean termite prevention treatment of soil areas scheduled to receive new construction.
   2. Subterranean termite prevention treatment of new construction in progress.

### 1.02 SUBMITTALS

A. Product Data: Submit product label or accompanying labeling in accordance with the Federal Insecticide, Fungicide, and Rodenticide Act.
B. Quality Control Submittals:
   1. Certificates: Evidence of installer's authorization to apply products under applicable state and local law.
   2. Manufacturer's instructions: Submit manufacturer's directions for use.
C. Contract Closeout Submittals:
   1. Project record documents:
      a. Submit a certificate signed by installer and contractor stating that treatment has been applied in accordance with applicable governing regulations and in accordance with this specification.
      b. Incorporate into the certificate or attach thereto a plan drawing indicating actual application locations and, for each location, noting methods and rates of application and including typical sections or details where necessary for clarity.
   2. Warranty.

### 1.03 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Licensed to install specified products in the state in which the project is located and in the local jurisdiction.
   2. A company installing products of this section and whose installations have performed in a satisfactory manner under comparable conditions for a period of 5 years.
B. Regulatory Requirements:
   1. Comply with applicable pesticide regulations of the state in which the project is located.
   2. Comply with applicable local pesticide regulations.

### 1.04 WARRANTY

A. Special Warranty:
   1. Submit manufacturer's warranty against infestation of treated areas.
   2. Warranty shall not reduce or otherwise limit any other rights to correction which the owner may have under the contract documents.
   3. Warranty period: **5 years.**
B. Correction during the warranty period shall include not less that the following:
   1. Retreatment of areas in which evidence of infestation is discovered.

## PART 2 PRODUCTS

### 2.01 TERMITICIDE

A. Registered with the United States Environmental Protection Agency (EPA) for use as a termiticide under conditions of use prevailing at the project site.

B. Registered with the applicable authorities in the state in which the project is located and with local governing authorities, as applicable for use as a termiticide under conditions of use prevailing at the project site.

## PART 3 EXECUTION

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### 3.01 APPLICATION

A. Apply termiticide in strict accordance with manufacturer's instructions; treat entire slab area and perimeter foundations.
B. Apply termiticide at the maximum recommended application rates for the respective areas to be treated and methods of treatment used.
C. Treat the entire structure. Do not leave any portion untreated.
D. Schedule treatment of new construction to occur when treatment may be applied directly to the soils and surfaces to be treated, and prior to their concealment with subsequent construction.

### 3.02 CLEANING

A. Do not allow contamination of surfaces not intended to be treated. Follow manufacturer's instructions to completely remove chemical from surfaces should contamination occur.
B. Remove from beneath the structure any cellulosic material, wood that is not pressure-preservative treated, and debris. Do not allow non-pressure-preservative treated wood to contact with or remain proximate to soil.

## END OF SECTION 02280

# SECTION 02712 - SUBDRAINAGE SYSTEMS FOR STRUCTURES

## PART 1 - GENERAL

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### 1.01 SUMMARY

A. Section Includes:
   1. Subdrainage systems of the following types: Downspout drains.
B. Related Sections: Earthwork: Elsewhere in Division 2 and Landscape Section at the end of the specification.

### 1.02 SUBMITTALS

A. Product Data: Submit manufacturer's technical literature and installation instructions for the following:
   1. Drainage piping.

## PART 2 - PRODUCTS

### 2.01 DRAINAGE PIPE

A. Piping System 1:
   1. Standard (solid) pipe: Polyethylene pipe; ASTM F 405 or ASTM F 667, as applicable for pipe size.
   2. Application: Gutter and downspout drainage.
B. Provide fittings and accessories of same material as pipe or compatible material for intersections, bends, transitions, and the like; provide black plastic downspout boots or downspout adapters; equal to Plastic Trends, Royal Pipe Systems, USPlastic, Flex-Drain.

## PART 3 - EXECUTION

### 3.01 PREPARATION

A. Engineering Layout: Establish lines, grades, and locations of piping and accessories.
   1. Maintain grade stakes, batter boards, and the like, to permit rapid checking of grades and lines as work progresses.

### 3.02 INSTALLATION - GENERAL

A. Earthwork and Trenching: Perform required excavation, backfilling, and compacting in accordance with requirements of other Division 2 sections as applicable.
B. Piping Installation:
   1. General: Install piping in accordance with governing authorities, except where more stringent requirements are indicated.
   2. Inspect piping before installation to detect apparent defects. Mark defective materials and promptly remove from site.
   3. Lay piping, beginning at low point of system, true to line and grade indicated and with unbroken continuity of invert.
   4. Polyethylene pipe: Install in accordance with ASTM F 449.
   5. Joint adapters: Make joints between different types of pipe or different diameters of the same type of pipe with standard manufactured adapters intended for that purpose.
C. Filling and Backfilling:
   1. Place and compact fill or backfill in uniform layers, and achieve required compaction.
   2. Take care when backfilling to avoid damaging or dislodging drainage system components.

### 3.04 FIELD QUALITY CONTROL

A. Piping: After installation of piping and placement of initial backfill, test piping for crushing and obstructions.
   1. Pull a mandrel with diameter of 90 percent of the pipe diameter through the pipe.
   2. Locate and replace damaged pipe or remove obstructions and retest until mandrel passes entire length of pipe.

## END OF SECTION 02712

# DIVISION 3 - CONCRETE 103

# SECTION 03310 - STRUCTURAL CONCRETE

## PART 1 - GENERAL

### 1.01 SUMMARY

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

### 1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data for the following:
   1. Concrete mix, reinforcing, admixtures and curing compound.

### 1.03 QUALITY ASSURANCE

A. Codes and Standards: Comply with the following documents, except where requirements of the contract documents or of governing codes and governing authorities are more stringent:
   1. Sidewalks, curb ramps, steps, curb & gutters, and parking lot paving shall comply with **NCDOT Standard Specifications** dated July 2006, Divisions 7 and 8; Sections 710, 844, 846 and 848; Class "A" concrete for Portland Cement Production and Delivery.
   2. ACI 301 & ACI 318.

B. Testing Agency Services:
   1. NCDOT's testing agency will conduct tests and perform other services specified for quality control during construction.

## PART 2 - PRODUCTS

### 2.01 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, and as follows:
   1. Type I, except where other type is specifically permitted or required.
      a. Type I may be replaced by Type III (high early strength) for concrete placed during cold weather.

B. Water: Potable.

C. Aggregates: Normal weight concrete: ASTM C 33.

D. Admixtures - General: Admixtures which result in more than 0.1 percent of soluble chloride ions by weight of cement are prohibited.

E. Air-Entraining Admixture: ASTM C 260 and certified by manufacturer for compatibility with other mix components.

F. Water-Reducing Admixture: ASTM C 494, Type A.

### 2.02 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Formwork:
   1. Facing Materials: Unexposed finish concrete: Any standard form materials that produce structurally sound concrete.
   2. Formwork Accessories:
      a. Form coating: Form release agent that will not adversely affect concrete surfaces or prevent subsequent application of concrete coatings.
      b. Metal ties: Commercially manufactured types; cone snap ties, taper removable bolt, or other type which will leave no metal closer than 1-1/2 inches from surface of concrete when forms are removed, leaving not more than a 1-inch-diameter hole in concrete surface.

B. Reinforcing Materials:
   1. Reinforcing Bars: Provide deformed bars complying with the following, except where otherwise indicated: ASTM A 615, Grade 60.
   2. Welded Wire Fabric: ASTM A 185, cold-drawn steel, plain.

3. Tie wire: Black annealed type, 16-1/2 gage or heavier.
4. Supports: Bar supports conforming to specifications of CRSI "Manual of Standard Practice."

C. Vapor Retarder: Membrane for installation beneath slabs on grade, resistant to decay when tested in accordance with ASTM E 1745, and as follows:
1. 10 mils thick, multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs Single ply polyethylene sheet is prohibited.

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

E. Liquid Curing Compounds: Comply with ASTM C 309, Type 1 and compatible with flooring.

## 2.03 CONCRETE MIX DESIGN

A. Proportioning of Normal Weight Concrete: Comply with recommendations of ACI 211.1.

B. Specified Compressive Strength f'© at 28 Days for Locations as Indicated on Drawings:
1. Footings, slab and walks: 3000 psi.

C. Admixtures:
1. Air-entraining admixture: Use in mixes for exterior exposed concrete unless otherwise specifically indicated. Add at rate to achieve total air content in accordance with Table 1.4.3 of ACI 201.2. For concrete not exposed to exterior, add at rate to achieve total air content between 2 percent and 4 percent.
   a. Do not use in slabs-on-grade scheduled to receive topping, unless manufacturer of topping recommends use over air-entrained concrete.
2. Water-reducing admixture: Add as required for placement and workability.
3. Do not use admixtures not specified or approved.

# PART 3 - EXECUTION

## 3.01 VAPOR RETARDER INSTALLATION

A. General: Place vapor retarder sheet over prepared base material, aligning longer dimension parallel to direction of pour and lapped 6 inches. Seal joints with appropriate tape. Cover with sand to depth shown on drawings.

## 3.02 JOINT CONSTRUCTION

A. Construction Joints: Locate and install construction joints as indicated on drawings. If construction joints are not indicated, locate in manner which will not impair strength and will have least impact on appearance, as acceptable to the Engineer.
1. Keyways: Provide keyways not less than 1-1/2 inches deep.
2. Reinforcement: Continue reinforcement across and perpendicular to construction joints, unless details specifically indicate otherwise.

B. Control Joints: Construct contraction joints in slabs poured on grade to form panels of sizes indicated on drawings, but not more than 15 feet apart in either direction.
1. Saw cuts: Form control joints by means of saw cuts one-fourth slab depth.

## 3.03 CONCRETE PLACEMENT

A. Inspection: Before beginning concrete placement, inspect formwork, reinforcing steel, and items to be embedded, verifying that all such work has been completed.
1. Wood forms: Moisten immediately before placing concrete in locations where form coatings are not used.

B. Placement - General: Comply with requirements of ACI 304 and as follows:
1. Schedule continuous placement of concrete to prevent the formation of cold joints.
2. Provide construction joints if concrete for a particular element or component cannot be placed in a continuous operation.
3. Deposit concrete as close as possible to its final location, to avoid segregation.

C. Placement in Forms: Limit horizontal layers to depths which can be properly consolidated, but in no event greater than 24 inches.
1. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
2. Do not use vibrators to move concrete laterally.

D. Slab Placement: Schedule continuous placement and consolidation of concrete within planned construction joints.
   1. Thoroughly consolidate concrete without displacing reinforcement or embedded items, using internal vibrators, vibrating screeds, roller pipe screeds, or other means acceptable to Engineer.
   2. Strike off and level concrete slab surfaces, using highway straightedges, darbies, or bull floats before bleed water can collect on surface. Do not work concrete further until finishing operations are commenced.



## 3.04 FINISHING FORMED SURFACES

A. Repairs, General: Repair surface defects, including tie holes, immediately after removing formwork.
   1. Smooth rubbed finish: Apply to surfaces indicated no later than 24 hours after form removal.
      a. Wet concrete surfaces to be finished and rub with Carborundum brick or other abrasive until uniform color and texture are achieved.
      b. Do not apply separate grout mixture.

## 3.05 FINISHING SLABS

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

## 3.06 CONCRETE CURING AND PROTECTION

A. General:
   1. Prevent premature drying of freshly placed concrete, and protect from excessively cold or hot temperatures until concrete has cured.

2. Provide curing of concrete by one of the methods listed and as appropriate to service conditions and type of applied finish in each case.



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

## 3.07 QUALITY CONTROL TESTING DURING CONSTRUCTION

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

# END OF SECTION 03310

# DIVISION 4 - MASONRY 197

# SECTION 04220 – VENEER, GLASS & CONCRETE UNIT MASONRY

## PART 1 - GENERAL

### *1.01 SUMMARY*

A. Section Includes:
   1. Face brick, glass block, and concrete masonry units.
   2. Mortar and grout.
   3. Reinforcement, anchorage, and accessories.

## PART 2 - PRODUCTS

### *2.01 BRICK MASONRY UNITS*

A. Facing Brick: ASTM C 216, and shall match existing brick veneer; **Pine Hall Brick Co.-"Old Dutch"**. Submit samples for verification and provide a sample wall, 3'x4', for approval by the Architect/Engineer, before proceeding.

### *2.02 GLASS BLOCK*

A. Hollow Glass Block: Non-load-bearing blocks comprising two half-blocks of pressed glass fused to produce a partial vacuum, with manufacturer's standard factory-applied edge coating, and complying with the design based on **Pittsburg Corning Corp., "Decora Pattern with LX Filter"**, 8" sq. x 4" thick (equal to Saint-Gobain or A.J. Weck Gmbh u. Co.).

### *2.03 CONCRETE MASONRY UNITS*

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

### *2.04 MORTAR AND GROUT MATERIALS*

A. Portland Cement: ASTM C 150, Type I.
B. Hydrated Lime: ASTM C 207, Type S.
C. Aggregate for Mortar: ASTM C 144.
D. Water: Potable.
E. White color for glass block units.
F. Standard gray color for brick units.

### *2.05 REINFORCEMENT AND ANCHORAGE*

A. Joint Reinforcement and Anchorage Materials: Steel wire: ASTM A 82, Hot-dip galvanizing (after fabrication): ASTM A 153, Class B-2. rod diameter 0.1483 inch, and Glass Block Panel Anchors: Standard 20 gage perforated steel strips galvanized after fabrication per ASTM A 153, Class B, and as recommended by manufacturer of masonry units.

### *2.06 MISCELLANEOUS MASONRY ACCESSORIES*

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

### 2.07 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C 270, Proportion Specification.
   1. Limit cementitious materials to lime and Portland cement.
   2. Masonry below grade and in contact with earth: Type M.
   3. Locations indicated on the drawings: Type S. Include waterproofing admixture in pointing mortar for glass block exterior panels.
   4. Applications as follows: Type N, exterior, above-grade walls.

## PART 3 - EXECUTION

### 3.01 INSTALLATION PROCEDURES

A. Existing and new Facing Brick: Match existing joints and re-use existing brick from the Welcome Center demolition walkway to fill in at new doors and to close off the walkway.
B. Concrete Masonry Units: Do not wet concrete masonry units prior to laying.
C. Cutting: Where cutting is required, use power saws to provide clean, sharp, unchipped edges.
   1. Do not use wet cutting techniques with concrete unit masonry.

### 3.02 MASONRY CONSTRUCTION - GENERAL

A. Pattern Bond: Lay exposed masonry in running bond except where other bonds are indicated at special features.
   1. Lay concealed masonry in running bond, or lap units at least 2 inches.
B. Expansion and Control Joints: Build in movement joints where indicated, installing accessory items as masonry is constructed.

### 3.03 LAYING MASONRY UNITS

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

### 3.04 JOINT REINFORCEMENT, SINGLE-WYTHE WALLS

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

### 3.05 CLEANING AND PROTECTION

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

## END OF SECTION 04220

# DIVISION 5 - METALS



# SECTION 05120 - STRUCTURAL STEEL

## PART 1 - GENERAL

### *1.01 SUMMARY*

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

### *1.02 SUBMITTALS*

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

### *1.03 QUALITY ASSURANCE*

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

## PART 2 - PRODUCTS

### *2.01 STEEL MATERIALS*

A. Structural Steel Members: ASTM A 36.
B. Steel Pipe: ASTM A 53, Type and grade: Type E, Grade B.
C. Cold-Formed Structural Tubing: ASTM A 500, Grade B.
D. Hot-Formed Structural Tubing: ASTM A 501, seamless or welded.
E. Anchor Bolts: ASTM A 307, Carbon steel, Grade C; ASTM A 36 steel plate washers.
F. Carbon Steel Bolts and Nuts: ASTM A 307, Grade A.
H. High-Strength Bolts, Nuts, and Washers: ASTM A 325.
   1. Type 1, plain (medium carbon steel).
F. Direct Tension Indicators: Load indicator washers or snap-off high-strength bolts certified to provide the minimum fastener tension in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" may be used at connections requiring high-strength bolts, at the contractor's option.

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## 2.02 MISCELLANEOUS MATERIALS

A. Welding Electrodes and Fluxes: AWS D1.1; types as required by materials being welded.
B. Nonshrink Grout: Prepackaged material requiring only the addition of water and complying with ASTM C 1107, and as follows:
   1. Natural aggregate (nonmetallic) type.
C. Shop Primer: Rust-inhibitive, lead and chromate free, low VOC primer, complying with FS TT-P-664, or equivalent.

## 2.03 FABRICATION

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

## 2.04 SHOP COATING - PAINT

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

## 2.05 SHOP QUALITY CONTROL

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

# PART 3 - EXECUTION

## 3.01 ERECTION

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

D. Bolting:
   1. Carbon steel bolts: Use only for temporary bracing during erection, unless otherwise specifically permitted by contract documents.
   2. High-strength bolts: Comply with requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

E. Welding:
   1. Perform field welding in accordance with AWS "Structural Welding Code - Steel."
   2. Tighten and leave in place erection bolts used in field-welded construction.

## *3.02 FIELD QUALITY CONTROL*

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

# END OF SECTION 05120

# DIVISION 6 - WOOD AND PLASTICS 112

# SECTION 06100 - ROUGH CARPENTRY

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Rough carpentry for:
      a. Wood framing.
      b. Miscellaneous lumber for attachment and support of other work.
      c. Sheathing.
   2. Preservative treatment.

### 1.02 SUBMITTALS

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

### 1.03 QUALITY ASSURANCE

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

## PART 2 - PRODUCTS

### 2.01 DIMENSION LUMBER / ENGINEERED LUMBER

A. Size: Provide nominal sizes indicated, complying with NIST PS 20 except where actual sizes are specifically required. Provide continuous members; splicing is not acceptable.
   1. Surfacing: Dressed lumber (S4S).
   2. Moisture content: Kiln-dry or MC15 (15 percent maximum moisture content).
B. Stud Framing -- 2 x 4 through 2 x 6: Grade: No. 2 (Structural Light Framing).
C. Joist and Small Beam Framing -- 2 x 6 through 4 x 16:
   1. Species: Southern Yellow Pine (SP), Grade: No. 2.
D. Engineer Lumber: 14" GPI 20 wood I beams roof joists, 24" o.c., OSB web, solid lumber or GP Lam LVL flanges and GP Lam LVL ridge beams equal Georgia-Pacific Wood Products. Provide overhang extensions, stiffeners, blocking, adjustable slope hangers, ridge supports, and 2" holes at 1/3 points as recommended by the manufacturer.
E. Miscellaneous Lumber: Provide dimension lumber and boards necessary for the support of work specified in other sections, whether or not specifically indicated, and including but not limited to blocking, nailers, etc.
   1. Lumber: S4S, No. 2 or better, 15 percent maximum (kiln-dry).

### 2.02 CONSTRUCTION PANELS

A. Roof Sheathing: Oriented Strand Board sheathing: APA Rated, OSB Structural Panels, Exposure 1 (exterior glue), PS-2 or APA PRP-108 performance standards, 24/16 spacing, and 5/8" thick.
   a. Tongue and groove edges.
B. Wall Sheathing: Oriented Strand Board (OSB), square edged, APA Rated (exterior glue) sheathing panels with nailing pattern recommended by the manufacturer for shear walls, and nominal ½" thick.

### 2.03 MISCELLANEOUS MATERIALS

A. Fasteners: Provide as required by applicable codes and as otherwise indicated.
   1. Provide fasteners with a hot-dip zinc coating (ASTM A 153) for treated lumber and where wood is in ground contact, subjected to high relative humidity, or exposed to weather.
B. Framing Connectors and Supports: Prefabricated, formed steel units; hot-dip galvanized finish unless otherwise indicated; type and size as required; approved by applicable codes.

C. Air Infiltration Barrier: Spunbonded olefin or woven polyolefin sheet, UV-stabilized, for building wrap.
   1. The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. "Styrofoam Weathermate Plus, Brand Housewrap"; The Dow Chemical Co.
      b. "Tyvek"; E. I. du Pont de Nemours and Company, Inc.
      c. "Amowrap"; Amoco Foam Products Co.

D. Sill Sealer Gaskets: Glass fiber insulation strips; uncompressed thickness, 1 inch (1/32 inch compressed); width to match sill members.

### 2.04 WOOD TREATMENT BY PRESSURE PROCESS

A. Aboveground Lumber: AWPB LP-2 (waterborne preservatives).
   1. Kiln dried after treatment to 19 percent maximum moisture content.
   2. Treat the following:
      a. Wood in contact with masonry or concrete.
      b. Sill plate.
      c. Other members indicated.

B. Fasteners for Preservative Treated Wood: Hot-dip galvanized steel (ASTM A153).

## PART 3 - EXECUTION

### 3.01 INSTALLATION - GENERAL

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

### 3.02 MISCELLANEOUS CARPENTRY

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

### 3.03 WOOD FRAMING - GENERAL

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

### 3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Employ the following fastening methods:
   1. Nail roof and wall sheathing to framing. Staples not permitted.
      a. Provide solid blocking under panel edges other than intact tongue and groove edges.

### 3.05 AIR INFILTRATION BARRIER

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

## END OF SECTION 06100

# SECTION 06200 - FINISH CARPENTRY

## PART 1 - GENERAL

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### 1.01 SUMMARY

A. Wood trim (window & display case), corner boards and plastic laminate changing tables.
B. Interior siding boards for walls and ceiling.
C. Exterior trim; fiber-cement fascia, soffit, and gable siding panels see Section 07460.
D. Fiberglass Reinforced Plastic, FRP, Panels for the service sink walls.

### 1.02 SUBMITTALS

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

## PART 2 - PRODUCTS

### 2.01 WOODWORK

A. All Woodwork Finishes: As indicated on drawings.

### 2.02 WOOD MATERIALS

A. Lumber: Species and grade as indicated; lumber ready for installation shall comply with WM 4, "General Requirements For Wood Molding," Wood Molding and Millwork Producers (WMMP).
   1. Specie(s):
      a. Plain sawn Red Oak at display cases and window picture frame trim.
      b. "Pine": Plain sawn Spruce or Idaho white pine at window extensions.
      c. Western Red Cedar for interior siding boards for walls and ceilings at the new rest area building.
         1) 1x6 T&G with v-groove Custom Grade siding, blind nail.
   2. Softwood: Comply with NIST PS 20 and grade in accordance with the grading rules of the grading and inspection agency applicable to the species.
   3. Hardwood: Red Oak, Grade in accordance with National Hardwood Lumber Association grading rules.
   4. For transparent finish, use only solid pieces of lumber; WM 4 N-grade.
   5. For opaque finish, pieces which are glued up may be used; WM 4 N- or P-grade.
   6. Moisture content: Not greater than that required by applicable grading rules; provide kiln-dried lumber.
   7. Provide lumber dressed on all exposed faces, unless otherwise indicated.
   8. Do not use twisted, warped, bowed, or otherwise defective lumber.
   9. Sizes indicated are nominal, unless otherwise indicated.
   10. Do not mark or color lumber, except where such marking will be concealed in finish work.
B. Plywood: Types, grades, and cores as indicated.
   1. Medium density overlaid plywood: NBS PS 1, Special Exterior MDO.
   3. Plywood in concealed locations: Comply with NBS PS 1, Grade C minimum.

### 2.03 FIBERGLASS REINFORCED PLASTIC (FRP) PANELS:

A. FRP Panels: Equal to Kemply, Glasbord-P, Class R fire rating, 4'x8'x0.09" thick, embossed suface, color #48, Pearl Grey, with fasteners, adhesive, and vinyl edge molding. To be used at two walls at the service sink. Other equal manufacturers maybe Crane Composites, Inc. or Glasteel FRP.

### 2.04 FABRICATION

A. Fabricate in sizes and shapes indicated and using details indicated.
B. Complete fabrication and assembly in shop.
   1. Ease edges of solid lumber members where indicated, using:
      a. 1/16-inch radius for members 1 inch or less nominal thickness.
      b. 1/8-inch radius for members more than 1 inch nominal thickness.
C. Where woodwork is indicated to be field finished, sand smooth, fill nail holes, clean thoroughly, and otherwise prepare for finishing.
D. Standing and Running Trim: Miter exposed ends of members to match profile.
   1. Rout out backs of flat members over 2 inches wide, unless ends are exposed.
   2. Kerf backs of flat members over 4 inches wide, except where ends are exposed.

# PART 3 - EXECUTION

115

## 3.01 PREPARATION

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

## 3.02 INSTALLATION - GENERAL

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

## 3.03 PROTECTION

A. Protect woodwork and column cover from damage and maintain design environmental conditions.

# END OF SECTION 06200

# DIVISION 7 - THERMAL AND MOISTURE PROTECTION

# SECTION 07160 - BITUMINOUS DAMPPROOFING

## PART 1 - GENERAL

116

### 1.01 SUMMARY

A. Section Includes:
   1. Substrate preparation.
   2. Bituminous dampproofing.
   3. Edge and penetration detailing material.

### 1.02 SUBMITTALS

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

### 1.03 DELIVERY, STORAGE, AND HANDLING

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

### 1.04 SITE CONDITIONS

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

## PART 2 - PRODUCTS

### 2.01 BITUMINOUS DAMPPROOFING MATERIALS

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

### 2.02 INSTALLATION ACCESSORIES

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

## PART 3 - EXECUTION

### 3.01 EXAMINATION

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

### 3.02 PREPARATION

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

## 3.03 INSTALLATION - GENERAL

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

## 3.04 BELOW-GRADE DAMPPROOFING

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

## 3.05 INSPECTION

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

## 3.06 PROTECTION AND CLEANING

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

# END OF SECTION 07160

# SECTION 07210 - BUILDING INSULATION

## PART 1 - GENERAL

118

### 1.01 SUMMARY

A. Section Includes:
   1. Extruded polystyrene board.
   2. Glass fiber blanket/batt.

### 1.02 DEFINITIONS

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

### 1.03 SUBMITTALS

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

### 1.04 DELIVERY, STORAGE, AND HANDLING

A. Foamed Plastic Insulation: Minimize period between product delivery and actual installation. Protect against exposure to flame, sparks, or excessive heat. Minimize exposure to sunlight.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Provide manufacturer's standard preformed insulation units, sized for proper fit in indicated applications.
B. Blanket/Batt Insulation: Where installation of blanket/batt insulation is indicated, glass fiber blanket/batt complying with requirements below.
C. Extruded Polystyrene Board Insulation: Manufactured by extrusion process with integral high density skin:
   1. Type VII (ASTM C 578): 60.0 psi compressive strength.
   2. Total R-value: 7.5.]
   3. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Amoco Foam Products Company.
      b. Dow U.S.A.
      c. DiversiFoam Products Company.
      d. UC Industries, Inc.
D. Glass Fiber Insulation-Blanket/Batt:
   1. Unfaced blanket/batt: Type I (ASTM C 665), passing ASTM E 136 combustion test requirements.
   2. Total R-value: 19 at exterior walls; 38 at ceilings.]
   3. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. CertainTeed Corporation.
      b. Manville Roofing Systems, a Division of Schuller International, Inc.
      c. Owens-Corning Fiberglas Corporation.
E. Vapor Retarder: Polyethylene film.
   1. Laboratory-tested vapor transmission rating: 0.2 perm.
   2. Thickness: 6 mils.
   3. Color: Natural.

### 2.02 ACCESSORIES

A. Provide accessories as necessary to properly install specified products.
   Adhesive: Insulation manufacturer's recommended adhesive, complying with fire performance requirements.

## PART 3 - EXECUTION



### 3.01 INSTALLATION

A. Comply with insulation manufacturer's recommendations and installation sequence. Provide permanent placement and support of insulation.
B. Install materials in a manner which will maximize continuity of thermal envelope. Use a single layer of insulation wherever possible to achieve indicated requirements, unless otherwise indicated.
C. Insulation Boards:
    1. Extruded polystyrene insulation:
        a. Foundation installation: Provide installation capable of sustaining subsequent construction work without damage or displacement.
            1. Adhesive: Use insulation manufacturer's recommended adhesive to attach insulation boards to foundation. Maximize contact between board surface and substrate.
        b. Under-slab installation: Do not install insulation before compaction of subgrade is verified. Provide installation capable of sustaining subsequent construction work without damage or displacement.
D. Insulation Blankets/Batts:
    1. Application: Wood-framed construction:
        a. Unfaced insulation: Friction-fit insulation between framing members.
E. Vapor Retarder:
    1. Comply with membrane manufacturer's recommendations for installation of membrane as vapor retarder in application indicated.
    2. Install vapor retarder in a manner which will maximize continuity of protection against vapor transmission. Extend membrane tightly and uniformly to building framing and to other objects (pipes, electrical boxes, etc.) impinging on the plane of the membrane.
    3. Install vapor retarder on warm side of insulation unless otherwise indicated.

## END OF SECTION 07210

# SECTION 07311 - ASPHALT SHINGLES

## PART 1 - GENERAL

120

### 1.01 SUMMARY

A. Section Includes:
   1. Asphalt shingle roofing for the new Rest Area, and Vending (existing old restrooms).
   2. Eave edging.
B. Related Sections:
   1. Soffit vent, see Section 07460 and Gutters, Section 07625.

### 1.02 SUBMITTALS

A. Product data.
B. Samples: For verification, submit sufficient number of samples to demonstrate range of color and texture anticipated for selected finish.

### 1.03 WARRANTY

A. Submit manufacturer's standard 30 year shingle warranty.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

A. Asphalt Shingles:
   1. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Celotex Corporation.
      b. Elk Corporation.
      c. **GAF Building Materials Corporation***.
      d. CertainTeed Roofing Products; CertainTeed Corp.
B. Rubberized Asphalt Ice Protection Membrane:
   1. The following products, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. "WinterGuard Waterproofing Underlayment"; CertainTeed Corporation.
      b. "Weather Watch Underlayment"; GAF Building Materials Corporation.
      c. "Ice & Water Shield"; W. R. Grace & Company.

### 2.02 MATERIALS

A. Asphalt Shingles: Mineral-surfaced, self-sealing, laminated multi-ply overlay construction glass fiber base.
   1. Comply with ASTM D 3018, Type I.
   2. Fire resistance: Class A, UL labeled.
   3. Wind resistance: Passes UL 997.
   4. Style: Three-dimensional laminated straight edge strip shingle.
   5. Color: Provide samples for the Owner's/Architect's selection.
   6. Provide factory prefabricated or field fabricated hip and ridge shingles to match field shingles, at contractor's option.
B. Underlayment: Asphalt-saturated organic roofing felt, ASTM D 226, No. 15 unperforated, Type I, 36-inch-wide rolls.
   1. Provide UL-listed material approved for use in roofing assembly to achieve specified fire rating.
C. Ice Protection Underlayment: Rubberized asphalt sheet membrane, self-adhering, minimum 40 mils thick, 36-inch-wide rolls; minimum tensile strength 250 psi, in accordance with ASTM D 146.
D. Asphalt Plastic Cement: ASTM D 4586, fibrated asphalt cement, asbestos free.
E. Ridge Vent: Shingle-Ridge Vent with external baffle; Air Vent Inc., ShingleVent II.

F. Eave Edging: Aluminum eave edging with baked on enamel paint, brown color.
G. Nails: 11 or 12 gage, aluminum or hot-dipped galvanized, with barbed shanks, minimum 3/8 inch diameter head; length as necessary to penetrate through sheathing, or ¾ inch into solid decking.

# PART 3 - EXECUTION

121

## 3.01 EXAMINATION

A. Review substrate to receive shingles for obstructions, loose sheathing, or voids in sheathing. Repair or replace unacceptable work which may affect proper material installation.

## 3.02 PREPARATION

A. Remove projections and debris from substrate before starting installation; lay sheet metal over minor voids and nail to substrate.
B. Coordinate shingle installation with flashing and other work integral with shingles.

## 3.03 INSTALLATION

A. Install shingles in accordance with shingle manufacturer's instructions or NRCA's "The NRCA Steep Roofing Manual," whichever is more restrictive.
B. Single Layer Underlayment: Apply one layer of felt horizontally over substrate, with 2 inch minimum side laps and 4 inch minimum end laps. Secure with roofing nails until shingles are installed.
C. Ice Protection Underlayment: Install self-adhering ice protection underlayment along full length of eaves from the eave edge to a point 24 inch minimum beyond the 4/12 upper roof slope, and at valley's in accordance with underlayment manufacturer's installation instructions.
D. Flashing: Install the following types of flashing to conform with installation details and instruction of "The NRCA Steep Roofing Manual."
   1. Step flashing at vertical walls, continuous at gable vent, and eave edging at all roof edges.
E. Ridge Vent: Install as recommended by the manufacturer.
F. Valley Construction: Woven valleys, using specified shingles.
G. Asphalt Shingles:
   1. Start shingle installation with row of inverted shingles without tabs or layer of roll roofing placed along full length of eave and fastened.
   2. Coursing - roof: Install shingles in accordance with "The NRCA Steep Roofing Manual."
      a. Pattern: As recommended by the shingle manufacturer for the type of shingles specified.

# END OF SECTION 07311

# SECTION 07460 – SIDING

122

## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. PVC fascia and soffit trim.
   2. Fiber-Cement interior-siding at both Vending buildings.
   3. Interior wood bands.
   4. Soffit vents.

### 1.02 REFERENCES

A. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1997a.
B. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 1998.

### 1.03 SUBMITTALS

A. Product Data: Submit product data and manufacturer's recommended installation instructions.
B. Samples: Submit two 12-inch samples for each siding material and finish.
C. Contract Closeout Submittals: Warranty.

### 1.04 WARRANTY

A. General: Warranties shall be in addition to, and not a limitation of, other rights the owner may have against the contractor.
B. Fiber-Cement Fascia Trim, Soffit Panels: Furnish manufacturer's standard warranty.
   1. Warranted against defects in siding substrate for 50 years.

## PART 2 - PRODUCTS

### 2.01 FIBER-CEMENT & HARDWOOD PRODUCTS

A. Manufacturer: Provide products complying with requirements of the contract documents and made by the following: **James Hardie Building Products** or equal to CertainTeed, or GAF-Weaterside.
B. Surface Burning Characteristics:
   1. Maximum flame spread: 25.
   2. Maximum smoke developed: 450.
C. PVC fascia and trim boards: Equal to KOMA Trimboards by Kommerling) for both rest area buildings including trim boards, fascia, see painting.
D. Cedarmill Panel Siding: Fiber-Cement, 5/16" x 4' x 12' rough sawn panels or Sierra 8 panels for both Vending and Storage rooms.
   1. Lap Siding: 5/16" x 6" x 12' Cedarmill lap siding at the rear entry to the Rest Area building.
   2. Smooth Panels: 5/16" x 4' x 12' at Rest Area vertical panels at the front entry.
E. PVC Exterior Soffit Panels: Equal to Amcraft Building Products; www.amcraft.com; Triple 3 1/3 Hidden Vent .044" Soffit, .042" thick x 9-1/8" wide x 12' long, vinyl, "Wicker" color.
F. Western Red Cedar Siding: Match existing Vending Building fascia and soffits for a painted finish, rough sawn Cedar boards; 1 x 4-12 and 5/8" thick plywood panels for soffits and large vertical panels.
G. PVC Exterior Soffit Panels: Equal to Amcraft Building Products; www.amcraft.com; Triple 3 1/3 Hidden Vent .044" Soffit, .042" thick x 9-1/8" wide x 12' long, vinyl, "Wicker" color.
H. Fasteners:
   1. Unprimed or factory primed siding: Hot-dip galvanized box nails.
   2. Length and spacing as indicated.

### 2.03 UNDERLAYMENT AND ACCESSORIES

A. House wrap over exterior OSB sheathing, see Rough Carpentry.
A. Soffit Vents: Continuous 2" aluminum or PVC soffit vents, "Gray" color equal to Air Vent Inc., miter at corners
C. Nails: Hot dipped galvanized type; non-staining, of size and strength to securely and rigidly retain the work.

## PART 3 - EXECUTION

123

### 3.01 FIBER-CEMENT FASCIA & TRIM INSTALLATION

A. General:
   1. Install siding in accordance with manufacturer's instructions.
   2. Position cut ends over bearing surfaces. Sand cut edges smooth and clean.
   3. Miter vertical joints tight at 45 degrees at fascia corners. Miter external and miter internal corners.

B. Installation:
   1. Drive nails 90 degrees to surface. Drive nail heads to siding surface without breaking siding surface. Do not overdrive. Do not countersink.
   2. Nail at each framing line, positioning nails as per manufacturer's installation instructions.

C. Install panel siding sheets horizontally with edges and ends over firm bearing, blind nail where possible.

D. Maximum Variation From Plumb and Level: 1/4 inch per 10 feet.

F. Prepare for site finishing specified in Section 09900.

### 3.02 SEALANTS

A. Siding:
   1. Use concealed beads where practicable. Do not use exposed beads of sealant except where concealed application is not possible.

## END OF SECTION 07460

# SECTION 07625 - SHEET METAL GUTTERS AND DOWNSPOUTS

## PART 1 - GENERAL

124

### 1.01 SUMMARY

A. Section Includes:
   1. Gutters and downspouts for the new Rest Area buildings and existing Vending buildings.

### 1.02 SUBMITTALS

A. Product Data.
B. Samples: Submit 6-inch-square samples of each type of metal and finish required.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

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

### 2.02 ACCESSORY MATERIALS

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

### 2.03 FABRICATION - GENERAL

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

### 2.04 GUTTERS AND DOWNSPOUTS

A. Fabricate from prefinished aluminum sheet.
   1. Downspouts: 3 inch by 4 inch size.
B. Provide expansion joints in gutters at spacing not to exceed 30 feet.
C. Provide sheet metal baffles 6 inches high with legs 18 inches long at gutter corners below roof valleys.
D. Gutter Supports: Brackets.
E. Downspout Supports: Brackets.

# PART 3 - EXECUTION

## 3.01 INSTALLATION

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

## 3.02 CLEANING AND PROTECTION

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

# END OF SECTION 07625

# SECTION 07900 - JOINT SEALERS

## PART 1 - GENERAL

126

### 1.01 SUMMARY

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

### 1.02 DEFINITIONS

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

### 1.03 SUBMITTALS

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

### 1.04 PROJECT CONDITIONS

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

### 1.05 WARRANTY

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

## PART 2 - PRODUCTS

### 2.01 MATERIALS - GENERAL

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

## 2.02 ELASTOMERIC SEALANTS 127

A. Elastomeric Sealants - General: Chemically curing elastomeric sealants of types indicated, complying with ASTM C 920, including specific Type, Grade, Class, and Uses indicated, as well as all other requirements specified.
   1. Where movement capability exceeding that measured by ASTM C 920 is specified, sealant shall withstand the total movement indicated while remaining in compliance with the other requirements specified, when tested in accord with ASTM C 719, with base joint width measured at the time of application.
   2. For M-type substrates: Comply with requirements for Use M.
   3. For G-type substrates: Comply with requirements for Use G.
   4. For A-type substrates: Comply with requirements for Use A.
   5. For O-type substrates: Comply with requirements for Use M (minimum) and Use O for the particular substrate.

B. Medium Movement Silicone Sealant: One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 25 percent but less than 50 percent in both extension and compression.

C. Mildew-Resistant Silicone Sealant: One-part, Type S,
Grade NS, Class 25, Use NT, formulated with fungicide, for interior use on nonporous substrates, color to match glazed wall tile.

## 2.03 SILICONE-LATEX SEALANTS

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

## 2.04 SEALANT BACKERS

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

# PART 3 - EXECUTION

## 3.01 PREPARATION

A. Do not begin joint sealer work until unsatisfactory conditions have been corrected.

B. Masking Tape: Use masking tape to keep primers and sealers off of adjacent surfaces which would be damaged by contact or by cleanup. Remove tape as soon as practical.

## 3.02 INSTALLATION

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

## 3.03 SCHEDULE OF JOINT SEALERS

A. Exterior Joints at fiber-cement siding and panel joints.
   1. Use Silicone-Latex sealants, paintable type.
   2. Joint shape: Concave joint configuration.

B. Interior inside corners of all glazed tile walls; Mildew-Resistant Silicone Sealant color to match tile.

C. Interior Joints for Which No Other Sealer Is Indicated:
   1. Use one of the following sealants:
      a. Use Silicone-Latex sealants, paintable type.
      b. Mildew-resistant silicone sealant at all ceramic tile corners (color to match gray wall tile) and at fixtures.
   2. Use bond-breaker tape.
   3. Joint shape: Concave joint configuration.

# END OF SECTION 07900

# DIVISION 8 - DOORS AND WINDOWS

# SECTION 08110 - STEEL DOORS AND FRAMES

## PART 1 - GENERAL

128

### 1.01 SUMMARY

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

### 1.02 REFERENCES

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

### 1.03 SUBMITTALS

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

### 1.04 QUALITY ASSURANCE

A. Quality Standard: Comply with SDI 100.
B. Fire-Rated Door Assemblies: In compliance with NFPA 80 and labeled per ASTM E 152 by agency acceptable to governing authorities.

### 1.05 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

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

### 2.02 MATERIALS

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

### 2.03 FABRICATION

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

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



## 2.04 STEEL DOORS

A. General: Fabricate steel doors in accordance with requirements of SDI 100.
B. Interior Doors:
   1. Grade II - Heavy-Duty, Model 1 - Full Flush.
   2. Minimum thickness: 18 gage interior, and 16 gage exterior with insulated cores at exterior.

## 2.05 STEEL FRAMES

A. General: Fabricate steel frames for scheduled openings, in styles and profiles as shown, using concealed fasteners.
   1. Minimum thickness: 16 gage interior, and 14 gage exterior.
   2. Construction: Mitered and welded corners.
B. Guards: Weld protective covers to back of hardware openings at locations where grout, plaster, or other materials might interfere with hardware operation.

# PART 3 - EXECUTION

## 3.01 INSTALLATION

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

## 3.02 ADJUST AND CLEAN

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

# END OF SECTION 08110

# SECTION 08211 - SOLID CORE FLUSH WOOD DOORS

## PART 1 - GENERAL

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### 1.01 SUBMITTALS
A. Product data.

### 1.02 QUALITY ASSURANCE
A. Flush Doors: Comply with the following, hereinafter referred to as referenced standard(s):
   1. " Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program," including Section 1300, " Architectural Flush Doors," Architectural Woodwork Institute (AWI).

### 1.03 WARRANTIES
A. Warranty:
   1. Solid core wood-faced interior doors: Lifetime warranty.

## PART 2 - PRODUCTS

### 2.01 SOLID CORE WOOD-FACED DOORS
A. Description:
   1. Interior door, non-rated.
   2. Faces: Veneers for transparent finish.
      a. Species: Red Oak.
      b. Cut: Rotary cut.
   3. Finish: Transparent finish specified elsewhere.
   4. Grade: Custom.
   5. Construction: 7 ply.
   6. Core: Particleboard, bonded to stiles and rails, sanded.

B. Manufacturers:
   1. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. GlenMar Door Manufacturing Company.
      b. Graham Manufacturing Corporation.
      c. Mohawk Flush Doors, Inc.
      d. Weyerhaeuser Company.

### 2.02 FABRICATION
A. Doors: Fabricate to provide consistent clearances as indicated.
   1. Hinge and lock edges: Provide standard (1/8-inch in 2 inches) bevel at edges, unless standard bevel would not precisely match hardware bevel; provide proper bevel for hardware.

## PART 3 - EXECUTION

### 3.01 INSTALLATION
A. Install doors in accordance with manufacturer's recommended procedures and requirements of referenced standard.

B. Fitting of Doors:
   1. Accurately align and fit doors for trouble free operation throughout range of door swing.

C. Clearances:
   1. Clearance between door edge and head: 1/8 inch.
   2. Clearance between door edge and jamb: 1/8 inch.
   3. Clearance between door bottom edge and top surface of threshold: ¼ inch.

4. Clearance between door bottom edge and floor covering surface or finish (where threshold is not indicated): 1/8 inch.
5. Clearance between meeting edges at pairs of doors: 1/8 inch.

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## END OF SECTION 08211

# SECTION 08410-METAL-FRAMED STOREFRONTS

## PART 1 GENERAL

132

### 1.01 SECTION INCLUDES

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

### 1.02 REFERENCES

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

### 1.03 PERFORMANCE REQUIREMENTS

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

### 1.04 SUBMITTALS

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

### 1.05 DELIVERY, STORAGE, AND PROTECTION

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

## 1.06 ENVIRONMENTAL REQUIREMENTS

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

# PART 2 PRODUCTS

133

## 2.01 MANUFACTURERS

A. Kawneer Company; Product Tri-Fab 450 and 451; www.kawneer.com.
B. Other Acceptable Manufacturers:
   1. United States Aluminum Corp.
   2. Vistawall Architectural Products: www.vistawall.com.
   3. Substitutions: See Section 01600 - Product Requirements.

## 2.02 COMPONENTS

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

## 2.03 MATERIALS

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

## 2.04 FINISHES

A. High Performance Organic Finish: AAMA 2604; multiple coats, thermally cured fluoropolymer system; color as scheduled.

## 2.05 HARDWARE

A. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
B. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
C. Pivots: Center type; top and bottom; provide on all doors.
D. Push/Pull Set: 1" bar, Hager No.160; provide on all doors.
E. Threshold: Aluminum, ¼" high maximum; provide on all doors.
F. Closers: Surface mounted on interior.
   1. Provide on all doors.
G. Locks: Dead latch with turn handle inside; keyed cylinder outside.
   1. Provide on all doors.

## 2.06 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

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



# PART 3 EXECUTION

## 3.01 EXAMINATION

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

## 3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.
B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
C. Provide alignment attachments and shims to permanently fasten system to building structure.
D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
E. Provide thermal isolation where components penetrate or disrupt building insulation.
F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
I. Set thresholds in bed of mastic and secure.
J. Install hardware using templates provided.
K. Install glass in accordance with Section 08800, using glazing method required to achieve performance criteria.
L. Install perimeter sealant in accordance with Section 07900.

## 3.03 ERECTION TOLERANCES

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

## 3.04 ADJUSTING

A. Adjust operating hardware for smooth operation.

## 3.05 CLEANING AND PROTECTION

A. Remove protective material from pre-finished aluminum surfaces.
B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
C. Remove excess sealant by method acceptable to sealant manufacturer.
D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

# END OF SECTION

# SECTION 08460 - AUTOMATIC ENTRANCE DOORS

## PART 1 GENERAL

135

### 1.01 SECTION INCLUDES

A. Automatic sliding doors, with frames (2-sets at each Vestibule); a total of 4-units for the project.
B. Actuators and safety devices.

### 1.02 REFERENCES

A. BHMA A156.10 - American National Standard for Power Operated Pedestrian Doors; Builders Hardware Manufacturers Association; 1999 (ANSI/BHMA A156.10).
B. BHMA A156.19 - American National Standard for Power Assist and Low Energy Power Operated Doors; Builders Hardware Manufacturers Association; 1997 (ANSI/BHMA A156.19).
C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 1998.
D. NFPA 70 - National Electrical Code; National Fire Protection Association; 1999.
E. UL (ECMD) - Electrical Construction Materials Directory; Underwriters Laboratories Inc.; current edition.
F. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Underwriters Laboratories Inc.; 1995.

### 1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Shop Drawings:
C. Product Data: Provide data on system components, sizes, features, and finishes.
D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and manufacturer's hardware and component templates.
E. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.
F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

### 1.04 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.
B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

### 1.05 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within a 1 year period after Date of Substantial Completion.
C. Provide five year manufacturer warranty for motor and compressor.

### 1.06 MAINTENANCE SERVICE

A. Provide service and maintenance of operating equipment for one year from Date of Substantial Completion.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. Automatic Entrance Doors: Dormatic, **Horton* Series 2310**, or Stanely or NABCO Entrances or Dorma.
   1. Substitutions: See Section 01600 - Product Requirements.

## 2.02 AUTOMATIC ENTRANCE DOORS

A. Automatic Sliding Door Type 1A: Single leaf track-mounted, electric operation, extruded aluminum glazed door, with frame, and operator concealed overhead.
B. Finish: Dark Bronze painted fluorocarbon, 20-year finish or Dark Bronze anodized aluminum finish.

## 2.03 LAMINATED GLASS



A. Laminated Glass: 1/4" thick laminated safety glass, see Section 08800.

## 2.04 DOOR OPERATORS

A. Door Operators - General Requirements: Comply with BHMA A156.10, BHMA A156.19 and UL 325, as applicable.
B. Door Locking: Provide electronic locking from interior for securing door at maintenance times with Adams Rite 8600 panic device.
C. Egress Function: Provide emergency egress function in compliance with the 2006 NCSBC, Section 1008.1.3.2 (that in an event of power failure the door is capable of being opened manually to permit means of egress) and 1008.1.3.3.

## 2.05 ACTUATORS

A. Proximity Detector Actuator: Microwave; distance of control sensitivity adjustable.

## 2.06 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics:
B. Motors: NEMA MG 1.
C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
D. Disconnect Switch: Factory mount disconnect switch in control panel.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.
B. Verify that electric power is available and of the correct characteristics.

## 3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.
B. Coordinate installation of components with related and adjacent work; level and plumb.

## 3.03 ADJUSTING

A. Adjust door equipment for correct function and smooth operation.

## 3.04 CLEANING

A. Remove temporary protection, clean exposed surfaces.

## 3.05 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

# END OF SECTION

# SECTION 08550 - WOOD WINDOWS

## PART 1 GENERAL

137

### 1.01 SECTION INCLUDES
A. Factory fabricated metal clad wood windows with operating sash.
B. Operating hardware.
C. Insect screens.

### 1.02 RELATED SECTIONS
A. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.
B. Section 09900 - Paints and Coatings: Site finishing wood surfaces.

### 1.03 REFERENCES
A. AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 1997.
B. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 1995.
C. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 1991.
D. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1997.
E. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference; 1996.
F. FS L-S-125 - Screening, Insect, Nonmetallic; Federal Specifications and Standards; Revision B, 1972.
G. NWWDA I.S.4 - Water-Repellent Preservative Non-Pressure Treatment for Millwork; National Wood Window and Door Association; 1994.

### 1.04 PERFORMANCE REQUIREMENTS
A. Performance Requirements: As specified in PART 2, with the following additional requirements:
B. Design and size windows to withstand dead loads and positive and negative wind loads acting normal to plane of wall calculated in accordance with ASCE 7, and the NC Building Code, when tested in accordance with ASTM E 330, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum load.
C. Deflection: Limit member deflection to flexure limit of glass with full recovery of glazing materials.
D. Design windows to accommodate, without damage to components or deterioration of seals, movement between window and perimeter framing and deflection of lintel.
E. Air Infiltration: Limit air leakage through assembly to 0.3 cu ft/min/sq ft (5.0 cu m/h/sq m) of wall area, measured at a reference differential pressure across assembly of 1.57 psf (75 Pa) as measured in accordance with ASTM E 283.
F. Water Leakage: None, when measured in accordance with ASTM E 331.

### 1.05 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Show component dimensions.
C. Shop Drawings: Indicate opening dimensions.

### 1.06 QUALITY ASSURANCE
A. Manufacturer and Installer: Company specializing in manufacturing residential wood windows with minimum three years of documented experience.

### 1.07 DELIVERY, STORAGE, AND PROTECTION
A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

### 1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

### 1.09 WARRANTY

138

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
B. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.
C. Warranty: Include coverage for:
   1. Degradation of color finish.
   2. Delamination or separation of finish cladding from window member.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

A. **Pella Corp.***
B. Other Acceptable Manufacturers:
   1. Pozzi.
   2. Marvin.
   3. Substitutions: See page SGC-1 – Supplementary General Conditions.
   4. Optional Manufacturer: Inline Fiberglass Ltd.; fiberglass awning windows equal in type of glazing system, accessories, and sizes indicated; American Southeast Window & Glass at (919) 231-1561.

### 2.02 WINDOW COMPONENTS

A. Windows: Wood frame and sash, factory fabricated and assembled.
   1. Performance Requirements: AAMA/NWWDA 101/I.S.2 C30
   2. Exterior Surfaces: Metal clad, Brown.
   3. Interior Surfaces: Unfinished, for transparent finish specified in Section 09900.
   4. Configuration: As indicated on drawings and awning type.
   5. Factory glazed; dry glazing method.
B. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
C. Insect Screens: Woven nonmetallic mesh; FS L-S-125; 14/18 mesh, PVC strands; black color.
D. Operable Sash Weatherstripping: Resilient PVC; permanently resilient, profiled to effect weather seal.

### 2.03 MATERIALS

A. Wood: Clear pine, clear preservative treated to NWWDA I.S.4 of type suitable for transparent or opaque finish.
B. Metal Cladding: Formed aluminum, factory finished, factory fit to profile of wood members.
C. Glass and Glazing Materials: As described below:
   1. Glass in Exterior Lights: Type Obscure and/or clear, double glazing, "Smart Glazing II" or 3/4" insulated glass with low "E" coating, Shading coefficient: 0.88, Winter U-value: 0.48, minimum. Provide obscure glass in the exterior pane and clear glass in the interior pane at all restroom windows.
D. Sealant and Backing Materials: As specified in Section 07900 of Types described below.

### 2.04 HARDWARE

A. Awning Sash: Metal and nylon spiral friction slide cylinder, each sash, each jamb.
B. Sash lock: Lever handle with cam lock.
C. Operator: Rotary type operator.

### 2.05 FABRICATION

A. Fabricate frame and sash members with mortise and tenon joints. Glue and steel pin joints to hairline fit, weather tight.
B. Transparent Finish: Scarf joints permitted if wood matches in color and grain texture.
C. Provide weather stop flange at entire perimeter of unit.
D. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet allowing installation and dynamic movement of perimeter seal.

E. Arrange fasteners to be concealed from view.
F. Provide internal drainage of glazing spaces to exterior through weep holes.
G. Assemble insect screen frame, miter and reinforce frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.
H. Single weatherstrip operable units.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

## 3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
D. Install sills, and jamb extensions.
E. Install operating hardware.
F. Install glass; Factory glazed.

## 3.03 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

## 3.04 CLEANING

A. Remove protective material from factory finished surfaces.
B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

# END OF SECTION

# SECTION 08620 - UNIT SKYLIGHTS

## PART 1 GENERAL

140

### 1.01 SECTION INCLUDES
A. Fixed wood clad skylights.

### 1.02 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide structural, thermal, and daylighting performance values.

### 1.03 WARRANTY
A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
Provide five year manufacturer warranty for including leakage due to defective skylight materials or workmanship.

### 1.04 QUALITY ASSURANCE
A. Skylight Units shall comply with the 2006 NCSBC, Section 2405.5 for sloped glazing construction.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS
A. Unit Skylights:
1. **Velux-America Inc.**
2. Andersen Window Co.
3. Pella Corporation.

### 2.02 COMPONENTS
A. Unit Skylight Type Wood: Factory-assembled glazing in wood frame; double glazed insulated glass; code compliance: 2006 NCSBC, Section 2405.5.
1. Nominal Size: [22x54] inches, Model No. FS 74-108 2.
2. Wood: Select kiln-dried solid and clear. No finger joints, preservative impregnated for opaquw interior finish.
3. Maintenance-Free Exterior Cladding: Roll-formed (0.65 aluminum) or vinyl prefinished product engineered and fabricated to fit exterior exposed surfaces.
4. Glazing: 5/8-inch **obscure** / clear, low E Argon gas filled-gas, insulated, tempered over laminated glass, "U"-value = 0.44, Glazing Code: No. 9914.
5. Baked Acrylic Enamel Finish: Thermally cured organic coating meeting the requirements of AAMA 603, "Dark Brown" color.
6. Interior finish: Factory primed to receive field applied coating specified in Section 09900.
7. Fittings: Surface treatment with electro-galvanized, chromate passivated yellow.
8. Mounting Brackets: Factory installed stamped steel, surface treatment electro-galvanized, chromate passivated yellow.
9. Flashing: Type EDL step flashing for use with shingles, 4/12 slope, minimum 4" curb construction.
10. Fasteners: For attachment of roof accessories to supporting structure; hot dip galvanized zinc plated or cadmium plated steel, or stainless steel.

### 2.03 ACCESSORIES
A. Anchorage Devices: Type recommended by manufacturer, concealed.

### 2.04 FABRICATION
A. Fabricate free of visual distortion and defects.
B. Fabricate to achieve leakproof, weathertight assembly.

C. Fabricate components to allow for expansion and contraction with minimum clearance and shim spacing around perimeter of assembly.

## PART 3 EXECUTION

141

### 3.01 INSTALLATION

A. Place skylight units and secure. Install counterflashing according to the manufacturer's installation instructions.
B. Overlap shingles with flashing to achieve watertight assembly.

### 3.02 CLEANING

A. Remove protective material from prefinished aluminum surfaces.
B. Wash down exposed surfaces; wipe surfaces clean.

## END OF SECTION

# SECTION 08710 - DOOR HARDWARE

## PART 1 - GENERAL

142

### 1.01 SUBMITTALS

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

## PART 2 - PRODUCTS

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

### 2.01 MATERIALS - GENERAL

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

### 2.02 LOCKS, LATCHES, AND BOLTS

A. Mortise Locksets and Latchsets:
   1. Comply with requirements of BHMA A156.13, Operational Grade 2.
      a. Security Grade 1.
   2. Trim: Cast lever with escutcheon plate (Architectural (hardware) trim shall conform to the requirements of Chapter 7 of the NCSBC Accessibility Code).
B. Strikes: Provide strike for each latch bolt and lock bolt.
   1. Finish to match other hardware on door.
   2. Use wrought box strikes with curved lips unless otherwise indicated.
   3. Open strike plates may be used on interior wood door frames.

### 2.03 LOCK CYLINDERS AND KEYING

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

## 2.04 DOOR CONTROL DEVICES

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

## 2.05 SEALS AND THRESHOLDS

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

## 2.06 ARCHITECTURAL DOOR TRIM

A. Manufacturers:
   1. Architectural door trim: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Yale Security, Inc.
      b. Hiawatha, Inc.
      c. H. B. Ives, a Harrow Company.
      d. Rockwood Manufacturing Company.
      e. Triangle Brass Manufacturing Company, Inc.
B. Push / pulls:
   1. Decorative pulls: 1 inch round bars, radius ends, vertical(pull side) and horizontal(push side), 12 & 32 inches long respectively.
   2. Pull handles which are not mounted on plates: Fasten with through-bolts concealed under plate on opposite side.
   3. Where matching handles or bars are installed on each side of door, mount back-to-back with concealed fasteners.

# PART 3 - EXECUTION

## 3.01 PREPARATION

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

## 3.02 INSTALLATION

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

## 3.03 ADJUSTMENT

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

## 3.04 CONTRACT CLOSEOUT

A. Deliver all keys to the owner.

# END OF SECTION 08710

# SECTION 08800 - GLAZING

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## PART 1 - GENERAL

### 1.01 SUMMARY

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

### 1.02 PERFORMANCE REQUIREMENTS

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

### 1.03 SUBMITTALS

A. Product Data.
B. Insulating Unit Warranty.

### 1.04 WARRANTY

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

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

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

### 2.02 GLASS TYPES

A. Glass Types - General: Provide glass types fabricated of the glass products indicated.
   1. Exterior glass thickness: 6 mm (1/4 inch nominal), unless otherwise indicated.
   2. Where safety glazing is required by governing authorities, provide certified safety glazing.
   3. Cut or drill holes in laminated units.
B. Glass Type I - 1: Single units at sliding entry doors and sidelights.
   1. Total thickness: 1/4 inch, nominal.
   2. Exterior and interior pane: **Laminated glass**.
      a. Two-ply.
      b. Thickness of plies: 6 mm.
      c. All plies: **Heat-strengthened float glass**.
      d. Color: Outer and inner ply: Clear.
      e. Interlayer thickness: 0.05 inch.

3. Shading coefficient: 0.96.
5. Winter U-value: 1.09, minimum.
6. Acceptable glazing methods:
   a. Structural adhesive glazed.

C. Glass Type SG - 2: Polycarbonate sheet, with mar-resistant coating; thickness: ¼ inch.
   1. Provide certified safety glazing and use at display cases.
   2. Color: Clear.
      2. Acceptable glazing methods: Sealant, both sides.

D. Glass Type SG - 3: Obscure glass at Unisex Restroom door; thickness: ¼ inch safety glass.

## 2.03 BASIC GLASS PRODUCTS

A. Sealed Insulating Units: Factory-assembled multiple panes separated by and sealed to spacers forming air-tight, dehydrated air space(s).
   1. ASTM E 774, Class B.
   2. Spacer seals: Manufacturer's standard.
   3. Exception: For structural adhesive glazed units use only a dual seal system, using materials determined by structural adhesive manufacturer to be compatible with structural adhesive.

B. Float Glass: Quality q3, unless otherwise indicated.
   1. Heat-strengthened: ASTM C 1048, Kind HS, Type I.

C. Laminated Units: Multiple plies laminated together with interlayer, using heat and pressure, without air pockets or contaminants between plies.
   1. Interlayer for all-glass units: Polyvinyl butyral sheet, specifically designed for lamination and with demonstrated long-term ability to maintain physical and visual properties under installed conditions.

D. Polycarbonate Sheet: Rigid, flat polycarbonate sheet; thicknesses as indicated.
   1. Flammability: Average extent of burning less than 1 inch, when tested in accordance with ASTM D 635, using the thickness of material to be used on the project.
   3. UV- and mar-resistant coating: Apply on all surfaces exposed to air.

B. Transom Grilles: Provide white coated aluminum grilles on all transom lights match grilles on sidelights.

## 2.04 INSTALLATION MATERIALS

A. Installation Materials - General: Select products which have appropriate performance characteristics as recommended by glass and glazing materials manufacturers and which are compatible with all materials with which they will come into contact.

B. Heel and Toe Bead Sealant: Noncuring, nonskinning, minimum 75 percent solids, butyl or polyisobutylene rubber, complying with 802.3, Type II ductile back bedding compound, as described in AAMA 800.

# PART 3 - EXECUTION

## 3.01 INSTALLATION - GENERAL

A. Comply with recommendations for installation contained in the FGMA "Glazing Manual" and "Sealant Manual" except when specifically not recommended or prohibited by the glass or glazing material manufacturer; comply with manufacturer's recommendations.

B. Protect glazing from edge damage during handling and installation.

C. Do not install glass that has edge damage or defects that reduce glass strength or performance or diminish appearance.

## 3.02 GLAZING IN FRAMES

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

## 3.03 PROTECTION AND CLEANING

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

# END OF SECTION 08800

# DIVISION 9 - FINISHES



# SECTION 09260 - GYPSUM BOARD SYSTEMS

## PART 1 - GENERAL

### 1.01 SUMMARY

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

### 1.02 QUALITY ASSURANCE

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

## PART 2 - PRODUCTS

### 2.01 GYPSUM BOARD

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

### 2.02 TRIM AND ACCESSORIES

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

### 2.03 JOINT TREATMENT

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

### 2.04 MISCELLANEOUS MATERIALS

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

## PART 3 - EXECUTION

### 3.01 INSTALLATION OF GYPSUM BOARD

A. General: Comply with ASTM C 840 and GA-216 except where exceeded by other requirements.
   1. Wherever possible, install gypsum board to minimize butt end joints.

2. Apply ceiling boards prior to installation of wallboards. Arrange to minimize butt end joints near center of ceiling area.
3. Install wallboards in a manner which will minimize butt end joints in center of wall area. Stagger vertical joints on opposite sides of walls.

B. Installation on Wood Framing:
1. Single-layer application: Install gypsum board by the following method:
   a. Screw attachment.

## 3.02 FINISHING

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

# END OF SECTION 09260

# SECTION 09300 - TILE

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## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Glazed wall tiles.
   2. Glazed paver tiles.

### 1.02 DESIGN REQUIREMENTS

A. Fire-Rated Construction: At locations indicated, provide fire-rated assemblies tested per ASTM E 119 and acceptable to governing authorities for designated fire ratings.

### 1.03 SUBMITTALS

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

### 1.04 MAINTENANCE

A. Extra Materials: Furnish not less than 1 percent of total product installed maintenance stock for each type, color, pattern, and size of tile product installed.

## PART 2 - PRODUCTS

### 2.01 MATERIALS - GENERAL

A. Colors, Textures, and Patterns, Tile, Grout, and Other Products: Match colors indicated or as scheduled on drawings as manufactured by the **Dal-Tile Corporation** or comparable equal (American Olean Tile).
   1. Tile trim and accessories: Match color and finish of adjoining flat tile.

### 2.02 TILE PRODUCTS

A. Glazed Paver Tile; Provide Flat Tile with abrasive glazed finish (non-slip):
   1. The design is based on the following products:
      a. Type 1: Main floor tile.
         1. Manufacturer: "Glazed Porcelain"; Dal-Tile Corporation.
         2. Pattern: Passaggio.
         3. Size: 12" x 12" x 5/16".
         4. Color: #PA33, Nocino field.
      b. Type 2: Diamond accent tile and sanitary base.
         1. Manufacturer: "Glazed Porcelain"; Dal-Tile Corporation.
         2. Pattern: Passaggio / Continental Slate.
         3. Size: 12" x 12" x 5/16" / 6" x 12" x ¼" (sanitary base).
         4. Color: #PA30, Livorno Beige (diamond floor accent) / #CS53, Asian Black (sanitary base).
      c. Type 3: Wall tile at Lobby and Corridor wainscot.
         1. Manufacturer: "Glazed Porcelain"; Dal-Tile Corporation.
         2. Pattern: Passaggio.
         3. Size: 12" x 12" x 5/16".
         4. Color: #PA30, Livorno Beige.
   2. Trim units: Match color and finish of accent tile (6" high base):
      a. Shapes and sizes: Manufacturer's standard, as indicated; coordinated with indicated size and coursing of adjoining flat tile, where applicable:
         1. Bullnose, 3" x 12", #PA30, Livorno Beige.
         2. Cove base, 6" x 12", #CS53, Asian Black.

B. Glazed Wall Tile; Flat Tile:
   1. The design is based on the following product:
      a. Tile: Manufacturer: Wall Tile"; Dal-Tile Corporation.

2. Pattern: Semi-Gloss.
3. Size: 6" x 6" x 5/16".
4. Color: #0135, Almond and #0138, Golden Granite-main walls.

b. Comparable products of other manufacturers will be considered for substitution.

2. Trim units: Match color and finish of adjacent flat tile:
   a. Shapes and sizes: Manufacturer's standard, as indicated; coordinated with indicated size and coursing of adjacent tile, where applicable:
      1. Surface bullnose.

## 2.03 SETTING MATERIALS

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

## 2.04 GROUTING MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10.
B. Latex-Portland Cement Grout: One-component dry grout mix, field-mixed with water; or two-component, dry grout mix and liquid latex additive, field-mixed; complying with ANSI A118.6.
   1. All components premeasured and prepackaged.
   2. Dry latex additive: Polyvinyl acetate or ethylene vinyl acetate.
   3. Liquid latex additive: Manufacturer's standard water emulsion.
C. **Urethane-Based Quartz Grout: By Quartz-Lock Grout, Star Quartz* or** 100% Solids Epoxy Grout **at all floors and sanitary base**; complying with ANSI A118.3.
   1. Mix in accordance with manufacturer's recommendations.
   2. Colors: #380, Charcoal Gray (floor & base), and #230, Almond (wall tile) by **Quartz-Lock Grout, Star Quartz*** (wall grouts: or equals by Custom Building Products or Bonsal or Hydroment).

## 2.05 ELASTOMERIC SEALANTS

A. Compatibility: Provide sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates for project performance conditions.
B. Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and O (for nonporous substrates) with added fungicide.

## 2.06 MISCELLANEOUS MATERIALS

A. Cementitious Backer Units: Comply with ANSI A118.9, equal to Durock Brand Cement Board by USG, Den-Shield by Georgia-Pacific; 1-800-327-2344, or James Hardie Cement Backer Board.
   1. Thickness shall equal 5/8"; may be furred to match drywall material above.
B. Tile Cleaner: Product specifically acceptable to tile manufacturer and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation or Ceramic Tile Institute.
C. Tile Sealer: Sealer's Choice Gold by Aquamix; apply to all floor and base grout joints.

## 2.05 MISCELLANEOUS MATERIALS

A. Cementitious Backer Units: Comply with ANSI A118.9...
B. Tile Cleaner: Product specifically acceptable to tile manufacturer and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation or Ceramic Tile Institute.

# PART 3 - EXECUTION

## 3.01 INSTALLATION - GENERAL

A. Tile Installation Standard: ANSI A108 series, for setting and grouting materials listed.
B. Installation Methods: Comply with TCA "Handbook for Ceramic Tile Installation" for type of applications indicated.
C. Cementitious Backer Units: Install in accordance with ANSI A108.11.

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## 3.02 TILE APPLICATIONS

A. Interior Floor, Thin-Bed:
   1. Tile: Glazed paver.
   2. Installation method:
      a. Concrete subfloor: TCA F113.
      b. Bond coat: Latex-portland cement mortar, ANSI A108.5.
      c. Joints shall be ¼" wide.
   3. Grout: Sand-portland cement.

B. Interior Wall, Thin-Bed:
   1. Tile: Glazed wall.
   2. Installation method:
      a. Cementitious backer units on studs: TCA W244.
      b. Bond coat: Latex-portland cement mortar, ANSI A108.5.
   4. Grout: Latex-portland cement.

D. Tolerances: Maximum variation in floor and wall finished surface/sub-structures shall not exceed 1/8" in 10'-0" from the required tile surface plane. All individual tile edges shall align with adjacent tile edges and no greater than a 1/64" offset variation shall be acceptable.

E. Tile Sealer: Apply Sealer's Choice Gold to all floor and base grout joints with a paint brush as recommended by the manufacturer to completely seal the grouted joints. Test joints with water after application showing beads if completely sealed. Apply sealer after grout has cured are cover with protective paper to just before the building Pre-Final Inspection.

## 3.03 CLEANING AND PROTECTION

A. Clean tile surfaces after installation is complete.

B. Protection: Apply neutral protective cleaner to tile after installation if recommended by tile manufacturer. Overlay completed tile installation with kraft paper for protection from subsequent construction activities.

## 3.04 MAINTENANCE

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

# END OF SECTION 09300

# SECTION 09660 - RESILIENT TILE FLOORING

## PART 1 - GENERAL



### 1.01 SUMMARY

A. Section Includes:
   1. Resilient tile flooring.
   2. Resilient base.

### 1.02 SUBMITTALS

A. Product Data: Submit technical data from each manufacturer of resilient products required.
B. Verification Samples: Submit samples of each type, color, and pattern of resilient product required, as follows:
   1. Actual tiles.
   2. Cut sections of resilient flooring accessories, not less than six inches in length.
   3. Other materials requested by Engineer.

### 1.03 PROJECT CONDITIONS

A. Environmental Requirements: At least 48 hours prior to beginning work, move resilient flooring materials to areas of installation and maintain at minimum 70 degrees F until 48 hours after completing installation and at minimum 55 degrees F thereafter.
B. Sequencing: Do not begin installation of resilient flooring products until painting has been completed for each area.
C. Existing Conditions: Do not install resilient flooring on concrete substrates until testing has been conducted to assure that moisture levels are acceptable.

### 1.04 MAINTENANCE

A. Extra Materials: At time of completing installation, deliver stock of maintenance materials to the owner. Furnish products matching those actually installed, packaged for storage and clearly labeled.
   1. Resilient tile: 5 percent of each variety installed.
   2. Resilient base: 5 percent of each variety installed.

## PART 2 - PRODUCTS

### 2.01 TILE FLOORING MATERIALS

A. Vinyl Tile:
   1. Manufacturer: **Azrock*** solid vinyl, no-wax finish.
      a. Comparable products of other manufacturers will be considered for substitution (Armstrong World Industries, Inc. or Johnsonite, Inc).
   2. Pattern or style: "Cortina Granite"; Solid Vinyl Tile.
   3. Size and gage: 12" x 12" x 1/8" thickness.
   4. Color: **#CG409, Ginger**.

### 2.02 RESILIENT BASE MATERIALS

A. Rubber Wall Base: FS SS-W-40, Type I, and as follows:
   1. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
      a. Flexco Company.
      b. Johnsonite, Inc.
      c. The R. C. Musson Rubber Company.
      d. **Roppe Corporation* (color# P100, Black)**.
   2. Height: 4 inches.
   3. Style: Standard toe base.
   4. Corners: Preformed or molded units matching base in color and finish.

### 2.03 MISCELLANEOUS ACCESSORIES

A. Adhesive: Type recommended by manufacturer of resilient product for specific substrate conditions.

### 2.04 COLORS AND PATTERNS

A. Provide colors and patterns of resilient flooring materials as scheduled on drawings.

## PART 3 - EXECUTION

### 3.01 GENERAL INSTALLATION REQUIREMENTS

A. Perform a subfloor Bond and Moisture Test (Calcium Chloride Test) as described in publication #F-5061, "Armstrong Guaranteed System", or other manufacturer's published recommendations to determine if surfaces are ready to receive resilient flooring; as recommended by the flooring manufacturer.
B. Comply with manufacturer's published recommendations for installation in each area, extending resilient flooring into spaces which are partially concealed. Cut and fit tightly to fixtures, pipes, and other obstructions, as well as to walls and partitions.
C. Tightly adhere resilient flooring to substrate with no open joints or cracks, and without raised or blistered areas. Spread adhesive evenly, so that final installation will be without telegraphed markings from adhesive or substrate.

### 3.02 TILE INSTALLATION

A. Layout: Establish center of each space and lay tile from center point, so tiles at each edge will be not less than ½ tile and equal in width.
B. Matching: In each space, use tiles from same production run, and lay tiles in same sequence as removed from cartons. Discard broken, chipped, or otherwise damaged tiles.
   1. Lay tile square to room axis.
   2. Lay tile with pattern in adjacent tiles oriented in opposite directions.

### 3.03 INSTALLATION OF RESILIENT BASE

A. Apply resilient base securely in locations indicated, using maximum lengths available.

### 3.04 CLEANING

A. Initial Cleaning: Remove excess and waste materials promptly, and sweep or vacuum clean resilient flooring as soon as installation has been completed in each area. After adhesive has had adequate time to set, mop each area with damp mop and mild detergent.
B. Final Cleaning: Remove scuff marks, excess adhesive, and other foreign substances, using only cleaning products and techniques recommended by manufacturer of resilient products.
   1. Polish: Apply 2-coats of high quality commercial protective polish to clean resilient flooring surfaces; such as Armstrong S-480 Floor Polish.

### 3.05 MAINTENANCE

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

## END OF SECTION 09660

# SECTION 09900 - PAINTING

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## PART 1 - GENERAL

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

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

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

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

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

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

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

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

# PART 2 - PRODUCTS



## 2.01 MANUFACTURERS

A. The brand-name products listed in the schedule at the end of this section and made by the following manufacturer are the basis of the contract documents:
   1. **The Glidden Company, ICI* - Lifemaster.**
B. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered in accordance with standard substitution procedures:
   1. Devoe & Raynolds Company - Lifemaster.
   2. Benjamin Moore & Company – Pristine EcoSpec.
   3. Sherwin Williams Company – Health Spec.

## 2.02 PRODUCTS

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

# PART 3 - EXECUTION

## 3.01 INSPECTION

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

## 3.02 SURFACE PREPARATION

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

## 3.03 MIXING AND THINNING

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

## 3.04 APPLICATION

A. General:
   1. Apply coatings in accordance with coating manufacturer's instructions and using application method best suited for obtaining full, uniform coverage of surfaces to be coated.
   2. Apply each coat to achieve the dry film thickness per coat recommended by the coating manufacturer. Application rates in excess of those recommended and fewer numbers of coats than specified will not be accepted.
   3. Completed coatings shall be free of defects such as runs, sags, variations in color, lap or brush marks, holidays, and skips.
   4. Apply coatings according to the schedule at the end of this section and as otherwise indicated. Coat all similar surfaces not specifically mentioned unless specifically exempted.
   5. Coat front and back of miscellaneous items such as covers, access panels, and grilles. Apply fully finish coats behind movable items of furniture and equipment before installation. Apply prime coat only behind non-movable items of furniture and equipment before installation.
   6. Sand gloss coats before applying subsequent coatings.

B. Remove coatings not in compliance with this specification, re-clean and re-prepare surfaces as specified, and apply coatings to comply with the contract documents.

C. Scheduling:
   1. Apply first coat of material to properly prepared surfaces without delay.
      a. Apply successive coats within the time limits recommended by the manufacturer.

## 3.05 PRIME COATS

A. General:
   1. Field apply bottom coats scheduled except where the contract documents require shop coating of ferrous metals.
   2. Ferrous metals that have not been shop primed shall be field primed promptly after arrival at the site or shall be stored away from the effects of weather.
   3. Re-prepare and retouch damaged prime coats using approved, compatible primer.

B. Primers for Wood and Wood Products:
   1. Apply first coat to wood upon receipt at the site and before wood is exposed to sun or rain.
   2. Back-prime concealed surfaces and cut edges of exterior wood trim prior to installation.

## 3.06 FINISH COATS

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

## 3.07 CLEANING AND PROTECTION

A. Cleaning:
   1. Clean work area on a daily basis; dispose of spent materials and empty containers. If requested, turn over the Engineer all empty coatings containers used during the course of each day.
   2. Remove all trace of coatings from adjacent surfaces not scheduled to be coated. Remove by appropriate methods that do not damage surfaces.

B. Protection:
   1. Protect work against damage until fully cured. Provide signs identifying wet surfaces until surfaces are adequately cured.
   2. Shortly before final completion of the project, examine surfaces for damage to coatings and restore coatings to new, undamaged condition.
   3. Touch-up of minor damage will be acceptable where result is not visibly different from surrounding surfaces. Where result is different either in color, sheen, or texture, recoat entire surface.

## 3.08 SCHEDULE OF COATINGS FOR INTERIOR NONTRAFFIC SURFACES

A. **Gypsum Wallboard: Walls & ceilings.**
   1. Latex acrylic.
      a. Bottom coat: Ultra-Hide 1260 Airless High-Build Flat Interior Primer / Finish; 1.1DFM.
      b. Intermediate coat: Same as top coat.
      c. Top coat: Devflex 4212HP High Performance Waterborne Acrylic Eggshell Enamel (color # 70YY 57/098, "Distant Mountain" at all Restrooms and upper Lobby and Corridor).



B. **Wood: Doors, windows, horizontal band/trim & display cabinet, shelving.**
   1. Varnish, satin (stained wood doors).
      a. Stain: WoodPride 1700 Interior Oil Wood Finishing Stain, (color "Natural on Oak").
      b. Bottom and intermediate coats: WoodPride 1908 Interior Polyurethane Gloss Varnish.
      c. Top coat: WoodPride 1902 Interior Polyurethane Satin Varnish.

C. **Wood: Interior Cedar T&G siding at walls and ceilings.**
   1. Varnish, satin finish.
      a. Bottom and intermediate coats: WoodPride 1902 Interior Polyurethane Satin Varnish.
      b. Top coat: WoodPride 1902 Interior Polyurethane Satin Varnish.

D. **Ferrous Metal: Hollow metal doors & frames.**
   1. Lifemaster Pro HB Acrylic Coating, semigloss:
      a. Bottom coat: Devoe Coatings DevGuard 4160 Multi-Purpose Tank & Structural Primer.
      b. Intermediate coat: Same as top coat.
      c. Top coat: Devflex PF 4020PF Interior/Exterior Semi-gloss waterborne acrylic (4 mils dry thickness, 148 s.f. / gal.); (Color: # 00NN 13/000, "Obsidian Glass" at Pipe Chase doors & frames, and at metal frames at wood doors).

## 3.09 SCHEDULE OF COATINGS FOR EXTERIOR NONTRAFFIC SURFACES

A. **Fiber-Cement: Wall panel siding, soffit panels & fascia trim.**
   1. Acrylic / Latex, flat.
      a. Bottom coat: Same as top coat.
      b. Top coat: Ultra-Hide Duras 2210 Exterior Acrylic Flat Finish; 1.5 DFM. (Siding & trim color shall match existing trim color; "Wicker," 1.4 DFM).

# END OF SECTION 09900

# DIVISION 10 - SPECIALTIES 159

# SECTION 10100 - VISUAL DISPLAY BOARDS

## PART 1 - GENERAL

### 1.01 SUMMARY

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

### 1.02 SUBMITTALS

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

### 1.03 PROJECT CONDITIONS

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

## PART 2 - PRODUCTS

### 2.01 MATERIALS

A. Natural Cork Tack Boards:
   1. Seamless, ¼-inch-thick cork sheet, laminated to ¼-inch-thick hardboard.
B. Wood Trim: See Section 06200-Finish Carpentry and Section 09900-Painting for stain and varnish.
C. Adhesives: As recommended by manufacturer for the materials and substrates to be joined.
C. Felt Seal: ¼" wide continuous felt strip adhered to the sides and bottom face of the Display Case Oak inner frame to seal out dust when in contact with the Display Case door in the closed position.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

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

### 3.02 INSTALLATION

A. General:
   1. Install off-site fabricated units as instructed by manufacturer.
   2. Provide any necessary installation accessories, including blocking, backing, anchors, etc.
   3. Join parts forming neatly fitted hairline joints.

### 3.03 PROTECTION

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

## END OF SECTION 10100

# SECTION 10170 – PLASTIC TOILET COMPARTMENTS

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Revised 8-11-09

## PART 1 - GENERAL

### 1.01 SUMMARY
A. Section Includes:
   1. Water-closet compartments Compartments and urinal screens.
   2. Restroom counters and bench.

### 1.02 SUBMITTALS
A. Product Data.
B. Shop Drawings.
C. Panel Color Verification Samples: Submit 6-inch-square samples of each panel finish type and color to be installed.
D. Manufacturer's Instructions.
E. Maintenance Data.

### 1.03 QUALITY ASSURANCE
A. Regulatory Requirements: Products and finished installations to be used by handicapped persons must comply with requirements of the NC State Building Code, Volume I-C, Accessibility Code, 2004 Edition.

### 1.04 COORDINATION
A. Use manufacturer's instructions and data to determine anchorage requirements for panel systems. In a timely manner, distribute to affected installers of related work those system components and anchorage devices provided by panel manufacturer for incorporation into other work.

## PART 2 - PRODUCTS

### 2.01 PANEL SYSTEMS
A. Compartments: Provide compartments fabricated of partitions and erected using the following panel systems at locations indicated on the drawings:
   1. Solid plastic, floor-anchored and overhead-braced.
B. Screen Systems: Provide screens erected using the following panel systems at locations indicated on the drawings:
   1. Solid plastic, wall-hung.

### 2.02 PANEL MATERIALS
A. Plastic Solid Plastic:
   1. Panel material: High-density polyethylene or polypropylene, of homogeneous composition and color throughout, minimum thickness of material 1 inch. Provide seamless panels with eased edges.
   2. Plastic Panel; shoes, and continuous mounting brackets in matching colors;
      a. Santana, color shall match AMPCO, Ash Grey.
      b. Sanymetal, color shall match AMPCO, Ash Grey.
      c. **AMPCO*: "Ash Grey"**.
      d. Columbia Partitions, a Division of PSiSC, www.PSiSC.com
   3. Hardware, head rails, heat-sink, and accessories. Manufacturer's standard styles. The following materials will be acceptable:
      a. Chromium-plated nonferrous cast alloy ("Zamac").
      b. Extruded aluminum, anodized and polished.
   4. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable (colors shall match those specified):
      a. Scranton Products: Santana/Comtec/Capitol.
      b. The Sanymetal Products Company, Inc.
      c. **Ampco*** Florida, Opa Locka, Florida 33054. (305) 821-5700, www.ampco.com.
      d. Columbia Partitions, a Division of PSiSC, www.PSiSC.com

## 2.03 ACCESSORIES

A. General: Provide hardware and accessories as necessary to properly install panel systems indicated.
   1. Hinge: Self-closing, pivot type hinge, recess-mounted within door; adjustable to permit door to rest at any angle.
   2. Latch for non-handicapped compartments: Surface-mounted type, with emergency access feature. Provide stop and keeper with rubber bumper.
   3. Latch for handicapped compartments: Surface-mounted sliding latch (for inner side of compartment doors), with emergency access feature, designed for use by handicapped persons.
   4. Door pull for handicapped compartments (for outer side of compartment doors): Suitable for use by handicapped persons.
   5. Combination coat hook with rubber bumper: Provide unit of sufficient length to prevent compartment door from striking installed toilet accessories.
   6. Leveling-and-anchorage devices: Rust-resistant steel devices as recommended by panel manufacturer for installation of panels in conditions indicated.
   7. Pilaster shoes: Plastic, finish to match compartments. Minimum shoe height: 3 inches.
   8. Fasteners: Tamper-resistant rust-proof, exposed fasteners as recommended by panel manufacturer for installation of panels and hardware in conditions indicated. Finish to match hardware.
   9. Overhead bracing: Antigrip headrail bracing fabricated from continuous extruded aluminum, clear anodized finish.
   10. Brackets: All panels shall be mounted with continuous panel brackets of matching plastic (or aluminum), and anchored to continuous wall blocking.
   11. Heat-Sink: Provide solid aluminum strips at the bottom of all panels or Class A rated panels.

# PART 3 - EXECUTION

## 3.01 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions, except where more restrictive requirements are shown, specified, or are necessary for project conditions.

# END OF SECTION 10170

# SECTION 10425 - SIGNS



## PART 1 - GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Plastic plaques, plastic letters, and individual exterior aluminum letters signs.
   2. Project sign.
B. Provide signage as indicated on the signage schedules and in compliance with Chapter 18 of the NCSBC Accessibility Code.

### 1.02 SUBMITTALS

A. Product Data: Submit for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
B. Shop drawings:
   1. Show fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

A. Plastic Signs: Substitutions: See Article 8 – Supplementary Instructions to Bidders.
1. Advance Printing Products, Inc.
2. Best Manufacturing Co.
3. Mohawk Sign Systems, Inc.
4. Accusign, Inc.; **Rowmark Ultra-Mattes***: (919) 872-2008.

### 2.02 RAISED LETTER SIGNS

A. Base Material: **Forest Green, #3X2-901** solid color acrylic plastic (Sign Plaques):
   1. Total Thickness: 1/8 inch.
   2. Height: 2 inches.
   3. Edges: Square
B. Raised Character Size and Style: Acrylic plastic, character adhered to base material:
   1. Comply with applicable provisions of NC State Building Code, Volume I-C, Accessibility Code, 1999/2004 Edition, including Braille.
   2. Character Color: **White**.
   3. Character Thickness: 1/8 inch.
   4. Height: 5/8 inch.
   5. Edges: Square.
   6. Character Font: Helvetica.
   7. Character Case: Upper case only.

### 2.03 INDIVIDUAL PLASTIC LETTERS

A. Material: **Forest Green** and **White** solid color acrylic plastic:
   1. Thickness: 1/8-1/4 inch.
   2. Height: 9 inches.
   3. Edges: Square.
B. Character Style:
   1. Character Color: **Forest Green** and **White**.
   2. Character Font: Helvetica.
   3. Character Case: Upper case only.

## 2.04 INDIVIDUAL ALUMINUM GRAPHICS 163

A. Material: **Dark Bronze** painted color on aluminum cast letters for exterior signage:
   1. Size:1/4 inch thick x 6 and 3 inches high w/ square edges and min. ¾" projection.
B. Character Style and Copy:
   1. Character Font: Helvetica, upper and lower case only; "I-85 DAVIDSON COUNTY REST AREA" (1-set 6" high), "I-85 DAVIDSON County Rest Area" (1-set 3" high) & "VENDING" (2-sets 6" high).

## 2.05 ACCESSORIES

A. Mounting Hardware: Chrome plated brass screws and double sided tape, permanent adhesive.
B. Provide projected mounting for individual exterior letters; 2-set projected on the wood fascia.

## 2.05 SIGN SCHEDULE:

A. Sign plaques shall read as follows:

| Location/Room No. | Copy | Quantity |
|---|---|---|
| 108 | MECHANICAL | 2 |
| 107 | RESTROOM** | 3 |
| 104/106 | WOMEN * | 2 |
| 112/114 | MEN * | 2 |
| 110 | Fire extinguisher is located inside storage room | 1 |
| 110 | STORAGE | 2 |

* Provide the male or female caricature at signs noted above with white figure and border on **Forest Green** background, 8"x 8" size, mount to glass block (1-extra sign shall be furnished to the Owner).
** Provide both caricatures (male & female) at signs noted above with white figure and border on **Forest Green** background, 8"x 8" size. Provide the following copy beneath "FAMILY ASSISTANCE RESTROOM" and "KNOCK WHEN ENTERING".

B. Interior Plastic Individual Letters, at 5" & 12" high; all 5" high above doorways (at bulkheads center on 1x6 T&G Cedar boards, **Forest Green**) and 12" high and with arrows at pipe chase doors (**White**), shall read:

| Location/Room No. | Copy | Quantity |
|---|---|---|
| 109 | <WOMEN> | 4 (2 of each size & color) |
| 103 | <MEN> | 4 (2 of each size & color) |

C. Project Sign: Provide the project sign as shown on the drawings.

# PART 3 - EXECUTION

## 3.01 INSTALLATION

A. General:
   1. Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
   2. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
   3. Install project sign in locations indicated and using mounting methods indicated.

B. Plastic Plaques and Individual Letters:
   1. Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.
   2. Concealed mounting: Use double-sided foam tape and mount plaques at 60" above the floor adjacent to doors 2" from the latch side of the jamb for plaques and center individual letters as indicated.

## 3.02 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

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# I-85 REST AREA & VENDING

6" HIGH COPY

NC DEPARTMENT OF TRANSPORTATION

2" HIGH COPY

ARCHITECT / ENGINEER:

1-1/2" HIGH COPY

**FACILITIES DESIGN**

5" HIGH COPY

**NCDOT**

2" HIGH COPY

CONTRACTORS:

1-1/2" HIGH COPY

**GENERAL CONTRACTOR**

2" HIGH COPY

**PLUMBING CONTRACTOR**

Helvetica Med. Style

**HVAC CONTRACTOR**

All Copy #90RR 11/257

**ELECTRICAL CONTRACTOR**

4' x 6' x 3/4" EXTERIOR PLYWOOD, PAINTED White, 30GY 88/014 BACKGROUND W/ 2 - 4" x 4" TREATED WOOD POSTS (3' BELOW GRADE), BOTTOM OF SIGN PANEL 3' ABOVE GRADE.

COLORS: # 90RR 11/257, "Tomahawk Red", (GLIDDEN) - COPY, # 30GY 88/014, "White On White" (GLIDDEN)-BACKGROUND

**END OF SECTION 10425**

# SECTION 10522 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

## PART 1 - GENERAL



### 1.01 SUMMARY
A. Fire extinguishers and cabinet located in Storage rooms.

### 1.02 SUBMITTALS
A. Product Data.
B. Operating and Maintenance Data.

### 1.03 QUALITY ASSURANCE
A. Labels: Provide only fire extinguishers which are listed and labeled by Underwriters Laboratories Inc., or Factory Mutual System.

## PART 2 - PRODUCTS

### 2.01 FIRE EXTINGUISHERS
A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of contract documents, will be among those considered acceptable:
   1. Fire extinguishers:
      a. Amerex Corporation.
      b. Buckeye Fire Equipment Co.
      c. Fire-End & Croker Corporation.
      d. General Fire Extinguisher Corporation.
      e. Walter Kidde, The Fire Extinguisher Co.
B. Fire Extinguishers:
   1. Rating: 4A:60B:C.
   2. Type: Multipurpose dry chemical (ammonium phosphate).
      a. Stored pressure type.
   3. Cabinet mounted.

### 2.02 CABINETS AND CABINET ACCESSORIES
A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of contract documents, will be among those considered acceptable:
   1. Cabinets and accessories:
      a. J.L. Industries.
      b. Larsen's Manufacturing Company.
      c. Potter-Roemer Division/Smith Industries, Inc.
      d. Samson Metal Products, Inc.
B. Cabinets:
   1. To house one extinguisher.
   2. Size: Inside minimum box dimensions: 24"h. x 9"w. x 6"d.; 4" deep into wall.]
   3. Style: Semi-recessed mounted, protruding not more than 1-1/2 inches from face of wall.
      a. Rolled edge trim.
   4. Single flat door.
      a. Frameless acrylic.
         1. Clear.
      b. Door material: Aluminum, satin anodized.
      c. Surface mounted door handle, finished to match door.
      d. Friction or roller catch.
   5. Trim (box flange or frame): Aluminum, satin anodized.

6. Manufacturer's standard vertical lettering identifying contents of cabinet.
   a. Letters silk screen painted.
   b. Letter color: Red.
7. Box: Aluminum sheet.

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C. Hinges: Provide hinges for each door; concealed or continuous type; allow full 180 degree opening of door.

## PART 3 - EXECUTION

### *3.01 PREPARATION*

A. Prepare openings for recessed cabinets.

### *3.02 INSTALLATION*

A. Perform installation in accordance with the manufacturer's instructions except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
B. Install cabinets at locations indicated.
C. Install with door handle not more than 48" above finish floor.

## END OF SECTION 10522

# SECTION 10810 - TOILET ACCESSORIES

## PART 1 - GENERAL

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### 1.01 SUMMARY

A. Section Includes:
1. Waste receptacles.
2. Recessed Multipurpose Units.
3. Mirrors.
4. Grab bars.
5. Toilet Paper Dispenser.
6. Sanitary Napkin Disposal Units.
7. Combination utility shelf / mop and broom holders.
8. Hand Dryers.

### 1.02 SUBMITTALS

A. Product Data.
B. Shop Drawings.
C. Manufacturer's Instructions.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

A. For each distinct type of toilet accessory, provide accessories fabricated by a single manufacturer.
B. All model numbers specified are products of **Bradley Corporation***.
C. Only equivalent products of the following other manufacturers, provided they comply with requirements of the contract documents, will be considered acceptable:
1. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.

### 2.02 TOILET ACCESSORIES

A. Waste Receptacle: Semi-Recessed, stainless steel, seamless beveled flange, open top, removable 12-gallon capacity, and hooks hold optional vinyl liner (locks into cabinet).
1. Product: 344 manufactured by Bradley.
B. Recessed Multipurpose Unit: Mirror/Towel Dispenser(600 C-fold)/Soap Dispenser(100 fl.oz.), recessed flush with wall, stainless steel; seamless wall flanges, continuous piano hinges.
1. Product: Model 130 manufactured by Bradley.
C. Mirrors: Stainless steel framed, 6 mm thick float glass mirror.
1. Size: 24" x 60".
2. Frame: 0.05 inch channel shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
3. Product: Model 780-2460 manufactured by Bradley.
D. Grab Bar 1:
1. Basis of design: 001 - 42".
a. Stainless steel, nonslip gripping surface and concealed mounting, Bradex Model 832, by Bradley.
E. Grab Bar 2:
1. Basis of design: 001 - 36".
a. Stainless steel, nonslip gripping surface and concealed mounting, Bradex Model 832, by Bradley.
F. Toilet Paper Dispenser:
1. Basis of design: Model 5402.
a. "Bradex" surface-mounted multi-roll toilet tissue dispenser, holds 2-rolls up to 5" diameter, extra roll drops in place.
G. Partition Mounted Sanitary Napkin Disposal:
1. Basis of design: 4721-15.
a. Stainless steel.
b. Serves 2-compartments.

H. Semi-Recessed Sanitary Napkin Disposal:
   1. Basis of design: 4722-10-15.
      a. Stainless steel.
      b. Single end compartments.
I. Combination Utility Shelf/Mop and Broom Holder:
   1. Basis of design: x 24".
   a. Stainless steel.
   b. With 3-spring loaded rubber cam mop/broom holders, Bradex Model 9953, by Bradley.
J. Hand Dryers:
   1. Basis of design: Excel Xlerator Hand Dryer Model XL-GR, www.exceldryer.com/products/xlerator.asp.
      a. Automatic hand dryer, Graphite finish, 110/120v, 12.5amp, 1500w, 60 Hz.
      b. Mount 41" above finish floor.

### 2.03 MATERIALS
A. Stainless steel: Type-304 stainless steel with satin finish, typical for all accessories.
B. Mounting Devices and Fasteners: Provide toilet accessory manufacturer's recommended items for substrates and conditions indicated.

### 2.04 FABRICATION
A. Manufacturer's Trademarks and Model Numbers: Permanently affix manufacturer's name and model number to unexposed surface of accessory.

## PART 3 - EXECUTION

### 3.01 INSTALLATION
A. Perform installation in accordance with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
B. Accessories Installed for Use by Handicapped Persons: Install as indicated on drawings and in accordance with the NC State Building Code, Volume I-C, Accessibility Code, 1999 Edition.

## END OF SECTION 10810

# DIVISION 12 - FURNISHINGS 169

# SECTION 12484 - FLOOR GRID AND MAT SYSTEMS

## PART 1 GENERAL

### 1.01 SECTION INCLUDES
A. Aluminum shallow pit floor grid system.
B. Recessed roll-up floor mat system.

### 1.02 RELATED SECTIONS
A. Section 03300 - Cast-In-Place Concrete.

### 1.03 REFERENCES
A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.
B. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2000.

### 1.04 PERFORMANCE REQUIREMENTS
A. Maximum Allowable Floor Grid Load: 300 psf uniform load.

### 1.05 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's specifications and technical data, including Material Safety Data Sheets, installation instructions, and catalog cuts and templates where required to explain construction and to provide for incorporation into the project.
   1. Maintenance Data: Manufacturer's instructions for cleaning and care of floor mats..
C. Shop Drawings: Show layout and types of products to be provided; include full-scale sections of typical installations, anchors, and accessories.
   1. Coordinate with concrete work shop drawings showing oversized recess for deferred installation of frame.
D. Verification Samples: Actual product sample in materials and colors specified, not less than 12 in square.

### 1.06 QUALITY ASSURANCE
A. Manufacturer Qualifications: Minimum of ten years of experience in the fabrication of assemblies of the types required for this project.

### 1.07 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to project site in new, clean, unopened crates of sufficient size and strength to protect materials during transit and storage.
B. Store components in original containers in a clean, dry location.

### 1.08 WARRANTY
A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
B. Submit manufacturer's standard warranty that materials furnished will perform as specified for a period of not less than two years when installed in accordance with manufacturer's recommendations.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS
A. Acceptable Manufacturer: Equal to **Construction Specialties, Inc., C/S, www.c-sgroup.com**.
   1. Arden Architectural Specialties, Inc., www.ardenarch.com.
   2. Balco, Inc. www.balcousa.com.

Revised 8-11-09

3. R.C. Musson Rubber Co.
4. Pawling Corp., www.pawling.com.
5. Reese Enterprises, Inc., www.reeseusa.com
6. KADEE Industries, www.KadeeIndustries.com

## 2.02 MATERIALS

A. Aluminum Frame: clear anodized aluminum frames recommended by manufacturer; ASTM B 221 (ASTM B 221M), alloy 6063-T5 or 6061-T6.
   1. Recessed Mat Frames: Extruded aluminum frame members, not less than 3/4 inch deep, with mitered corners and finish to match mat. Provide size and style to fit floor mat with anchorage devices required.
B. Carpet:
   1. A combination of BASF yarn and nylon, or level-cut DuPont Antron III nylon filament tread inserts ¼ inch thickness, 28-32 oz/sq yd, solution dyed with polypropylene and backing fusion bonded to guard against fraying, delamination or moisture penetration.
C. Vinyl: Flexible PVC. Extruded aluminum tread-slats with continuous vinyl cushions on bottom surface of slats.
   1. Tread Inserts: As selected from manufacturer's standards.
   2. Edge frames and fillers: Black.
   3. Continuous hinge: Black.
   4. Continuous cushions.

## 2.03 PRODUCTS

A. Floor Grid System: Recessed pit with a series of tread rails spaced 1-1/2 in o.c. and running perpendicular to traffic flow.
B. Roll-Up Aluminum Linked-Tread Floor Mats: Aluminum tread rails 2 inches o.c. by 3/8-inch-thick slat modules with fusion-bonded carpet insert, running perpendicular to traffic flow, connected by flexible joints to permit rolling up for access to debris and water.
   1. **C/S, PediTred #G3-C-CP-PTF-NL**: Continuous vinyl hinge construction.
      a. Tread rails: Aluminum or vinyl.
      b. Frame: Aluminum.
      c. Tread inserts: Carpet, **C/S color #7319, Hearty Moss**.

## 2.04 FABRICATION

A. Fabricate assemblies to sizes indicated, minimizing need for splicing on site. Where joints are necessary, space symmetrically and away from normal traffic patterns.
B. Provide frames with hairline joints, complete with corner pins and installation anchors.

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Verify that field measurements are as shown on shop drawings prior to releasing materials for fabrication by the manufacturer.
B. Examine conditions under which work is to be performed and notify Contractor in writing of unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

## 3.02 INSTALLATION

A. Install products in accordance with governing regulations, industry standards applicable to the work and the manufacturer's written installation instructions.
B. Recessed Frames and Mats: Set mat tops at height recommended by manufacturer for most effective cleaning action. Coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.
   a. Tile Flooring: Set recessed mat frames to allow for Tile Work. Coordinate with other trades as required.
   b. Concrete Flooring: Install necessary shims, spacers, and anchors for proper location and secure to prevent displacement when placing concrete. Install Latex / concrete screed leveling material.
C. Space anchors at maximum 24 in o.c.

D. Align work plumb, level, and flush with adjacent surfaces.

## 3.03 ADJUSTING AND CLEANING

A. Inspect system components for proper fit. Adjust, repair or replace components not conforming to requirements. Repair or replacement of an individual unit shall be as approved by the Architect.

## 3.04 PROTECTION

A. Protect installation from damage by work of other Sections. After installation of frame, install temporary filler of plywood in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of Substantial Completion.
B. Install grids and mats near time of Substantial Completion.

## 3.05 SCHEDULE

A. Vestibules, 2-required.

# END OF SECTION 12484

# DIVISION 13 - COMPENSATION FOR GENERAL CONSTRUCTION

## SECTION 13100 - COMPENSATION FOR GENERAL CONSTRUCTION

### 1.01 COMPENSATION

A. The work of furnishing materials and constructing the Northbound and Southbound lanes of the I-85 Rest Area Buildings in accordance with the plans and specifications; completed and accepted, will be paid for at the contract unit prices for "General Construction of I-85 Rest Area Building & Vending Building ". Such price and payment will be full compensation for all work of constructing I-85 Rest Area & Vending buildings; including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"General Construction Rest Area Serv Bldg NBL / SBL".....Lump Sum

"General Construction Vend Building NBL / SBL".....Lump Sum

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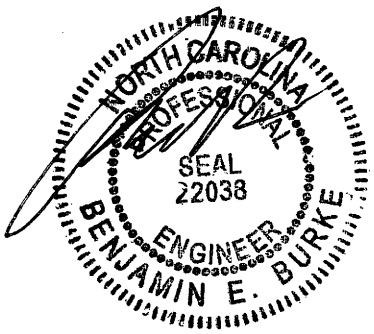
## DIVISION 15A - PLUMBING

| | |
|---|---|
| 15010 | Basic Plumbing Requirements |
| 15140 | Hangers and Supports |
| 15190 | Plumbing Identification |
| 15250 | Plumbing Piping Insulation |
| 15410 | Plumbing Piping |
| 15430 | Plumbing Specialties |
| 15450 | Water Heaters |




2/27/09

## SECTION 15010 - BASIC PLUMBING REQUIREMENTS

### PART I - GENERAL



1.1 GENERAL CONDITIONS

A. The stipulations and conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", hereinbefore set forth, shall apply to this and the other Sections of Division 15A.

1.2 GENERAL REQUIREMENTS

A. The General Requirements hereinafter listed apply to the Plumbing Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

1.3 ALTERNATES

A. Carefully examine all alternates at the back of this specification to determine if any work described under the Plumbing Section will be affected thereby.

1.4 INTENT

A. The intent of these drawings and specifications are to describe the installation of a complete, fully adjusted and operational system. Therefore, any items shown on drawings and not specifically called for in the specifications, or any items specified and not specifically indicated or detailed on the drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Plumbing Contractor at his own expense.

1.5 DEFINITIONS

A. The Plumbing Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the plumbing systems. All items of equipment are specified in the singular; however, the Plumbing Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

1.6 VISIT TO THE SITE

The Plumbing Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

1.7 REGULATORY REQUIREMENTS

A. All work under this Section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern. The Plumbing Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

1.8 PERMITS AND FEES 175

A. NA

1.9 DRAWINGS AND SPECIFICATIONS

A. The Plumbing Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between General Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Plumbing Contractor shall figure on the most expensive of the items in conflict.

B. The Plumbing Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. The Plumbing Contractor shall not under any circumstances scale drawings for the location of equipment. The Plumbing Contractor shall verify the locations of all utility services.

C. The Plumbing Contractor shall keep at least one set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

1.10 SUPERVISION

A. The Plumbing Contractor performing the work specified shall be required to employ a qualified Superintendent or Foreman to continuously supervise the installation of their work, with authorization to act as agent. Contractors: He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels, and locating chases, openings, hangers, inserts, sleeves, etc.

**PART II - PRODUCTS**

2.1 STANDARD PRODUCTS

A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

2.2 SUBMITTAL

A. The Plumbing Contractor shall submit, for approval, detailed shop drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Plumbing Contractor has in his possession the approved shop drawing for the particular material or equipment. The Plumbing Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.

B. Submitted material shall be properly labeled indicating specific service for which material or equipment to be used, section and article number of specifications governing, Contractor's name and name of job.

C. Approval of equipment will not relieve the Plumbing Contractor of compliance with the Specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of Submittal Data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other Contractors and suppliers shall be solely the responsibility of the Plumbing Contractor and with no additional expense to the Owner.

2.3 SUBSTITUTIONS

A. Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown, shall be new and of the highest grade and quality and free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Plumbing Contractor shall purchase and install all materials required.

B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

2.4 PRODUCT HANDLING

A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.

B. The Plumbing Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

2.5 MATERIALS AND WORKMANSHIP

A. The Plumbing Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Plumbing Contractor at the Plumbing Contractor's expense.

B. The material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.

C. Any equipment furnished by the Plumbing Contractor that is larger than those indicated on the drawings and described in these Specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

**PART III - EXECUTION**

3.1 EXCAVATION AND BACKFILL

A. The Plumbing Contractor shall preform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding 4 inches in depth, wetting each layer as it is placed, and thoroughly compacting each layer with mechanical tamper or other approved means. Any damage done during excavation and backfilling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its condition prior to construction at no expense to the Owner.

3.2 SCAFFOLDING, RIGGING AND HOISTING

A. The Plumbing Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

3.3 CUTTING AND PATCHING

A. The Plumbing Contractor shall provide all cutting and patching necessary to install the work specified in this section. The patching shall match adjacent surfaces.

B. No structural member shall be cut without the approval of the Engineer, and all such cutting shall be done in a manner directed by him.

3.4 EQUIPMENT SPACE AND ARRANGEMENT

A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Plumbing Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.

B. These drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Plumbing Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after award of the contract. No departure shall be made without written approval of the Architect/Engineer.

3.5 DAMAGE TO WORK ALREADY IN PLACE

A. The Plumbing Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by mechanics skilled at their respective trades to the approval of the Architect/Engineer.

3.6 JURISDICTION OF WORK

A. It may become necessary for the Plumbing Contractor to furnish labor or materials which is not generally accepted as part of this trade. In cases of this type, he shall contract the work or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

3.7 COORDINATION WITH OTHER TRADES 178

A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Plumbing Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Plumbing Contractor shall make required changes or relocations at no additional cost to the Owner.

B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination.

C. The Plumbing Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed shall be borne by the Subcontractor or Contractors directed to do this work.

3.8 DIVISION OF WORK

A. This paragraph is intended to show exactly the point of division of work between the Electrical Division and the Plumbing Division.

B. All equipment covered in the Plumbing Division of the specifications shall be furnished, mounted, and aligned under the Plumbing Division. All individual motor starters, unless indicated as part of a motor control center, for this equipment shall be furnished and installed by the Plumbing Contractor.

C. All final electrical connections to equipment covered in the Plumbing Division of the specifications shall be completed under the Plumbing Division.

D. The Electrical Contractor shall provide a disconnect switch or junction box for each item of equipment under Division 16.

E. Electrical equipment and wiring that is provided by the Plumbing Contractor shall be in accordance with the Electrical specification.

3.9 EQUIPMENT INSTALLATION

A. Final connections to equipment, including pipe, duct, and controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.

B. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these drawings and specifications.

3.10 OPERATION AND MAINTENANCE MANUALS

A. One complete manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.

B. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words

"OPERATION AND MAINTENANCE MANUAL", the name and location of the building, the name of the Section, such as "Plumbing" and the name of the Plumbing Contractor. Two copies of each approved manual shall be submitted to the Owner and one copy shall be submitted to the Architect/Engineer.

C. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the Contract Documents.

D. Manuals shall include the following:

1. Complete operating installations, covering start-up and shutdown for all components installed.

2. Legible copies of all shop drawings. Any comments incorporated in "as noted" approvals of shop drawings shall be recorded on the drawings included in the manuals.

3. All equipment Maintenance and Service Manuals.

E. A complete parts list for each piece of equipment.

F. All descriptive literature for the equipment.

G. Operating characteristics, performance data, ratings, and curves for each piece of equipment.

H. Internal wiring and control diagrams.

I. All other information pertinent to the maintenance and servicing of equipment and systems provided in the project.

J. Name, address, and telephone number for service on each manufacturer's equipment.

3.11 OPERATING INSTRUCTIONS

A. After all equipment and services are in operation, and the Operation and Maintenance Manuals are available, an instruction and training session shall be conducted for the Owner's operating personnel.

B. Instruction sessions shall be conducted during the Owner's normal working periods, and at times and locations satisfactory to the Owner.

3.12 EQUIPMENT START-UP

A. No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and Certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments required to meet design conditions. Such services shall be at no additional cost to the Owner.

3.13 GUARANTEE

A. The Plumbing Contractor shall present to the Owner a written guarantee covering his work, including all equipment, material and workmanship. This guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.

B. Any defective work, equipment, material and/or workmanship that develops within the guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Plumbing Contractor without cost to the Owner.

3.14 FINAL INSPECTION

A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Plumbing Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.

3.15 FINAL PAYMENTS

A. All final payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

END OF SECTION 15010

## SECTION 15140 - HANGERS AND SUPPORTS

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Hangers and Supports for Plumbing Systems Piping and Equipment.

### PART II - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Hangers: Galvanized carbon steel, adjustable, clevis

B. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

C. Vertical Support: Steel riser clamp

D. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

E. Shield for Insulated Piping 2 Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

F Sheet metal saddles must be ½ the circumference of the insulation, turned up or rounded at the corners to avoid damage to the vapor barrier.

2.2 HANGER RODS

A. Galvanized Steel Hanger Rods: Threaded both ends or continuous threaded.

2.3 FLASHING

A. Metal Flashing: 26 gauge galvanized steel

B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

C. Flashing shall be compatible with the roofing material and be coordinated with the General Contractor.

2.4 SLEEVES

A. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe

B. Fire Stopping Insulation: Glass fiber type, non-combustible

C. Caulk: Fire Barrier type sealant

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts

C. Washers: ASTM F 844, steel, plain, flat washers

D. Grout: ASTM C 1107, Grade B, non-shrink, non-metallic

1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic cement-type grout that is non-staining, non-corrosive, non-gaseous and is recommended for both interior and exterior applications.

2. Design Mix: 5000-psi (34.5MPa), 28-day compressive strength

3. Water: Potable

4. Packaging: Pre-mixed and factory-packaged

2.6 ATTACHMENTS

A. Mechanical Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over four (4) inches thick.

B. Weld: Type 22

C. Beam clamps: Types 20, 21, 28 or 29

D. Wood: Wood screws or lag bolts

**PART III - EXECUTION**

3.1 HANGERS AND SUPPORTS INSTALLATION

A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints ,and at changes in direction of piping.

C. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers and other accessories.

D. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends and similar units.

E. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

F. Support horizontal piping as follows:

| PIPE SIZE | HANGER SPACING | MAXIMUM DIAMETER |
|---|---|---|
| 1/2 to 1-1/4 inch | 6'-6" | 3/8" |
| 1-1/2 to 2 inch | 10'-0" | 3/8" |
| 2-1/2 to 3 inch | 10'-0" | 1/2" |
| 4 to 6 inch | 10'-0" | 5/8" |

| | | | |
|---|---|---|---|
| Waste Pipe | 5'-0" | 183 | 3/8" |

G. Install hangers to provide minimum ½ inch space between finished covering and adjacent work

H. Place a hanger within 12 inches of each horizontal elbow.

I. Use hangers with 1½ inch minimum vertical adjustment

J. Support riser piping independently of connected horizontal piping.

K. Hangers shall be galvanized steel or copper.

3.5 FLASHING

A. Provide flashing and counter-flashing where piping penetrates weather-proofed walls, floors and roofs.

B. Flash vent and soil pipes projecting six (6) inches minimum above finished roof surface with lead worked one (1) inch minimum into hub. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash and seal.

3.6 SLEEVES

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe

C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and caulk seal air-tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

E. Pipe strapping will not be allowed.

END OF SECTION 15140

## SECTION 15190 - PLUMBING IDENTIFICATION

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plumbing identification materials and devices.

1.3 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.4 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices after completion of covering and painting where devices are applied to surfaces. Install identifying devices prior to installation of acoustical ceilings and similar concealment.

### PART II - PRODUCTS

2.1 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

1. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½ inch diameter.

3. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

4. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

### PART III - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners.

B. Plastic Tags: Install with corrosive-resistant chain.

C. Plastic Tape Pipe Markers: Install complete around pipe in accordance with the manufacturer's instructions

D. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above the buried pipe.

E. Equipment: Identify pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may by identified with plastic tags

F. Controls: Identify control panels and major control components outside panels with plastic nameplates.

G. Piping: Identify piping, concealed or exposed, with plastic tape pipe markers. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 15190

## SECTION 15250 - PLUMBING PIPING INSULATION

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Plumbing Pipe Insulation.

1.3 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

1.4 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping systems.

B. Schedule insulation application after installation and testing of heat trace tape.

### PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Glass Fiber:
   a. Certain Teed Corporation
   b. Knauf Fiberglass GmbH
   c. Manville
   d. Owens-Corning Fiberglas Corporation
   e. USG Interiors, Inc. - Thermafiber Division

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin. Jacket: All purpose, factory applied, laminated glass fiber- reinforced, flame retardant Kraft paper and aluminum foil having self-sealing lap.

B. Preformed Pipe Insulation: ASTM C 547, Class 1, rigid pipe insulation, jacketed.

1. Thermal Conductivity: 0.26 average maximum at 75 degrees F mean temperature.

2. Density: 10 average maximum.

C. Adhesive: Produced under the UL Classification and Follow-up Service.

1. Type: Non-flammable, solvent-based.

2. Service Temperature Range: Minus 20 degrees to 180 degrees F.

2.3 INSULATING CEMENTS

A. Mineral Fiber, Hydraulic-Setting Insulating and Finishing Cement: ASTM C 449

1. Thermal Conductivity: 1.2 average maximum at 400 degrees F mean temperature.

2. Compressive Strength: 100 psi at 5 percent deformation.

2.4 ADHESIVES

A. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades.

1. Class 1, Grade A for bonding glass cloth and tape to un-faced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to un-faced glass fiber insulation.

2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.5 JACKETS

A. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil thick, high impact, ultra-violet resistant PVC.

1. Adhesive: As recommended by insulation manufacturer.

2.6 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition

1. Water Vapor Permeance: 0.08 perm maximum
2. Temperature Range: Minus 20 degrees to 180 degrees F

**PART III - EXECUTION**

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

3.2 INSTALLATION - GENERAL

A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

C. Keep insulation materials dry during application and finishing.

D. Apply insulation continuously over fittings, valves and specialties.

E. Apply insulation with a minimum number of joints.

F. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Cover circumferential joints with butt strips, at least three (3) inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

3. Longitudinal Seams: Overlap seams at least 1½ inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at four (4) inches on center.

4. Vapor Barrier Coatings: Apply on seams and joints, over staples, and at ends butt to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gauges, fill and seal voids with vapor barrier coating.

6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple, and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

G. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire rated walls and partitions.

H. Flanges, Fittings, and Valves: Apply pre-molded, pre-cut, or field fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

1. Use same material and thickness as adjacent pipe insulation.

2. Overlap nesting insulation by 2 inches or 1 pipe diameter, whichever is greater.

3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

4. Insulate elbows and tees smaller than three (3) inches pipe size with pre-molded insulation.

5. Insulate elbows and tees Three (3) inches and larger with pre-molded insulation or insulation material segments. Use at least three (3) segments for each elbow.

6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified.

1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.3 GLASS FIBER INSULATION INSTALLATION

A. Bond insulation to pipe with lagging adhesive.

B. Seal exposed ends with lagging adhesive.

C. Seal seams and joints with vapor barrier compound.

3.7 PIPE INSULATION SCHEDULES

| PIPING | INSULATION TYPE | THICKNESS IN INCHES |
|---|---|---|
| Domestic Hot Water Supply | GLASS FIBER | 1 |
| Domestic Hot Water Re-Circulating | GLASS FIBER | 1 |
| Domestic Cold Water(INTERIOR) | GLASS FIBER | 1/2 |
| "P" Trap at Handicapped Fixtures | ELASTOMERIC | 1/2 |

END OF SECTION 15250

## SECTION 15410 - PLUMBING PIPING

### PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes plumbing piping systems to a point shown on the civil drawings. Systems include the following:

1. Potable water distribution, including cold and hot water supply and hot water circulation.

2. Sanitary Drainage and Vent Systems.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:

1. Water Distribution Systems, Below Ground: 150 psig.
2. Water Distribution Systems, Above Ground: 125 psig.
3. Soil, Waste and Vent Systems: 10-foot head of water

### PART II - PRODUCTS

2.1 SANITARY SEWER PIPING - BURIED

A. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

2.2 SANITARY SEWER PIPING - ABOVE GRADE

A. Sch. 40 PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2564, solvent weld.

2.3 WATER PIPING - BURIED

A. Copper Tubing: ASTM B88, Type K, annealed. Fittings; ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.4 WATER PIPING - ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.

2.5 MANUFACTURERS

A. Acceptable Manufacturers-Valves:

1. Crane
2. Grinnell
3. Nibco
4. Apollo

2.6 GATE VALVES

A. 150 psig rated, bronze body, lever ball type, Apollo or equal.

**PART III - EXECUTION**

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipes, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Slope water piping and arrange to drain at low points.

H. Establish elevations of buried piping outside the building to ensure not less than 1 ft of cover.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting.

K. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

L. Excavate in accordance with Sections 15010.

M. Backfill in accordance with Sections 15010.

N. Install bell and spigot pipe with bell end upstream.

**O. Copper piping 2" and larger shall be silver-soldered.**

P. Install valves with stems upright or horizontal, not inverted.

3.3 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install globe or ball valves for throttling, bypass, or manual flow control services.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.

B. Inject disinfectant solution containing 100 ppm of available chlorine and allow to stand for 2 hours before flushing.

C. Flush disinfectant from system until residual is equal to that of incoming water or 1.0 mg/L.

E. Take samples from outlets and analyze in accordance with AWWA C601. Contractor shall engage an independent laboratory to conduct bacteriological and post chlorination tests certifying that the water meets the quality of drinking water. After acceptance by the Engineer of Record, "The Water Test Report for Use" is required to be submitted to SCO prior to requesting the Occupancy Permit.

3.5 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

END OF SECTION 15410

## SECTION 15430 - PLUMBING SPECIALTIES

### PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes Plumbing Specialties for water distribution systems; and soil, waste and vent systems.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Submit product data including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections.

### PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Backflow Preventers:

a. Ames Co., Inc.
b. Hersey Products, Inc., Grinnell Corp.
c. Watts Regulator Co.
d. Wilkins Regulator Div., Zurn Industries, Inc.

2. Water Pressure Regulators:

a. Spence Engineering Co., Inc.
b. Watts Regulator Co.
c. Wilkins Regulator Div., Zurn Industries, Inc.

3. Specialties:

a. Josam Co.
b. Smith by Jay R. Smith Mfg. Co. Div., Smith Industries, Inc.
c. Watts Regulator Co.
d. Woodford Manufacturing Co. Div., WCM Industries, Inc.
e. Zurn by Hydromechanics Div., Zurn Industries, Inc.

2.2 CLEANOUTS

A. Exterior Surfaced Areas: Round cast nickel-bronze access frame and non-skid cover.

B. Exterior Un-Surfaced Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover.

C. Interior Finished Floor Areas: Lacquered cast iron, two piece body, round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.

D. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.3 WATER HAMMER ARRESTORS

A. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.

2.4 TRAP SEAL PRIMER VALVE:

A. ASSE 1018; water supply fed type, fully automatic 125psig minimum working pressure, Bronze body with atmospheric vented drain chamber, ½ inch threaded or solder joint inlet and outlet connections, Chrome plated, or rough bronze finish. Unit shall be capable of being located on any active water line.

2.5 BACKFLOW PREVENTERS

A. Reduced Pressure Back-flow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

**PART III - EXECUTION**

3.1 PREPARATION

A. Coordinate construction areas to receive drains to the required invert elevations.

3.2 INSTALLATION AND APPLICATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Extend clean-outs to finished floor. Lubricate threaded clean-out plugs Teflon pipe dope. Ensure clearance at clean-out for rodding of drainage system.

C. Encase exterior clean-outs in concrete flush with grade.

D. Install water hammer arrestors complete with accessible isolation valve.

END OF SECTION 15430

## SECTION 15450 - WATER HEATERS

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Electric Water Heaters and In-Line Circulators.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories, and indicating dimensions, required clearances, and methods of assembly of components, and piping and wiring connections.

### PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Water Heaters:
   (a) Bradford-White Corp.
   (b) A.O. Smith Water Products Co. Div.
   (c) State Industries, Inc.
   (d) Ruud

2.5 COMMERCIAL ELECTRIC WATER HEATERS

A. Factory assembled and wired, electric, [vertical] [horizontal] storage type, 150 psig maximum working pressure.

B. Glass lined welded steel tank; four (4) inch diameter inspection port, thermally insulated with minimum two (2) inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.

C. Brass water connections and dip tube, drain valve, high-density magnesium anode, and ASME rated temperature and pressure relief valve.

D. Flange-mounted immersion heating electrical elements; individual elements sheathed with Incoloy corrosion- resistant metal alloy, rated less than 75 Watts per square inch.

2.6 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig working pressure

B. Impeller: Bronze

C. Shaft: Alloy steel with integral thrust collar and two (2) oil lubricated bronze sleeve

bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling

2.7 THERMAL EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, maximum operating temperature 210 degrees F., with flexible EPDM diaphragm sealed into tank.

B. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 55 psig.

C. Size: 10.5" diameter, 16" overall length, 5 gallon capacity.

**PART III - EXECUTION**

3.1 WATER HEATER INSTALLATION

A. Install water heaters in accordance with manufacturer's instructions and to UL requirements.

B. Coordinate with plumbing piping and related [fuel piping] [gas venting] [electrical] work to achieve operating system.

3.2 PUMP INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide air cock and drain connection on horizontal pump casings.

C. Decrease from line size, with long radius reducing elbows or reducers. Support piping adjacent to pump such as that no weight is carried on pump casings.

Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 15450

## SECTION 15460 - COMPENSATION FOR PLUMBING

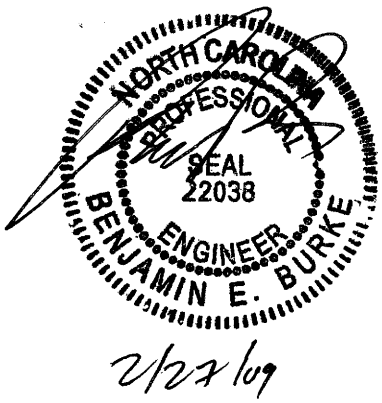
The work of furnishing materials and constructing the North & South Bound Rest Area Service Building and Vending Building in accordance with the plans and specifications, completed and accepted, will be paid for at the contract lump price for " Plumbing installation for the N & SBL Rest Area Building & Vending Building". Such price and payment will be full compensation for all work of constructing the North & South Bound Lane Rest Area Service Building and Vending Building, including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"Plumbing Installation Rest Area Serv Bldg NBL / SBL". . . . . Lump Sum

"Plumbing Installation Vend Building NBL / SBL". . . . . Lump Sum

## DIVISION 15B: MECHANICAL

| | |
|---|---|
| 15500 | Basic Mechanical Requirements |
| 15501 | Hangers and Supports |
| 15504 | Piping Insulation-Refrigerant and Condensate |
| 15507 | Ductwork Insulation |
| 15513 | Refrigerant Piping |
| 15672 | Split System Heat Pump |
| 15674 | Duct Free Split System Air Conditioner |
| 15782 | HVAC Unit with Energy Recovery |
| 15870A | Power Ventilators |
| 15891A | Metal Ductwork |
| 15910 | Duct Accessories |
| 15932 | Air Outlets and Inlets |
| 15990 | Testing, Adjusting and Balancing |

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## SECTION 15500 BASIC MECHANICAL REQUIREMENTS

### PART I - GENERAL

200

1.1 GENERAL CONDITIONS

A. The Stipulations and Conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions", and "Special Conditions", herein before set forth, shall apply to this and the other Sections of Division 15.

1.2 GENERAL REQUIREMENTS

A. The General Requirements hereinafter listed apply to the Mechanical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

1.3 ALTERNATES

A. Carefully examine all Alternates at the back of this Specification to determine if any work described under the Mechanical Section will be affected thereby.

1.4 INTENT

A. The intent of these Drawings and Specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on Drawings and not specifically called for in the Specifications, or any items specified and not specifically indicated or detailed on the Drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Mechanical Contractor at his own expense.

1.5 DEFINITIONS

A. The Mechanical Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the mechanical systems. All items of equipment are specified in the singular; however, the Mechanical Contractor shall provide the number of items of equipment as indicated on the Drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

1.6 VISIT TO THE SITE

A. The Mechanical Contractor shall visit the site before submitting his bid, so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything that could have been anticipated from a visit to the site.

1.7 REGULATORY REQUIREMENTS

A. All work under this Section shall be accomplished in strict accordance with State codes. Where these Plans and Specifications conflict with such codes, the codes shall govern. The Mechanical Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

1.8 PERMITS AND FEES

A. The Mechanical Contractor shall make all necessary arrangements, obtain all necessary approval, obtain all permits and pay fees required for the installation of any of the work covered under the Mechanical Work Division of the Specifications. Any fees required by any utility companies or municipal authorities for the final connections for these services shall be paid by the Mechanical Contractor under whose work such services appear. Before the job is certified as substantially complete, a Certificate of Approval from all authorities involved must be obtained and turned over to the Architect/Engineer.

1.9 DRAWINGS AND SPECIFICATIONS

A. The Mechanical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between general Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Mechanical Contractor shall figure on the most expensive of the items in conflict.

B. The Mechanical Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No Contractor shall under any circumstances scale Drawings for the location of equipment. The Mechanical Contractor shall verify the locations of all utility services.

C. The Mechanical Contractor shall keep at least one (1) set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit drawings to Architect/Engineer before final payment is made.

1.10 SUPERVISION

A. The Mechanical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent Contractors. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels and locating chases, openings, hangers, inserts, sleeves, etc.

**PART II - PRODUCTS**

2.1 STANDARD PRODUCTS

A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

2.2 SUBMITTAL

A. The Mechanical Contractor shall submit, for approval, detailed Shop Drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Mechanical Contractor has in his possession the approved shop drawing for the particular material or equipment. The Mechanical Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but in

no case less than six (6) copies.

B. Submitted material shall be properly labeled indicating specific Service for which material or equipment to be used, Section and Article Number of Specifications governing, Contractor's name and name of job.

C. Approval of equipment will not relieve the Mechanical Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Mechanical Contractor and with no additional expense to the Owner.

2.3 SUBSTITUTIONS

A. Manufacturer's lists are to establish a Standard of Quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality. Free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Mechanical Contractor shall purchase and install all materials required.

B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

2.4 PRODUCT HANDLING

A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt, and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner

B. The Mechanical Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

2.5 MATERIALS AND WORKMANSHIP

A. The Mechanical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Mechanical Contractor at the Mechanical Contractor's expense.

B. The material used throughout the work, except when otherwise noted, shall be new and of the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.

C. Any equipment furnished by the Mechanical Contractor that is larger than those indicated on the Drawings and described in these Specifications or have different electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

**PART III - EXECUTION** 204

3.1 EXCAVATION AND BACKFILL

A. The Mechanical Contractor shall preform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding four (4) inches in depth, wetting each layer as it is placed, and thoroughly compacting each layer with mechanical tamper or other approved means. Any damage done during excavation and back-filling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its condition prior to construction at no expense to the Owner.

3.2 SCAFFOLDING, RIGGING AND HOISTING

A. The Mechanical Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

3.3 CUTTING AND PATCHING

A. The Mechanical Contractor shall provide all cutting and patching necessary to install the work specified in this Section. The patching shall match adjacent surfaces.

B. No Structural member shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.

3.4 EQUIPMENT SPACE AND ARRANGEMENT

A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing and maintenance. The Mechanical Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements.

B. These drawings indicate the extent and general arrangement of equipment, piping, and ductwork. If any departures are deemed necessary by the Mechanical Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after Award of Contract. No departure shall be made without written Approval of the Architect/Engineer.

3.5 DAMAGE TO WORK ALREADY IN PLACE

A. The Mechanical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

3.6 JURISDICTION OF WORK

A. It may become necessary for the Mechanical Contractor to furnish labor or material which is not generally accepted as part of this trade. In cases of this type, he shall contract the work, or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of trade agreements as to jurisdiction, alleged or actual.

3.7 COORDINATION WITH OTHER TRADES

A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations, and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Mechanical Contractor shall make required changes or relocations at no additional cost to the Owner.

B. Installation, inspection, and testing of work above ceilings shall be completed and approved by the Architect/Engineer prior to installation of the specified finished ceilings. However, ceiling suspension system may be installed as required for coordination.

C. The Mechanical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed will be borne by the subcontractor or contractors directed to do this work.

3.8 DIVISION OF WORK

A. This paragraph is intended to show exactly the point of division of work between the Electrical Division and the Mechanical Division.

B. All equipment covered in the Mechanical Division of the Specifications shall be furnished, mounted and aligned under the Mechanical Division. All individual motor starters, unless indicated as part of a motor control center, for this equipment shall be furnished and installed by the Mechanical Contractor.

C. All final electrical connections to equipment covered in the Mechanical Division of the Specifications shall be completed under the Mechanical Division.

D. The Electrical Contractor shall provide a disconnect switch or junction box for each item of equipment under Division 16.

E. Electrical equipment and wiring that is provided by the Mechanical Contractor shall be in accordance with the Electrical specification.

3.9 EQUIPMENT INSTALLATION

A. Final connections to equipment, including pipe, duct, and controls, shall be provided under applicable sections of this Division, unless otherwise specified or indicated.

B. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these Drawings and Specifications.

3.10 OPERATION AND MAINTENANCE MANUALS

A. One complete Manual as outlined herein shall be submitted for approval before conducting instruction sessions in operation, before systems or equipment tests are performed, and before final or beneficial occupancy.

B. Manuals shall have rigid covers and index tabs for each major piece of equipment, auxiliaries, and systems. The following shall be inscribed on the cover: the words "OPERATION AND MAINTENANCE MANUAL", the name and location of the building, the

name of the Section, such as "Heating" and the name of the Mechanical Contractor. Two (2) copies of each approved manual shall be submitted to the Owner and one (1) copy shall be submitted to the Architect/Engineer.

C. Each piece of equipment shall be listed and identified with the same name, mark, number, or other identification as noted or scheduled in the Contract Documents.

D. Manuals shall include the following:

1. Complete Operating Installations, covering start-up and shutdown for all components installed.

2. Legible copies of all Shop Drawings. Any comments incorporated in "as noted" approvals of Shop Drawings shall be recorded on the Drawings included in the Manuals.

3. All equipment Maintenance and Service Manuals.

4. A complete parts list for each piece of equipment.

5. All descriptive literature for the equipment.

6. Operating characteristics, performance data, ratings, and curves for each piece of equipment such as condensers, fans and air handling units.

7. Internal wiring and control diagrams.

8. Automatic temperature control diagrams, part descriptions and numbers, and sequences of operation. Drawings shall be neatly folded and inserted in a separate clear plastic binder. The plastic binders shall be bound in the back of each Manual.

9. Final Testing and Balancing Reports.

10. All other information pertinent to the maintenance and servicing of equipment and systems provided in the Project.

11. Name, address, and telephone number for service on each manufacturer's equipment.

3.11 OPERATING INSTRUCTIONS

A. After all equipment and services are in operation, and the Operation and Maintenance Manuals are available, an instruction and training session shall be conducted for the Owner's operating personnel.

B. Instruction sessions shall be conducted during the Owner's normal working periods, and at times and locations satisfactory to the Owner.

3.12 EQUIPMENT START-UP

A. No equipment shall be placed in operation until it has been inspected by a qualified representative of the manufacturer and certified to be ready for operation. The manufacturer's representative shall supervise the start-up operation and shall be responsible for all adjustments are required to meet design conditions. Such services shall be at no additional cost to the Owner.

3.13 GUARANTEE

A. The Mechanical Contractor shall present to the Owner a written Guarantee covering his work, including all equipment, material and workmanship. This Guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.

B. Any defective work, equipment, material and/or workmanship that develops within the Guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Mechanical Contractor without cost to the Owner.

3.14 FINAL INSPECTION

A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Mechanical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.

3.15 FINAL PAYMENTS

A. All Final Payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

END OF SECTION 15500

## SECTION 15501 - HANGERS AND SUPPORTS

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and General Provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

B. This Section includes Hangers and Supports for Mechanical Systems Piping and Equipment.

### PART II - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Hangers: Galvanized carbon steel, adjustable, clevis.

B. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

2.2 HANGER RODS

A. Steel Hanger Rods: Threaded both ends or continuous threaded.

2.3 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

2.4 SLEEVES

A. Sleeves for Pipes: Form with schedule 40, galvanized steel pipe

B. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.

C. Sleeves for Round Ductwork: Form with galvanized steel.

D. Sleeves for Rectangular Ductwork: Form with galvanized steel or wood.

E. Fire Stopping Insulation: Glass fiber type, non-combustible.

F. Caulk: Fire Barrier type sealant.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F 844, steel, plain, flat washers.

2.6 ATTACHMENTS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Permitted in concrete over 4 inches thick.

B. Beam Clamps: Types 20, 21, 28 or 29

C. Wood: Wood screws or lag bolts

**PART III - EXECUTION**

3.1 HANGERS AND SUPPORTS INSTALLATION

A. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Install building attachments within concrete or to structural steel. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.

C. Install hangers and support complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

D. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

E. Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

F. Support horizontal piping as follows:

| PIPE SIZE | HANGER SPACING | MAXIMUM HANGER DIAMETER |
|---|---|---|
| 1/2 to 1-1/4 inch | 6' - 6" | 3/8" |
| 1-1/2 to 2 inch | 10' - 0" | 3/8" |

G. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

H. Place a hanger within 12 inches of each horizontal elbow.

I. Use hangers with 1½ inch minimum vertical adjustment.

J. Support vertical piping at every floor.

L. Support riser piping independently of connected horizontal piping.

M. All pipe hangers shall be galvanized steel or copper.

N. Pipe strapping, duct tape or zip ties will not be allowed.

3.2 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal arc welding, appearance and quality of welds.

3.5 FLASHING

A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flexible sheet flash and counter-flash with sheet metal; seal watertight.

3.6 SLEEVES

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent work with fire stopping insulation and caulk seal air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Install chrome plated steel or stainless steel escutcheons at finished surfaces.

END OF SECTION 15501

## SECTION 15504 - PIPING INSULATION-REFRIGERANT/CONDENSATE

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Mechanical Pipe Insulation.

1.3 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50or less.
2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.4 SEQUENCING AND SCHEDULING

A. Schedule insulation application after testing of piping systems.

B. Schedule insulation application after installation and testing of heat trace tape.

### PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers

1. Flexible Elastomeric Cellular:
   a. Armstrong World Industries, Inc.
   b. Halstead Industrial Products
   c. IMCOA
   d. Rubatex Corporation

2.3 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.

B. Form: Tubular materials conforming to ASTM C 534, Type I.

C. Thermal Conductivity: 0.30 average maximum at 75 degrees F.

D. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.5 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

2.8 SEALING COMPOUNDS

B. Weatherproof Sealant: Flexible elastomer based, vapor barrier sealant designed to seal metal joints.

1. Water Vapor Permeance: 0.02 perm maximum

2. Temperature Range: Minus 50 to 250 degrees F

**PART III - EXECUTION**

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

3.2 INSTALLATION - GENERAL

A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

C. Keep insulation materials dry during application and finishing.

D. Apply insulation continuously over fittings, valves, and specialties.

E. Apply insulation with a minimum number of joints.

F. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

G. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with fire stopping or fire resistant joint sealer.

H. Flanges, Fittings, and Valves: Apply pre-molded, pre-cut, or field fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

1. Use same material and thickness as adjacent pipe insulation.

2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.

3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

4. Insulate elbows and tees smaller than 3-inches pipe size with pre-molded insulation.

5. Insulate elbows and tees Three (3) inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.

J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor

2.3 ACCESSORIES AND ATTACHMENTS

A. Corner Angles: 28-gauge, 1inch by 1-inch aluminum, adhered to 2-inch by 2-inch Kraft paper.

B. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.4 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition

1. Water Vapor Permeance: 0.08 perm maximum
2. Temperature Range: Minus 20 to 180 degrees F

**PART III - EXECUTION**

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale and dirt.

3.2 INSTALLATION

A. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

B. Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions.

C. Install insulation with smooth, straight, and even surfaces.

D. Seal joints and seams to maintain vapor barrier.

E. Seal penetrations for hangers, supports, anchors and other projections.

F. Keep insulation materials dry during application and finishing.

H. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:

1. Smaller Than 24 Inches: Bonding adhesive applied in 6-inch wide transverse strips on 12-inch centers.
2. Twenty-four (24) Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
3. Overlap joints three (3) inches.
4. Seal joints, breaks, and punctures with vapor barrier compound.

END OF SECTION 15507

attachments. Install saddles, shields, and inserts as specified.

1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

3.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION INSTALLATION

A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.

B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.

1. Miter cut materials to cover soldered elbows and tees.

2. Fabricate sleeve fitting covers from flexible elastomeric cellular insulation for screwed valves, fittings, and specialties. Miter cut materials. Overlap adjoining pipe insulation.

3.6 FINISHES

A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply 2 coats of protective coating to exposed insulation. Paint all exterior insulation with UV resistant paint as recommended by Insulation manufacturer.

**INTERIOR COLD CONDENSATE DRAINS**

| PIPE SIZES (NPS) | MATERIALS | THICKNESS IN INCHES |
|---|---|---|
| 1/2 TO 4 | FLEXIBLE ELASTOMERIC | 3/4 |

**REFRIGERANT SUCTION**

| PIPE SIZES (NPS) | MATERIALS | THICKNESS IN INCHES |
|---|---|---|
| 1/2 TO 1-1/4 | FLEXIBLE ELASTOMERIC | 3/4 |
| 1-1/2 TO 4 | FLEXIBLE ELASTOMERIC | 1 |

END OF SECTION 15505

## SECTION 15507 - DUCTWORK INSULATION

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Duct and Plenum Insulation.

1.3 QUALITY ASSURANCE

A. Fire Performance Characteristics: Conform to the following characteristics for insulation including linings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

### PART II – PRODUCTS

2.1 MANUFACTURERS

!. Glass Fiber:
   a. Certain Teed Corporation
   b. Knauf Fiberglass GmbH
   c. Manville
   d. Owens-Corning Fiberglass Corporation
   e. USG Interiors, Inc. - Thermafiber Division

2.2 INSTALLATION

A. GLASS FIBER

1. Material: Inorganic glass fibers, bonded with a thermosetting resin.

B. Jacket: All purpose, factory-applied, laminated glass fiber reinforced, flame retardant Kraft paper and aluminum foil having self-sealing lap.

C. Blanket: ASTM C 553, Type II, Class F-1, jacketed flexible blankets-2" thick.

1. Thermal Conductivity: 0.32 average maximum, at 75 degrees F mean temperature.

D. Adhesive: Produced under the UL Classification and follow-up service.

1. Type: Non-Flammable, solvent-based.
2. Service Temperature Range: Minus 20 to 180 degrees F.

## SECTION 15513 – REFRIGERANT PIPING

### PART I - GENERAL

1.1 A. This section includes all pipe, pipe fittings, hangers, supports, etc. as may be required to provide a complete refrigerant piping system.

B. Testing of all piping shall be made in the presence of a designated representative of the owner. No piping shall be covered or put into operation before such testing has been approved.

C. The actual arrangement of the piping shall follow the general locations shown on the drawings such that clearances, line drainage, etc. shall be maintained.

### PART II - PRODUCTS

2.1 PIPING

A. Refrigerant piping shall be type "ACR" hard drawn copper conforming to ANSI B-31.5 or ASTM B280.

2.2 PIPE FITTINGS

A. Copper pipe fittings shall be wrought metal solder joint type conforming to ANSI B16.22.

### PART III - EXECUTION

3.1 PIPING

A. The installation of piping and related items shall be made neatly and in such a manner as not to interfere with access to valves or equipment.

B. All piping shall be reamed to remove all burrs, fins and foreign material. Pipe shall be thoroughly cleaned before soldering.

C. "Sil-Fos" or silver solder shall be used with non-corrosive flux. During the soldering operation, the pipe shall be purged with nitrogen.

D. Piping shall be arranged (and traps installed where necessary) to allow the proper return of oil to the compressor.

3.2 HANGERS AND SUPPORTS

A. The spacing of hangers and supports shall not exceed five feet.

B. Pipe covering protection saddles shall be used at all supports for insulated piping. Sheet metal shields shall be 10 gauge, one half the circumference of the insulation and minimum of twelve inches long.

3.3 TESTING

A All refrigerant equipment not tested at the factory shall be shut off from the rest of the system and tested. Piping systems shall be tested after installation is complete and before any insulation is applied. All controls and other apparatus that may be damaged by the test pressure shall be removed before tests are made.

B. Refrigerant lines shall be tested at 150 psig with dry nitrogen. Pressure shall be maintained for 60 minutes without loss of pressure. Each joint shall be checked for leaks with a soap solution. Testing and repair shall continue until there is no loss of pressure. After a satisfactory pressure test, high vacuum pumps shall be connected to the system and the system evacuated to a pressure of 0.20 inches of mercury with the ambient temperature at not less than 36 degrees F. After this has been attained, the vacuum shall be broken by charging the system with refrigerant as soon as possible.

END OF SECTION 15055

## SECTION 15672 - SPLIT SYSTEM HEAT PUMP

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and a Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. Section includes Split System Heat Pumps.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), dimensions, required clearances, and methods of assembly of components, furnished specialties and accessories and installation and start-up instructions.

B. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring required for final installation of heat pump units and controls. Clearly differentiate between portions of wiring which are factory-installed and portions to be field-installed.

C. Operation and Maintenance Data: Submit maintenance data and parts list for each heat pump unit, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual in accordance with requirements of Division 1.

1.4 WARRANTY

A. Provide Five (5) Year Warranty.

B. Warranty: Include coverage for Refrigerant Compressors.

### PART II - PRODUCTS

2.1 SPLIT SYSTEM HEAT PUMPS

A. Acceptable Manufacturers:

1. Carrier Air Conditioning: Division of Carrier Corp.
2. Trane (The) Co.: Division of American Standard Inc.
3. York: Division of York International
4. Lennox

2.2 GENERAL

A. Spilt System: The split-system unit shall be an outdoor heat pump unit and indoor factory-fabricated single-zone draw-through air-handling unit. Both indoor and outdoor unit shall be by the same manufacturer. The net capacities shall be as indicated and shall not exceeded by more than 5%. The minimum efficiency for systems less than 65,000 BTUH shall be 10.0 SEER. The minimum efficiency for systems of 65,000 BTUH or greater shall be in accordance with the N. C. State Building Code, Volume X - Energy.

2.3 AIR HANDLER 219

A. Direct Expansion Coil: Coil shall be provided with pressure-type brass distributors and solder connections. The coil shall be dehydrated after testing and charged with dry air. Maximum working conditions shall be 300 psig at 200 degrees F for cooling. Tests shall be conducted, subjecting the coil to a minimum air pressure of 350 psig with the coil submerged in water. The cooling coil shall be subject to ASHRAE 15-1978 Safety code for Mechanical Refrigeration. Coils shall be of the cartridge type, removable from other side of casing and supported the entire length in tracks. Staggered tube pattern shall be provided for all coils of more than one row deep. Tubing shall have a minimum outside diameter of 1/2 inch. Tubing shall be individually finned with smooth aluminum or copper fins, wound under tension. Tube joints for all coils shall be made with high temperature brazing alloys.

B. Cabinet: Unit shall be provided with baked enamel finish and internally insulated. Fan shall be forward curved, and dynamically and statically balanced at the factory. Fan shall be belt driven. Provide adjustable sheaves for each air handler. Fan and motor bearings shall be permanently lubricated type.

2.4 OUTDOOR HEAT PUMP UNIT

A. Unit shall be factory-assembled and tested. Unit shall provide liquid lift as required to suit installation. Unit shall deliver the specified capacity to the cooling coil with an ambient air temperature of 95 degrees F. Units shall be certified per ARI 240 and 270.

B. Coil shall have aluminum plate fins, mechanically bonded to ½ inch aluminum tubes. Coil shall be circuited for sub-cooling.

C. Outdoor Fans and Motors: Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation and built in current and thermal overload protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard.

D. Compressor: Unit shall have compressors of serviceable hermetic design with external spring isolators and an automatically reversible oil pump. Compressor motors shall have across-the-line start.

E. Controls shall be factory-wired and located in a separate enclosure. Safety devices shall consist of high and low pressure stats and compressor overload devices. Unit wiring shall incorporate a time delay relay to prevent short-cycling of the compressor. Relay shall prevent compressor from restarting for a 5-minute period. The unit shall include a transformer for 24-volt control circuit, pressure relief valves and circuit breakers.

F. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be provided for power and refrigerant connections. Panel shall be removable to provide access for servicing. The unit shall be mounted on manufacturer's standard legs anchored to concrete pedestals with steel bearing plates and neoprene pads.

G. Connections: Only one liquid line, one suction line, required for units under 15 tons in capacity shall be provided. A 15-ton unit shall be dual circuited. Double suction risers for the refrigerant lines shall be provided.

H. Piping shall be sized by the manufacturer.

2.5 TEMPERATURE CONTROL SYSTEM

A. See Section 15973, Direct Digital Controls

2.6 FILTRATION

A. Provide a filter rack and a 1" replaceable pleated throwaway filter. Filter rack size shall be as required by AHU manufacture.

B. Provide additional sets of filters (minimum of 3) as required during construction. Install a clean set of filters for the Final Inspection.

**PART III - EXECUTION**

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units with vibration isolation.

D. Install units on concrete base as indicated.

3.2 MANUFACTURER'S FIELD SERVICES

A. Prepare start systems under provisions of Section 15500.

B. Provide initial start-up.

C. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION 15672

## SECTION 15674 DUCT FREE SPLIT SYSTEM AIR CONDITIONER

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and a Division 1 Specification Sections, apply to work of this Section.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), dimensions, required clearances, and methods of assembly of components, furnished specialties and accessories and installation and start-up instructions.

B. Wiring Diagrams: Submit ladder-type wiring diagrams for power and control wiring required for final installation of heat pump units and controls. Clearly differentiate between portions of wiring which are factory-installed and portions to be field-installed.

C. Operation and Maintenance Data: Submit maintenance data and parts list for each heat pump unit, control, and accessory; including "trouble shooting" maintenance guide; plus servicing, and preventative maintenance procedures and schedule. Include this data and product data in maintenance manual in accordance with requirements of Division 1.

1.3 WARRANTY

A. Provide Five (5) Year Warranty.

B. Warranty: Include coverage for Refrigerant Compressors.

### PART II - PRODUCTS

2.1 SPLIT SYSTEM AIR CONDITIONER

A. Acceptable Manufacturers:

1. Mitsubishi
2. Sanyo.
3. Freidrich
4. Amana

2.2 GENERAL

A. Spilt System: The split-system unit shall be an outdoor condensing unit and indoor factory-fabricated single-zone draw-through air-handling unit. Both indoor and outdoor unit shall be by the same manufacturer. The net capacities shall be as indicated and shall not be exceeded by more than 5%. The minimum efficiency for systems less than 65,000 BTUH shall be 10.0 SEER and shall be in accordance with the N. C. State Building Code, Volume X - Energy.

2.3 AIR HANDLER

A. Direct Expansion Coil: Coil shall be provided with pressure-type brass distributors and solder connections. The coil shall be dehydrated after testing and charged with dry air. Maximum working conditions shall be 300 psig at 200 degrees F for cooling. Tests shall be conducted, subjecting the coil to a minimum air pressure of 350 psig with the coil submerged in water. The cooling coil shall be subject to ASHRAE 15-1978 Safety code for Mechanical Refrigeration. Staggered tube pattern shall be provided for all coils of more than one row deep. Tubing shall have a minimum outside diameter of 1/2 inch. Tubing shall be individually finned with smooth aluminum or copper fins, wound under tension. Tube joints for all coils shall be made with high temperature brazing alloys.

B. Cabinet: Unit shall be provided with baked enamel finish and internally insulated. Fan shall be forward curved, and dynamically and statically balanced at the factory. Fan and motor bearings shall be permanently lubricated type.

2.4 OUTDOOR CONDENSING UNIT

A. Unit shall be factory-assembled and tested. Unit shall provide liquid lift as required to suit installation. Unit shall deliver the specified capacity to the cooling coil with an ambient air temperature of 95 degrees F. Units shall be certified per ARI 240 and 270.

B. Coil shall have aluminum plate fins, mechanically bonded to ½ inch aluminum tubes. Coil shall be circuited for sub-cooling.

C. Outdoor Fans and Motors: Unit shall be furnished with direct-driven, propeller-type fans arranged for vertical discharge. Condenser fan motors shall have Class B motor insulation and built in current and thermal overload protection, and shall be of the permanently lubricated type, resiliently mounted. Each fan shall have a safety guard.

D. Compressor: Unit shall have compressors of serviceable hermetic design with external spring isolators and an automatically reversible oil pump. Compressor motors shall have across-the-line start.

E. Controls shall be factory-wired and located in a separate enclosure. Safety devices shall consist of high and low pressure stats and compressor overload devices. Unit wiring shall incorporate a time delay relay to prevent short-cycling of the compressor. Relay shall prevent compressor from restarting for a 5-minute period. The unit shall include a transformer for 24-volt control circuit, AND pressure relief valve.

F. Casing shall make unit fully weatherproof for outdoor installation. Casing shall be of galvanized steel, zinc phosphatized and finished with baked enamel. Openings shall be provided for power and refrigerant connections. Panel shall be removable to provide access for servicing. The unit shall be mounted on manufacturer's standard legs anchored to concrete pedestals with steel bearing plates and neoprene pads.

G. Piping shall be sized by the manufacturer.

2.5 FILTRATION

A. Provide a throw away filter.

B. Provide additional sets of filters (minimum of 3) as required during construction. Install a clean set of filters for the Final Inspection.

**PART III - EXECUTION**

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service.

C. Install units with vibration isolation.

D. Install units on concrete base as indicated.

3.2 MANUFACTURER'S FIELD SERVICES

A. Prepare start systems under provisions of Section 15500.

B. Provide initial start-up.

C. Supply initial charge of refrigerant and oil for each refrigerant circuit. Replace losses of refrigerant and oil.

END OF SECTION

## SECTION 15782 – HVAC Unit With Energy Recovery

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of Package Air Conditioning Unit work required by this Section is indicated on Drawings and Schedules and by Requirements of this Section.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including rated capacities for each unit indicated, weights (shipping, installed, and operating), furnished specialties and accessories; and rigging, installation, and start-up instructions.

B. Maintenance Data: Submit Maintenance Data and Parts List for each unit, control, and accessory; including "trouble- shooting" maintenance guide. Include this data and product data in Maintenance Manual in accordance with requirements of Division 1.

1.4 DELIVERY, STORAGE AND HANDLING

A. Handle unit and components properly to prevent damage, breaking, denting and scoring. Do not install damaged roof top unit or components; replace with new. Comply with manufacturer's rigging and installation instructions for unloading the unit, and transporting them to final location.

1.5 WARRANTY

A. General Warranty: The special warranty specified in this Section shall not deprive the owner of other rights the owner may have under other provisions of the contract documents and shall be in addition to, and run concurrent with, other warranties made by the contractor under requirements of the contract documents.

B. Special Warranty: A written warranty, executed by the manufacturer and signed by the contractor, agreeing to replace the components that fail in material or workmanship, within the specified warranty period, provided manufacturer's written instructions for installation, operation, and maintenance have been followed.

1. Unit warranty period: Not less than one year after date of start-up, but not to exceed 14 months from date of shipment.

2. Compressors: Not less than 5 years from date of shipment.

3. Heat Exchangers: Non-prorated full parts replacement not less than 15 years from date of shipment.

### PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
1. Addison

2. AAON
3. Greenheck

2.2 MANUFACTURED UNITS

A. Provide package unit having gas burner and electric refrigeration.

B. Unit shall be self-contained, packaged, factory assembled and pre-wired, consisting of cabinet and frame, supply fan, exhaust fan, heat exchanger and burner, heat recovery wheel, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

2.3 FABRICATION

A. Cabinet: Galvanized steel with baked enamel finish, access doors or removable access panels with quick fasteners [locking door handle type with piano hinges. Structural members shall be minimum 18 gauge (1.20 mm), with access doors or removable panels of minimum 20 gauge (0.90 mm).

B. Insulation: One inch thick neoprene coated glass fiber on surfaces where conditioned air is handled. Protect edges from erosion.

C. Heat Exchangers: Aluminized steel of welded construction.

D. Supply and Exhaust Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted motor.

E. Air Filters: 2 inch thick pleated glass fiber disposable media in metal frames. Provide at total of 4 complete sets.

F. Roof Mounting Frame: 14 inches high galvanized steel, channel frame with gaskets, nailer strips.

2.4 GAS HEAT SECTION

A. Unit shall heat using natural or propane gas fuel as noted on the drawings.

B. Unit shall be provided with a gas heating furnace consisting of an aluminized steel heat exchanger with multiple concavities, an induced draft blower and an electric pressure switch to lock out the gas valve until the combustion chamber is purged and combustion air flow is established.

C. Unit shall be provided with a gas ignition system consisting of an electronic ignitor to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.

2.5 ENERGY RECOVERY SECTION

A. The unit shall have a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings.

B. The energy recovery cassette shall be rated in accordance with ARI Standard 1060 and shall bear the ARI certification symbol.

C. The energy recovery cassette shall contain a total energy recovery heat wheel constructed of a light-weight polymer material with permanently bonded desiccant coating. The energy recovery wheel media shall be capable of removal from the cassette and replacement without the use of tools. Wheel media shall be cleanable using hot water or light detergent without degrading the efficiency.

D. The exhaust fan shall be backward inclined type. Fan and motor shall be dynamically balanced. A back draft damper shall be included with the exhaust fan. Outside air filters shall be 4" thick pleated disposable media. Provide a total of 4 sets.

E. Motors shall be standard efficiency with ball bearings and external lubrication connections.

2.6 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

B. Provide capillary tubes or thermostatic expansion valves for units of 6 tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 tons cooling capacity and larger.

2.7 COMPRESSOR

A. Compressors shall be scroll type with internal thermal overload protection and mounted on the manufacturer's recommended rubber vibration isolators. Each compressor shall have independent refrigerant circuits.

B. Five minute timed off circuit shall delay compressor start.

C. All unit over 7 tons shall be multiple stage.

D. System shall be equipped with thermostatic expansion valve type refrigerant flow control.

E. System shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant controls.

F. Unit shall be equipped with Schrader type service fittings on both the high and low pressure sides.

G. Unit shall be equipped with refrigerant liquid line driers.

H. Unit shall be fully charged with refrigerant and tested.

I. Hot gas bypass shall be provided on the refrigerant circuit.

J. Each compressor shall be staged for capacity control.

K. All circuits shall be provided with liquid line sight glasses.

L. Unit shall be provided with hot gas reheat coil and modulating hot gas reheat control valve piped to the lead refrigerant system.

M. Unit shall be equipped with a 5 minute anti-short cycle delay timer for each stage.

N. Unit shall be equipped with 20 second delay timers between each stage.

O. Each compressor shall be equipped with suction and discharge service valves.

2.8 CONDENSER

A. Provide copper tube aluminum fin coil assembly with sub-cooling rows.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor.

C. Provide refrigerant pressure switches to cycle condenser fans.

2.9 POWER OPTION

A. Unit shall be provided with a factory installed and wired internal disconnect.

2.10 OPERATING CONTROLS

A. Electric solid state microcomputer based room T-stat.

B. Room T-stat shall incorporate:

1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Short cycle protection.
4. Actual room temperature.
5. Programmed temperature.
6. System model indication: heating, cooling, off, fan auto, fan on.
7. Fan-on-auto switch.

**PART III - EXECUTION**

3.1 EXAMINATION

A. Verify that wall openings and lintels are ready to receive work and opening dimensions are as indicated on Shop Drawings.

B. Verify that proper power supply is available.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Mount units on field built mounting frame. Install roof mounting frame level. Mounting frame shall be provided by the HVAC Contractor. Field Coordinate frame and installation required.

C. See structural drawings for design of mounting frame and concrete support footings.

3.3 MANUFACTURER'S FIELD SERVICES

A. Provide initial start-up during first year of operation, including routine service and check-out.

**B. Provide owner with names and numbers of 3 licensed factory authorized service contractors within 75 miles.**

END OF SECTION 15781

## SECTION 15870 - POWER VENTILATORS

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Power Ventilators.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections:

1. Product data for selected models, including specialties, accessories, and the following:

a. Motor ratings and electrical characteristics plus motor and fan accessories.

b. Materials gauges and finishes.

2. Shop drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.

### PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Carnes Company, Inc.
2. Cook (Loren) Co.
3. Greenheck Fan Corp.
4. Penn Ventilator Co., Inc.

2.2 ROOF EXHAUSTERS

A. Centrifugal Fan Unit: V-belt driven with spun aluminum housing; resilient mounted motor, ½ inch mesh, 16 gauge aluminum bird screen; square base to suit roof curb with continuous curb gaskets; secured with cadmium plated bolts and screws.

B. Roof Curb: 16 inch high with continuously welded seams and factory installed door nailer strip.

C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

D. Back Draft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.

E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.3 WALL EXHAUSTERS

A. Centrifugal Fan Unit: V-belt driven with spun aluminum housing; resilient mounted motor, ½ inch mesh, 16 gauge aluminum bird screen; secured with cadmium plated bolts and screws.

B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

C. Back Draft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.

D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.4 CEILING EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct drive with galvanized steel housing lined with ½ inch acoustic insulation, resilient mounted motor, gravity back draft damper in discharge.

B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

C. Grille: Molded white plastic or aluminum with baked white enamel finish.

D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required RPM is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.5 IN-LINE CABINET EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with ½ inch acoustic insulation, resilient mounted motor, gravity back draft damper in discharge.

B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required RPM is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.6 ROOF SUPPLY FAN

A. Fan Unit: Direct driven axial type, aluminum hood, bird screen, die formed aluminum propeller blades riveted to steel hub, resilient mounted motor square base to suit roof curb.

B. Roof Curbs: 16 inch high, continuously welded seams, and factory door nailed strip. Roof curb shall have same manufacturer as fan and be supplied by Mechanical Contractor and installed by the General Contractor.

C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

**PART III - EXECUTION**

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with lag screws to roof curb.

END OF SECTION 15870

## SECTION 15891 - METAL DUCTWORK

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes low pressure ducts and plenums for heating, ventilating, and air conditioning systems

### PART II - PRODUCTS

2.1 MATERIALS

A. Steel Ducts: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of G-90 for each side in conformance with ASTM A90.

B. Insulated Flexible Ducts: Flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 degrees F.

C. Fasteners: Rivets, bolts, or sheet metal screws

D. Sealant: Liquid non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

E. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 LOW PRESSURE DUCTWORK

A. Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing and sealing for operating pressures indicated.

B. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with radius of not less than 1½ times width of duct on center line. Where not possible and where rectangular elbows are used, provide turning vanes.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

E. Connect flexible ducts to metal ducts with liquid adhesive.

F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

G. Use double nuts and lock washers on threaded rod supports.

2.3 FACTORY FABRICATED DUCTWORK

A. Duct shall be of standard spiral lock seam or single-rib construction and shall be provided according to the gages given in the following table:

| Diameter (inches) | Thickness (inches) |
|---|---|
| 3 - 8 | .032 |
| 9 - 14 | .040 |
| 15 - 36 | .050 |

B. Duct shall be provided in continuous, unjoined lengths wherever possible. Except when interrupted by fittings, round duct sections.

C. Fittings shall be round and shall have a wall thickness in accordance with the following table:

| Fitting Body Diameters (inches) | Minimum Round Fitting Thickness (inches) |
|---|---|
| 3-14 | .040 |
| 15-26 | .050 |
| 27-36 | .063 |

D. Elbows shall be of die-stamped, gored or pleated construction. The bend radius of stamped, gored and pleated elbows shall be 1.5 time the elbow diameter.

E. All round elbows in diameter of 8 inches or less shall be of die-stamped or pleated construction.

F. All round elbows in diameter of 9 inches through 14 inches shall be of gored or pleated construction.

G. All round elbows in diameter greater than 14 inches shall be of gored construction.

H. Diverging-flow fittings shall be constructed with a radiused entrance to all branch taps and with no excess material projecting from the body into the branch tap entrance.

I. All take-off or branch entrances shall be by means of factory fabricated fittings.

J. All fitting ends shall be sized to slip inside mating duct sections. They shall provide a tight fit and have a minimum 2-inch insertion length with a stop bead. No additional coupling shall be required for duct to fitting joints.

**PART III - EXECUTION**

3.1 INSTALLATION

A. Factory Fabricated ductwork can be substituted for low-pressure field constructed ductwork.

B. All factory fabricated spiral duct and fittings shall be installed in accordance with manufacturer's recommendations.

C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. Connect diffusers or troffer boots to low pressure ducts with 5 feet maximum length of flexible duct. Hold in place with strap or clamp.

E. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.3 ADJUSTING AND CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that may be harmed by excessive dirt with temporary filters or bypass during cleaning.

B. Clean duct systems with high power vacuum machines. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION 15891

## SECTION 15910 - DUCT ACCESSORIES

### PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Not used
2. Turning Vanes
3. Duct Mounted Access Doors and Panels
4. Flexible Connectors
5. Flexible Ducts

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data including details for materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings from manufacturer detailing assemblies: Include dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

### PART II - PRODUCTS

2.3 AIR TURNING DEVICES

A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.

2.4 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Provide factory made spin-in starting collars for connections to trunk ducts.

2.5 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards and as indicated.

B. Review locations prior to fabrication.

C. Fabricate rigid and close fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one-inch thick insulation with sheet metal cover.

D. Access doors smaller than 12 inches square may be secured with sash locks.
E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.

F. Access doors with sheet metal screw fasteners are not acceptable.

**PART III - EXECUTION**

3.1 INSTALLATION

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

B. Provide balancing dampers at points on low pressure supply systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers only where indicated.

C. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

D. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.

E. Provide duct test holes where indicated and required for testing and balancing purposes.

END OF SECTION 15910

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## SECTION 15932 - AIR OUTLETS AND INLETS

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 DESCRIPTION OF WORK

A. Extent of air outlets and inlets work is indicated by Drawings and Schedules and by Requirements of this Section.

B. Types of outlets and inlets required for this Project include the following:

1. Ceiling Air Diffusers
2. Wall Registers and Grilles
3. Louvers

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:

1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size and accessories furnished.

2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish and mounting details.

3. Performance data for each type of air outlet and inlet furnished, throw and drop; and noise criteria ratings. Indicate selections on data.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

### PART II - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Diffusers & Grilles

1. Titus, Inc.
2. Metalaire, Inc.
3. Carnes, Inc.
4. E. H. Price

B. Louvers

1. Arrow United Industries, Inc.
2. Louvers & Dampers, Inc.
3. Penn Ventilator Co., Inc.
4. Ruskin Mfg. Co.
5. Safe-Air Inc.
6. Vent Products Co., Inc.

## SECTION 15990 - TESTING, ADJUSTING AND BALANCING

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. This Section specifies the Requirements and Procedures of Total Mechanical Systems Testing, Adjusting and Balancing. Requirements include measurement and establishment of the fluid quantities of the Mechanical Systems as required to meet Design Specifications and Recording and reporting the results.

B. Testing and Balancing must be conducted by an independent, Certified Testing and Balancing firm, registered with either the AABC or the NEBB.

C. The Test and Balance Contractor shall be a subcontractor to the Mechanical Contractor.

1.3 SECTION INCLUDES

A. Testing, adjustment and balancing of air systems.

B. Measurement of final operating condition of HVAC Systems.

C. Sound measurement of equipment operating conditions.

D. Vibration measurement of equipment operating conditions.

1.4 SUBMITTALS

A. Submit under provisions of Section 15500.

B. Submit name of adjusting and balancing agency for approval within 30 days after Award of Contract.

C. Field Reports: Submit under provisions of Section 15500.

D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

E. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and for inclusion in operating and maintenance manuals.

G. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Report shall reference the Contract Drawings for location of equipment and devices. Where reference to the contract drawings is not satisfactory, include a set of reduced drawings or sketches with equipment and devices identified to correspond with data sheets.

7. NCA
8. Cesco Products

2.2 RECTANGULAR CEILING DIFFUSERS

A. Rectangular, extruded aluminum, multi-core type diffuser to discharge air in 360 degree pattern.

B. Provide inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabricate of aluminum with baked enamel off-white finish.

D. Provide opposed blade damper with damper adjustable from diffuser face.

2.3 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Fixed grilles of 1/2 x 1/2 x 1 inch egg crate.

B. Provide inverted T-bar type frame. In plaster ceilings, provide plaster frame and ceiling frame.

C. Fabricate of aluminum with baked enamel off-white finish.

D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.4 WALL SUPPLY REGISTERS/GRILLES

A. Streamlined and individually adjustable blades, depth of which exceeds ¾ inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.

B. Fabricate 1¼ inch margin frame with countersunk screw mounting and gasket.

C. Fabricate of aluminum extrusions with 20 gauge minimum frames and 22 g auge minimum blades, with baked enamel off-white finish.

D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.6 LOUVERS

A. Provide 4-inch deep louvers with blades on 45 degree slope with center baffle and return bend, heavy channel frame, bird screen with ½ inch square mesh.

B. Fabricate of 12-gauge extruded aluminum, welded assembly, with factory baked enamel finish. Color selection from manufacturer standard.

C. Furnish with interior screw holes in jambs for installation.

2.7 ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA Low Pressure Duct Construction Standards.

B. Fabricate of aluminum, minimum 16 gauge base and 18 gauge hood; suitably reinforced; with removable hood; bird screen with ½ inch square mesh and factory prime coat baked enamel finish.

C. Mount unit on minimum 12-inch high curb base with insulation between duct and curb.

D. Make hood outlet area minimum of twice throat area.

**PART III - EXECUTION**

3.1 INSTALLATION

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

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.

C. Install diffusers to ductwork with air-tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION 15932

H. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

I. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or NEBB forms.

1.5 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111, and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. Maintain one copy of each document on site.

1.6 SEQUENCING AND SCHEDULING

A. Sequence work under the provisions of Section 15500.

B. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

C. Schedule work under the provisions of Section 15500.

D. Schedule and provide assistance in final adjustment and test of Smoke Control System with Fire Authority.

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

**PART III - EXECUTION**

3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.

2. Control systems are installed complete and operable.

3. Proper thermal overload protection is in place for electrical equipment.

4. Ductwork Systems:

a. Final filters are clean and in place. If required, install temporary media in addition to final filters.
b. Duct systems are clean of debris.
c. Fans are rotating correctly.
d. Dampers are in place and open.
e. Air coil fins are cleaned and combed.
f. Access doors are closed and duct end caps are in place.
g. Air inlets and outlets are installed and connected.
h. Duct system leakage is minimized.

B. Submit Field Reports: Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner to facilitate spot checks during testing.
B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. HVAC Systems: Adjust to within plus or minus 5 percent of design for supply and return systems and plus or minus 10 percent of design for exhaust systems.

B. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of balancing devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5 AIR SYSTEM PROCEDURE

A. Adjust equipment and distribution systems to provide required or design air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure and record air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Adjust air volume by adjusting duct internal devices such as dampers and splitters. Do not utilize opposed blade dampers at air inlets and outlets.

F. Vary total system air quantities by adjusting sheave position at each fan. Vary branch air quantities by damper regulation.

G. Measure and record static air pressure conditions at air supply and exhaust units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust settings and minimum set points for motorized and back draft dampers to design conditions.

I. Measure and record inlet and outlet temperatures at each air supply unit at full cooling and

heating capacity.

3.6 REPORT FORMS

A. Forms shall include the following:

1. Title Page:
   a. Name of Testing, Adjusting and Balancing Agency
   b. Address of Testing, Adjusting and Balancing Agency
   c. Telephone number of Testing, Adjusting and Balancing Agency
   d. Project Name
   e. Project Location
   f. Project Architect
   g. Project Engineer
   h. Project Contractor
   i. Project Altitude
   j. Report Date

2. Summary Comments:
   a. Design versus final performance
   b. Notable characteristics of system
   c. Description of systems operation sequence
   d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
   e. Nomenclature used throughout report
   f. Test Conditions

3. Instrument List:
   a. Instrument
   b. Manufacturer
   c. Model Number
   d. Serial Number
   e. Range
   f. Calibration Date

4. Electric Motors:
   a. Manufacturer
   b. Model/Frame
   c. HP/BHP/Efficiency
   d. Phase, Voltage, Amperage; Nameplate, Actual, No Load
   e. RPM
   f. Service Factor
   g. Starter Size, Rating, Heater Elements
   h. Sheave Make/Size/Bore

5. V-Belt Drive:
   a. Identification/Location
   b. Required Driven RPM
   c. Driven Sheave, Diameter and RPM
   d. Belt, Size and Quantity
   e. Motor Sheave Diameter and RPM
   f. Center to center distance, maximum, minimum, and actual

6. Equipment Data:
   a. Identification/number
   b. Manufacturer

c. Model number and Serial number
d. Capacity
e. Service
f. Design flow rate, pressure drop, BHP
g. Actual flow rate, pressure drop, BHP
h. Temperature readings

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

8. Air Distribution Test Sheet:
   a. Air terminal number
   b. Room number/location
   c. Terminal type
   d. Terminal size
   e. Area factor
   f. Design velocity
   g. Design air flow
   h. Test (final) velocity
   i Test (final) air flow
   j. Percent of design air flow

3.7 SOUND AND VIBRATION TESTING

A. Test and adjust Mechanical Systems for sound and vibration in accordance with the detailed instructions of the referenced Standards.

B. Sound Level Test and Report:
   1. Location
   2. Octave Bands - equipment off
   3. Octave Bands - equipment on

C. Vibration Test and Report:

   1. Location of Points:
      a. Fan bearing: drive end
      b. Fan bearing: opposite end
      c. Motor bearing: center (if applicable)
      d. Motor bearing: drive end
      e. Motor bearing: opposite end
      f. Casing: (bottom or top)
      g. Casing: (side)
      h. Duct after flexible connection: (discharge)
      i. Duct after flexible connection: (suction)

   2. Test Readings:
      a. Horizontal, velocity and displacement

b. Vertical, velocity and displacement
c. Axial, velocity and displacement

3. Normally acceptable readings, velocity and acceleration
4. Unusual conditions at time of test
5. Vibration source (if non-complying)

END OF SECTION 15990

## SECTION 15990 - TESTING, ADJUSTING AND BALANCING

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SUMMARY

A. This Section specifies the Requirements and Procedures of Total Mechanical Systems Testing, Adjusting and Balancing. Requirements include measurement and establishment of the fluid quantities of the Mechanical Systems as required to meet Design Specifications and Recording and reporting the results.

B. Testing and Balancing must be conducted by an independent, Certified Testing and Balancing firm, registered with either the AABC or the NEBB.

C. The Test and Balance Contractor shall be a subcontractor to the Mechanical Contractor.

1.3 SECTION INCLUDES

A. Testing, adjustment and balancing of air systems.

B. Measurement of final operating condition of HVAC Systems.

C. Sound measurement of equipment operating conditions.

D. Vibration measurement of equipment operating conditions.

1.4 SUBMITTALS

A. Submit under provisions of Section 15500.

B. Submit name of adjusting and balancing agency for approval within 30 days after Award of Contract.

C. Field Reports: Submit under provisions of Section 15500.

D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

E. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and for inclusion in operating and maintenance manuals.

G. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Report shall reference the Contract Drawings for location of equipment and devices. Where reference to the contract drawings is not satisfactory, include a set of reduced drawings or sketches with equipment and devices identified to correspond with data sheets.

H. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.

I. Test Reports: Indicate data on AABC National Standards for Total System Balance forms or NEBB forms.

1.5 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111, and NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

B. Maintain one copy of each document on site.

1.6 SEQUENCING AND SCHEDULING

A. Sequence work under the provisions of Section 15500.

B. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

C. Schedule work under the provisions of Section 15500.

D. Schedule and provide assistance in final adjustment and test of Smoke Control System with Fire Authority.

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

**PART III - EXECUTION**

3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.

2. Control systems are installed complete and operable.

3. Proper thermal overload protection is in place for electrical equipment.

4. Ductwork Systems:

a. Final filters are clean and in place. If required, install temporary media in addition to final filters.
b. Duct systems are clean of debris.
c. Fans are rotating correctly.
d. Dampers are in place and open.
e. Air coil fins are cleaned and combed.
f. Access doors are closed and duct end caps are in place.
g. Air inlets and outlets are installed and connected.
h. Duct system leakage is minimized.

B. Submit Field Reports: Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.3 INSTALLATION TOLERANCES

A. HVAC Systems: Adjust to within plus or minus 5 percent of design for supply and return systems and plus or minus 10 percent of design for exhaust systems.

B. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of balancing devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5 AIR SYSTEM PROCEDURE

A. Adjust equipment and distribution systems to provide required or design air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure and record air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Adjust air volume by adjusting duct internal devices such as dampers and splitters. Do not utilize opposed blade dampers at air inlets and outlets.

F. Vary total system air quantities by adjusting sheave position at each fan. Vary branch air quantities by damper regulation.

G. Measure and record static air pressure conditions at air supply and exhaust units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust settings and minimum set points for motorized and back draft dampers to design conditions.

I. Measure and record inlet and outlet temperatures at each air supply unit at full cooling and

heating capacity.

3.6 REPORT FORMS

A. Forms shall include the following:

1. Title Page:
   a. Name of Testing, Adjusting and Balancing Agency
   b. Address of Testing, Adjusting and Balancing Agency
   c. Telephone number of Testing, Adjusting and Balancing Agency
   d. Project Name
   e. Project Location
   f. Project Architect
   g. Project Engineer
   h. Project Contractor
   i. Project Altitude
   j. Report Date

2. Summary Comments:
   a. Design versus final performance
   b. Notable characteristics of system
   c. Description of systems operation sequence
   d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
   e. Nomenclature used throughout report
   f. Test Conditions

3. Instrument List:
   a. Instrument
   b. Manufacturer
   c. Model Number
   d. Serial Number
   e. Range
   f. Calibration Date

4. Electric Motors:
   a. Manufacturer
   b. Model/Frame
   c. HP/BHP/Efficiency
   d. Phase, Voltage, Amperage; Nameplate, Actual, No Load
   e. RPM
   f. Service Factor
   g. Starter Size, Rating, Heater Elements
   h. Sheave Make/Size/Bore

5. V-Belt Drive:
   a. Identification/Location
   b. Required Driven RPM
   c. Driven Sheave, Diameter and RPM
   d. Belt, Size and Quantity
   e. Motor Sheave Diameter and RPM
   f. Center to center distance, maximum, minimum, and actual

6. Equipment Data:
   a. Identification/number
   b. Manufacturer

c. Model number and Serial number
d. Capacity
e. Service
f. Design flow rate, pressure drop, BHP
g. Actual flow rate, pressure drop, BHP
h. Temperature readings

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

8. Air Distribution Test Sheet:
   a. Air terminal number
   b. Room number/location
   c. Terminal type
   d. Terminal size
   e. Area factor
   f. Design velocity
   g. Design air flow
   h. Test (final) velocity
   i Test (final) air flow
   j. Percent of design air flow

3.7 SOUND AND VIBRATION TESTING

A. Test and adjust Mechanical Systems for sound and vibration in accordance with the detailed instructions of the referenced Standards.

B. Sound Level Test and Report:
   1. Location
   2. Octave Bands - equipment off
   3. Octave Bands - equipment on

C. Vibration Test and Report:

   1. Location of Points:
      a. Fan bearing: drive end
      b. Fan bearing: opposite end
      c. Motor bearing: center (if applicable)
      d. Motor bearing: drive end
      e. Motor bearing: opposite end
      f. Casing: (bottom or top)
      g. Casing: (side)
      h. Duct after flexible connection: (discharge)
      i. Duct after flexible connection: (suction)

   2. Test Readings:
      a. Horizontal, velocity and displacement

b. Vertical, velocity and displacement
c. Axial, velocity and displacement

3. Normally acceptable readings, velocity and acceleration
4. Unusual conditions at time of test
5. Vibration source (if non-complying)

END OF SECTION 15990

# SECTION 15999 - COMPENSATION FOR HEATING AND AIR CONDITIONING



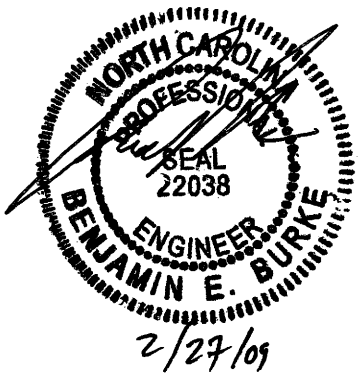
The work of furnishing and installing Heating and Air Conditioning in the North & South Bound Rest Area Service Building and Vending Building in accordance with the plans and specifications, completed and accepted, will be paid for at the contract lump price for " Heating and Air Conditioning installation for the N & SBL Rest Area Building & Vending Building". Such price and payment will be full compensation for all work of constructing the North & South Bound Lane Rest Area Service Building and Vending Building, including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"HVAC Installation Rest Area Serv Bldg NBL / SBL ". . . . . Lump Sum

"HVAC Installation Vend Building NBL / SBL". . . . . Lump Sum

## DIVISION 16: ELECTRICAL

| | |
|---|---|
| 16010 | Basic Electrical Requirements |
| 16050 | Basic Electrical Materials and Methods |
| 16100 | Raceways, Boxes and Cabinets |
| 16120 | Wires and Cables |
| 16140 | Wiring Devices |
| 16190 | Supporting Devices |
| 16195 | Electrical Identification |
| 16452 | Grounding |
| 16470 | Panel Boards |
| 16476 | Disconnects |
| 16515 | Interior Lighting |



## SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

### PART I - GENERAL

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1.1 GENERAL CONDITIONS

A. The Stipulations and Conditions stated in this Section, together with all provisions of the "Instructions to Bidders", "General Conditions", "Supplemental General Conditions" and "Special Conditions", hereinbefore set forth, shall apply to this and the other Sections of Division 16.

1.2 GENERAL REQUIREMENTS

A. The General Requirements hereinafter listed apply to the Electrical Work Division. If there is any conflict between the General Requirements and the General Conditions, the General Conditions shall take precedence.

1.3 ALTERNATES

A. Carefully examine all alternates at the back of this Specification and on the Drawings to determine if any work described under the Electrical Section will be affected thereby.

1.4 INTENT

A. The intent of these Drawings and Specifications are to describe the installation of a complete, fully adjusted, and operational system. Therefore, any items shown on Drawings and not specifically called for in the Specifications, or any items specified and not specifically indicated or detailed on the Drawings, or any items neither specified or shown, but which are reasonably incidental to and commonly required to make a complete job, will be furnished and installed by the Electrical Contractor at his own expense.

1.5 DEFINITIONS

A. The Electrical Contractor shall provide all supervision, labor, material equipment, machinery, plant, and any and all other items necessary to complete the Electrical systems. All items of equipment are specified in the singular; however, the Electrical Contractor shall provide the number of items of equipment as indicated on the drawings, and as required for complete systems.

Where the word "provide" is used, it shall mean "furnish and install complete and ready to use".

1.6 VISIT TO THE SITE

A. The Electrical Contractor shall visit the site before submitting his bid so as to be thoroughly familiar with the job conditions and/or peculiarities. No extra payment will be allowed for anything which could have been anticipated from a visit to the site.

1.7 REGULATORY REQUIREMENTS

A. All work under this section shall be accomplished in strict accordance with State codes. Where these plans and specifications conflict with such codes, the codes shall govern.

B. The Electrical Contractor shall notify the Architect or Engineer of such conflicts in writing prior to receipt of bids.

C. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), and National Fire Protection Association (NFPA) are a minimum installation requirement.

D. The following regulatory shall be used as minimum standards:

| | |
|---|---|
| AEIC | American Association of Edison Illuminating Companies |
| ANSI | American National Standards Institute |
| ASTM | American Society for Testing and Materials |
| ICEA | Insulated Cable Engineers Association |
| IEEE | Institute of Electrical and Electronic Engineers |
| NCCM | N.C. Construction Manual w/G.S. as listed |
| NCSBC | N.C. State Building Code |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturers Association |
| NESC | National Electrical Safety Code |
| NFPA | National Fire Protection Association |
| U/L | Underwriters' Laboratories, Inc. |
| OSHA | Occupational Safety and Health Standards |
| ASHRAE/IES | 90.1 energy code |

1.8 TEST STANDARDS

A. All material and equipment shall be listed, labeled or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., or third party agencies accredited by the North Carolina Building Code Councils latest edition or amendment.

1.9 PERMITS AND FEES

A. NA

1.10 DRAWINGS AND SPECIFICATIONS

A. The Electrical Drawings and Specifications are intended to cover all the work enumerated under the respective headings. The Drawings are diagrammatic only. No Contractor shall take advantage of conflict or error between Drawings and Specifications, or between General Drawings and Mechanical, Plumbing and/or Electrical Drawings, but shall request a clarification of such from the Architect/Engineer, should this condition exist. If there is insufficient time to issue an Addendum for this clarification, the Electrical Contractor shall include in his bid the most expensive of the items in conflict.

B. The Electrical Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floors and ceiling heights, for locations of walls, partitions, beams, etc., and shall be guided accordingly for setting of all sleeves, inserts and equipment. No Contractor shall under any circumstances scale drawings for the location of equipment. The Electrical Contractor shall verify the locations of all utility services and electrical equipment.

C. The Electrical Contractor shall keep at least one set of corrected Shop and Design Drawings at the site. Drawings are to be current, denoting approved modifications and actual installed departure. Submit Drawings to Architect/Engineer before final payment is made.

1.11 SUPERVISION

A. The Electrical Contractor performing the work specified shall be required to employ a qualified superintendent or foreman to continuously supervise the installation of their work, with authorization to act as agent. He shall be capable of checking layouts, coordinating and supervising the work, establishing grades and levels and locating chases, openings, hangers, inserts, sleeves, etc.

**PART II - PRODUCTS**

2.1 STANDARD PRODUCTS

A. Unless otherwise indicated in writing by the Architect/Engineer, the materials to be provided under this Specification shall be standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest design. All items of the same type or rating shall be identical.

2.2 SUBMITTAL

A. The Electrical Contractor shall submit, for approval, detailed Shop Drawings on all major equipment and where requested. No materials or equipment may be delivered to the job site or installed until the Electrical Contractor has in his possession the approved Shop Drawing for the particular material or equipment. The Electrical Contractor shall furnish the number of copies required by the General or Special Conditions of the contract, but no case less than six (6) copies.

B. Submitted material shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article Number of Specifications governing, Contractor's name and name of job.

C. Approval of equipment will not relieve the Electrical Contractor of compliance with the Specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other Contractors and suppliers shall be solely the responsibility of the Electrical Contractor and with no additional expense to the Owner.

2.3 SUBSTITUTIONS

A. Manufacturer's lists are to establish a standard of quality and not intended to limit the selection to these manufacturers. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality free from defect or other imperfections. It should be understood that where the words "furnished and installed" are used, it is intended that the Electrical Contractor shall purchase and install all materials required, unless otherwise noted.

B. All materials and equipment proposed as substitutes for these specified shall require a ten (10) day prior approval from the Engineer prior to the bid date. No substitutions will be allowed after the ten (10) day period before the bid date.

C. All products shall be furnished in compliance with NC General Statute 133-3.

2.4 PRODUCT HANDLING

A. Equipment and materials shall be properly stored, adequately protected, and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored and protected in accordance with the manufacturer's recommendations and as approved by the Architect/Engineer. Equipment installed with a factory finish shall be fully protected during construction and shall be maintained free of dust, dirt and foreign matter. Dents and other surface damage shall be repaired or replaced to the satisfaction of the Architect/Engineer at no additional cost to the Owner.

B. The Electrical Contractor shall clean up and remove from the job site all waste materials, packaging, crating, and refuse resulting from his work on a daily basis.

2.5 MATERIALS AND WORKMANSHIP

A. The Electrical Contractor shall perform a first class job, both in material and workmanship. None other will be accepted. Deviations from either will be corrected by the Electrical Contractor at the Electrical Contractor's expense.

B. The material used throughout the work, except when otherwise noted, shall be new and of Specification grade and the best of its kind. No substitutes shall be used unless approved by the Architect/Engineer. All work shall be executed with a maximum speed consistent with safety and good workmanship.

C. Any equipment furnished by the Mechanical Contractor or any other Contractor that is larger than those indicated on the Drawings and described in these Specifications or have different Electrical characteristics, the increase in cost to the Electrical Contractor for larger wires, conduit, circuit breakers, switches, etc. or for changes in work already installed shall be borne by the instigating Contractor.

**PART III - EXECUTION**

3.1 EXCAVATION AND BACKFILL

A. The Electrical Contractor shall preform any and all trench and pit excavation and backfilling required for the installation of his work. Trenches shall be made with the sides vertical and shall be shored where necessary for the protection of men and equipment. All excavation work shall be done in a careful manner to avoid damage to footers and foundations. The backfilling shall be placed in layers not exceeding 4 inches in depth, wetting each layer as it is placed and thoroughly compacting each layer with Mechanical tamper or other approved means. Any damage done during excavation and backfilling operations to roads, sidewalks, curbs, shrubs, sod, footers, foundations, etc. shall be replaced to its original condition prior to construction at no expense to the owner. All work will be approved by the Engineer.

3.2 SCAFFOLDING, RIGGING AND HOISTING

A. The Electrical Contractor shall furnish all necessary scaffolding, staging, rigging and hoisting required for the completion of his work. All such scaffolding, etc., shall be removed from the premises when its use is no longer required on the job.

3.3 CUTTING AND PATCHING

A. The Electrical Contractor shall provide all cutting and patching necessary to install the work specified in the 16000 Sections. The patching shall match adjacent surface material and finishes.

B. No Structural member shall be cut without the approval of the Engineer and all such cutting shall be done in a manner directed by him.

C. Cutting or Holes:

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1. Locate holes in advance where they are proposed in the Structural Sections such as ribs or beams. Obtain the approval of the Engineer prior to drilling through Structural Sections.

2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed.

3.4 WATERPROOFING

A. At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight. All work subject to approval of the Engineer.

3.5 EQUIPMENT SPACE AND ARRANGEMENT

A. The equipment shall fit into the space allotted and shall allow adequate clearance for entry, installation, replacement, servicing, and maintenance. The Electrical Contractor shall coordinate the work to ensure that equipment may be moved into place without altering building components or other installations. Access space shall not be less than the equipment manufacturer's requirements. Working clearances shall be not less than N.E.C or other regulatory requirements.

B. These drawings indicate the extent and general arrangement of equipment. If any departures are deemed necessary by the Electrical Contractor, details of such departures and the reasons therefore shall be submitted to the Architect/Engineer for approval as soon as practicable and within 30 days after Award of the Contract. No departure shall be made without written approval of the Architect/Engineer. Any delay on the Contractor's part to provide such submittal will not constitute an extension of the Contract time.

3.6 DAMAGE TO WORK ALREADY IN PLACE

A. The Electrical Contractor shall assume full responsibility for any damage done by him, his agents or employees, to any work already in place. Any such damage done shall be repaired at the Contractor's expense by Mechanics skilled at their respective trades, to the approval of the Architect/Engineer.

3.7 JURISDICTION OF WORK

A. It may become necessary for the Electrical Contractor to furnish labor or materials which are not generally accepted as part of this trade. In cases of this type, he shall contract the work or shall furnish materials and employ workmen of the trade involved in order not to cause any delay or stoppage of work caused by infringement of Trade Agreements as to jurisdiction, alleged or actual.

3.8 COORDINATION WITH OTHER TRADES

A. All work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance to coordinate Architectural, Structural, Mechanical, Plumbing and Electrical features of construction. The Contractor shall verify at the site all locations, grades, elevations and utility service connections indicated. Any conflicts due to lack of proper coordination shall be brought to the attention of the Architect/Engineer for resolution. The Electrical Contractor shall make required changes or relocations at no additional cost to the Owner.

B. Installation, inspection, and testing of work above ceilings shall be completed and approved

by the Architect/Engineer prior to installation of the specified finished ceilings. However, a Ceiling Suspension System may be installed as required for coordination.

C. The Electrical Contractor shall consult with the other trades at the start of the work and periodically thereafter, as required to properly coordinate the various items of work, and to avoid interferences. Should any interferences of any nature develop as the work progresses, such interferences shall be resolved and eliminated as directed. The cost of any work directed shall be borne by the Subcontractor or Contractors directed to do this work.

3.9 DIVISION OF WORK

A. These paragraphs are intended to show exactly the point of division of work between the Electrical Division and the Mechanical Division or any other division.

C. All equipment covered in the Mechanical Division or any other Division of the Specifications shall be furnished, mounted, and aligned under the respective Division. All starters, controls and wiring for this equipment, including final connection to the same, shall be furnished and installed under that Division.

D. Divisions of the Specifications shall be completed under the respective Division.

E. Under Division 16, the Contractor shall be responsible for providing all line side power wiring, conduit, disconnect switches, and junction boxes as shown on the electrical drawings.

3.10 EQUIPMENT INSTALLATION

A. Manufacturer's Instructions: Equipment shall be installed as recommended by the manufacturer to conform to the requirements of the particular application, in accordance with these Drawings and Specifications.

3.11 OPERATION AND MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT". In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

2. Manufacturer's printed Operating Procedures to include start-up, break-in, and routine and normal Operating Instructions; regulation, control, stopping, shutdown, and emergency instructions and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and re-assembly; aligning and adjusting instructions.

4. Servicing Instructions and Lubrication Charts and Schedules.

3.12 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Section

"PROJECT CLOSEOUT". In addition to the requirements specified in Division 1, indicate installed conditions for:

1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.

2. Equipment locations (exposed and concealed) dimensioned from prominent building lines.

3. Approved substitutions, Contract modifications and actual equipment and materials installed.

3.13 GUARANTEE

A. The Electrical Contractor shall present to the Owner a written guarantee covering his work, including all equipment, material and workmanship. This guarantee shall be against all defects in any of the above work, and shall run for a period of one (1) year from the date of written acceptance of the Contractor's work.

B. Any defective work, equipment, material and/or workmanship that develops within the Guarantee period, which is not caused by ordinary wear or abuse by other persons, shall be replaced by the Electrical Contractor without cost to the Owner.

3.14 FINAL INSPECTION

A. When the entire Contract has been completed and the work is ready for final inspection, the Architect/Engineer or his duly authorized representative will make the inspection. At the time of inspection, the Electrical Contractor shall demonstrate to the Architect/Engineer that the various systems and pieces of equipment have been adjusted to operate in accordance with the requirements of the Contract.

**B. An authorized Inspector from the North Carolina Department of Insurance shall inspect the project during construction and upon completion of the construction phase. It shall be the responsibility of the Electrical Contractor to notify the Inspector as the work progresses. The NCDOI Inspector can be reached at (919) 661-5880.**

3.15 FINAL PAYMENTS

A. All Final Payments are contingent upon all necessary Certificates and/or Approvals cited above, together with the written Guarantee being presented to the Owner.

3.16 DOCUMENTATION

A. All tests shall be completely documented indicated time of day, temperature, and all pertinent test information.

B. All required documentation of readings shall be submitted to the engineer prior to, and as one of the prerequisites for, final acceptance of the project.

END OF SECTION 16010

## SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes limited Scope, General Construction Materials and Methods for Application with Electrical Installations as follows:

1. Miscellaneous metals for support of electrical materials and equipment.

2. Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.

1.3 DEFINITIONS

A. The following definitions apply to excavation operations:

1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.

2. Sub-Base: As used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.

3. Sub-Grade: As used in this Section refers to the compacted soil immediately below the slab or pavement system.

4. Unauthorized excavation consists of removal of materials beyond indicated sub-grade elevations or dimensions without specific direction from the Architect.

1.4 SEQUENCE AND SCHEDULING

A. Coordinate the shut-off and disconnection of electrical service with the Owner and the utility company.

### PART II - PRODUCTS

2.1 SOIL MATERIALS

A. Sub-Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.

B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1½ inch sieve, and not more than 5 percent passing a No. 4 sieve.

C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP; free of clay, rock, or gravel larger than 2 inches in any dimension; debris; waste; frozen materials; and vegetable and other deleterious matter.

2.2 MISCELLANEOUS METALS

A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500.

C. Hot-Rolled Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Schedule 40, welded.

E. Fasteners: Zinc-coated, type, grade and class as required.

**PART III - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 EXCAVATION

A. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.

B. Install sediment and erosion control measures in accordance with local codes and ordinances.

C. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials.

2. Provide and establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

D. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

2. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.

E. Trenching: Excavate trenches for electrical installations as follows:

1. Excavate trenches to the uniform width, sufficiently wide to provide ample working

room and a minimum of 6 to 9 inches clearance on both sides of raceways and equipment.

2. Excavate trenches to depth indicated or required.

3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.

4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.

F. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F (1 degree 2 C).

G. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.

1. Under walks and pavements, use a combination of sub-base materials and excavated or borrowed materials.

2. Under building slabs, use drainage fill materials.

3. Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.

4. For raceways less than 30 inches below surface of roadways, provide 4-inch thick concrete base slab support. After installation of raceways, provide a 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway sub-base.

5. Other areas, use excavated or borrowed materials.

H. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and locations of underground utilities have been recorded.

2. Removal of concrete formwork.

3. Removal of shoring and bracing and backfilling of voids.

4. Removal of trash and debris.

I. Placement and Compaction: Place backfill and fill materials in layers of not more than eight (8) inches in loose depth for material compacted by heavy equipment, and not more than four (4) inches in loose depth for material compacted by hand operated tampers.

J. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

K. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.

L. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture density relationship (cohesion-less soils).

2. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of material, or 95 percent relative density for cohesionless material.

a. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material or 95 percent relative density for cohesionless material.

b. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.

3. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

4. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code".

END OF SECTION 16050

## SECTION 16100 - RACEWAYS, BOXES AND CABINETS

### PART I - GENERAL



1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes Raceways, Fittings, Boxes, Enclosures and Cabinets for Electrical Wiring.

### PART II - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1

B. Intermediate Metal Conduit: ANSI C80.6

C. Electrical Metallic Tubing and Fittings: ANSI C80.3 with compression-type fittings.

D. Flexible Metal Conduit: Zinc coated steel

E. Liquid tight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

F. Fittings: NEMA FB 1, compatible with conduit/tubing materials.

G. Non-Metallic Rigid Conduit: Schedule 40 pvc as where shown on the drawings.

H. "MC" type cable.

2.2 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1

B. Cast Metal Boxes: NEMA FB 1, type FD, cast alloy box with gasketed cover

2.3 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

C. Pull Boxes: Code gauge steel with screw type removable cover. NEMA rated for the condition.

### PART III - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 MINIMUM CONDUIT SIZE: (unless indicated otherwise) on the drawings conduit shall be sized as follows:

A. Indoors: The minimum conduit size shall be 1/2".

1. Flexible metal conduit may be used for tap connection to recessed lighting fixtures.

B. Outdoors: Branch circuit conduit installed below grade to exterior equipment shall be one (1) inch minimum unless noted otherwise.

3.3 WIRING METHODS: Unless noted otherwise on the drawings the following materials shall be used:

A. Outdoors: Use the following wiring methods:

1. Exposed: Rigid or intermediate metal conduit.

2. Underground: Galvanized Rigid Conduit.

3. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquid tight flexible metal conduit.

4. Boxes and Enclosures: NEMA Type 3R or Type 4.

B. Indoors: Use the following wiring methods:

1. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquid tight flexible metal conduit.

2. Damp or Wet Locations: Rigid steel conduit.

3. Exposed: Electrical metallic tubing above 8 feet and rigid metallic conduit below eight (8) feet.

4. Concealed: Electrical metallic tubing or MC cable.

5. Boxes and Enclosures: NEMA Type 1, except in damp or wet locations use NEMA Type 3R, unless otherwise noted.

3.4 INSTALLATION

A. Telephone/Data/Cable TV outlet boxes shall be 2 gang with appropriate trim and cover. Coordinate cover plates with Owner.

B. Provide insulated bushings for all conduit ends.

C. Conceal rigid conduit and EMT, unless otherwise indicated, within finished walls, ceilings, above attic space and below floors.

D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.

E. Install raceways level and square and at proper elevations. Provide adequate headroom.

F. Complete raceway installation before starting conductor installation.

G. Use temporary closures to prevent foreign matter from entering raceway.

H. Protect stubs from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

I. **Where non-metallic conduit is shown to be used below the slab provide rigid conduit to turn up into the building space or at all exterior walls, poles or equipment.**

J. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.

K. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated. Where the number of bends exceed the total number required by the N.E.C., provide pull boxes as required by code.

L. Install raceways parallel to or at right angles to surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.

2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

M. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Use bonding jumpers where joints cannot be made tight.

2. Use insulating bushings to protect conductors.

3. Provide expansion joint fittings where required for the raceway used.

N. IMC and GRC shall terminate with either a double locknut/bushing set or in a threaded hub.

O. Where conduit type "LB" fittings are used all conduits on conduits over 2" in size shall be "MOGAL" type.

**P. "EMT" connectors shall be steel plated hexagonal compression type only. Do not use pot metal, set-screw, or indenter type connectors.**

Q. Where concentric, eccentric, or oversized knockouts are encountered, a grounding-type insulated bushing shall be provided.

R. Where conduits of any type pass over a building expansion joint, a standard "expansion joint" fitting, compatible with the type raceway, shall be provided.

S. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

T. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

U. Install pull cords in all empty raceways. Use monofilament plastic line having not less than 200-lb (90 kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull cord.

V. Telephone and Signal System Raceways 2 Inch Trade Size and Smaller: In addition to the

above requirements, install in maximum lengths of 150 feet (45 m) and with a maximum of two 90-degree bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements. Pull boxes shall be a minimum of 10" square x 6" deep with removable cover.

W. Install raceway sealing fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

1. Where conduits enter or leave hazardous classified locations.

2. Where conduits pass from warm locations to cold locations, such as exterior spaces and air-conditioned spaces.

3. Where otherwise required by the NEC.

X. Stub-Up Connections: Extend conduits through concrete floor a minimum of 6" for connection to freestanding equipment. Extend conductors to equipment with flexible metal conduit. Where equipment connections are not made under this Contract verify the length of the flexible connectors.

Y. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquid tight flexible conduit in wet or damp locations. Install separate ground conductor.

AA. Provide grounding connections for raceway, boxes and components. Tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

BB. All underground raceways shall be identified by "UNDERGROUND LINE MARKING TAPE" located directly above the raceway at 6" below finished grade. Tape shall be permanent, bright-colored, continuous, magnetic strip, printed, plastic tape compounded for direct burial not less than 6" wide and 4 mils thick. Printed legend shall be indicative of the service it is marking. Provide sufficient tape not less than 2/3 of the width of the item marked for the full length of the Raceway.

CC. Where underground raceways are required to turn up into cabinets, equipment, etc., and on to poles, the elbow required and the sub-up out of the slab or earth shall be rigid steel.

DD. Where shown to be used on the drawings PVC non-metallic conduit used exterior to the building for grouped circuits it shall be encased in a minimum of 3" of 3000 psi rated concrete. Concrete encased non-metallic ducts shall be supported on plastic separators coordinated with duct size and spacing. Separators shall be spaced close enough to prevent sagging and deforming of ducts. Secure separators to the earth and to ducts to prevent floating during placement of concrete. Do not use steel or tie wires in such a way to form conductive or magnetic loops around ducts or duct groups.

EE. The Raceway System shall not be relied on for grounding continuity. A green grounding conductor, properly sized per NEC Table 250-122, shall be run in all power raceways.

FF. Where non-metallic conduit is allowed on the drawings all bends and off-sets shall be made by approved mechanical benders per the manufacturers instruction. Any conduit not in compliance will be removed.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to paint finishes with matching touch-up coating recommended by the manufacturer.

3.6 CLEANING

A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt and construction debris and repair damaged finish, including chips.

END OF SECTION 16100

## SECTION 16120 - WIRES AND CABLES

### PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes Building Wires and Cables and Associated Splices, Connectors and Terminations for Wiring Systems rated 600 Volts and Less.

### PART II - PRODUCTS

2.1 BUILDING WIRES AND CABLES

A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Applications" Article.

B. Rubber Insulation: Conform to NEMA WC 3.

C. Thermoplastic Insulation: Conform to NEMA WC 5.

D. Cross-Linked Polyethylene Insulation: Conform to NEMA WC 7.

E. Ethylene Propylene Rubber Insulation: Conform to NEMA WC 8.

F. Solid conductor for 10 AWG and smaller: Stranded conductor for larger than 10 AWG.

2.2 CONNECTORS AND SPLICES

A. UL-listed factory fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.

### PART III - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Feeders and Branch Circuits: Type THHN\THWN or XHHW, copper conductor, in raceway.

3.3 INSTALLATION

A. All conductors shall be copper.

B. Minimum conductor size for power and lighting circuits shall be #12 AWG. Maximum conductor size shall be 500 KCMIL AWG.

C. All power and lighting circuits #10 awg and smaller shall be solid copper conductors. Conductor sizes #8 awg and larger shall be Class "B" stranded copper conductors.

D. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.

1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.

2. Use pulling means, including fish tape, cable, rope, and basket weave wire/cable grips that will not damage cables or raceway.

E. Conductor Splices: Keep to minimum.

F. Wiring at Outlets: Install with at least 8 inches of slack conductor at each outlet.

G. Connect outlets and components to wiring and to ground as indicated. Tighten to UL Standard 486A.

H. Power and Lighting circuits shall have individual neutral conductors.

I. All power circuits noted for computer equipment with isolated grounding shall be individually installed in a separate conduit with separate phase, neutral conductor, grounding conductor, and isolated grounding conductor, unless noted otherwise.

J. In no case shall any wire installed to a device exceed the U.L. rating of the device.

3.4 SPLICING

A. Joints in solid conductors shall be using Idea "wire nuts", 3M Company "scotch lock", or "T&B" "PIGGY" connectors in junction boxes, outlet boxes and lighting fixtures.

B. "Sta-kon" or other permanent type crimp connectors shall not be used for branch circuit connections.

C. Joints in stranded conductors shall be spliced by approved mechanical connectors. Solderless mechanical connectors similar to "NSI" multi-cable connector blocks for splices and taps, provided with UL approved insulating covers, may be used instead of mechanical connectors plus tape.

D. Conductors in all cases, shall be continuous from outlet to outlet unless "taps" are required and shall be made only within outlet, junction boxes, troughs and gutters.

3.5 VOLTAGE DROP

A. Where conductor length from the panel to the first outlet on a 120 volt circuit exceeds 100 feet, the branch circuit conductors from the panel to the first outlet shall be not smaller than #10 awg.

3.6 FIELD QUALITY CONTROL

A. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each Visual and Mechanical Inspection and Electrical Test stated in NETA Standard ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning products at site, where possible, and re-test to demonstrate compliance; otherwise, remove and replace with new units and re-test.

3.7 ELECTRICAL TESTING

A. Feeder Insulation Resistance Testing:

1. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500-volt megger. The procedures listed below shall be followed:

2. Minimum readings shall be one million (1,000,000) or more ohms for # 6 AWG wire and smaller, 250,000 ohms or more for #4 wire or larger, between conductor and the grounding conductor.

3. After all devices and equipment are installed and all connections completed to each panel, the Contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the Contractor shall disconnect the branch circuit neutral wires from the neutral bar. Test each neutral conductor separately until the low readings are found. The Contractor shall correct troubles, reconnect and re-test until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

4. The Contractor shall send a letter to the Engineer certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.

5. At the final inspection, the Contractor shall furnish a megger and show the Engineers that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and a voltmeter and take current and voltage readings as directed by the representatives.

END OF SECTION 16120

## SECTION 16140 - WIRING DEVICES 275

### PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes various types of receptacles, connectors, switches and finish plates.

1.3 SUBMITTALS

A. Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each product specified.

### PART II - PRODUCTS

2.1 WIRING DEVICES

A. Comply with NEMA Standard WD 1-101968, "General Purpose Wiring Devices".

B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.

C. Color: Selected by Architect.

D. Duplex receptacles shall be of the grounding type arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall be straight blade, rated 20 amp, 125 volt and the face configuration shall conform to the NEMA Standard No. WD-1, NEMA WD-6, DSCC W-C-596G & 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. Receptacles shall be specification grade mounted vertically.

E. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicted, and with the following additional requirements:

1. Ground Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, "Ground Fault Circuit Interrupters" with integral NEMA 5-20R duplex receptacle. Design units for installation in a 2¾ inch (70-mm) deep outlet box without an adapter.

F. Receptacles, Industrial Heavy-Duty: Conform to NEMA Standard PK 4 "Plugs, Receptacles and Cable Connectors of the Pin and Sleeve type for Industrial Use".

G. Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.

H. Single pole and three or four-way toggle type as indicated on the drawings. Switches shall be of the grounding type with hex-head grounding screw rated 20 amp 120/277V 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. Color selected by Architect.

I. Motion Sensor Switches

1. Single Pole-single switching
2. Single Pole-double switching
3. Switches shall be combination ultrasonic and passive infrared.
4. 100 square foot coverage, 180 degree.
5. 120 volt: 800 watt incandescent, 1000 watt fluorescent.
6. 277 volt, 1800 watt fluorescent.
7. 5 year warranty.

J. Wall Plates: Single and combination types that mate and match with corresponding wiring devices. Features include the following:

1. Material for Finished Spaces: 0.04 inch thick, type 302, satin finished stainless steel, intermediate jumbo size except as otherwise indicated.
2. Material for Unfinished Spaces: Galvanized cast ferrous steel, standard size.
3. Provide a quantity of 2% spare cover plates for each type of device cover used to the Owner.

**PART III - EXECUTION**

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

1. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

C. Protect devices and assemblies during painting.

D. Adjust locations at which floor service outlets are installed to suit the indicated arrangement of partitions and furnishings.

E. Field verify the actual location of all outlet devices above equipment or counter tops before rough-in and installation. Any outlet installed in conflict with equipment or conditions that could have been avoided, will be corrected at the Contractor's expense.

F. Provide weatherproof cast aluminum cover plates for all devices exterior to the building or in "wet" locations, Hubbell WP26M or equal.

G. GFCI protection shall be provided for all receptacles exterior to the building, in restrooms or where required by Code.

H. Locate all receptacles in rated walls with 24" minimum horizontal separation. This includes

devices located opposite each other in the walls.

3.2 IDENTIFICATION

A. Comply with Division 16 Section "Electrical Identification".

1. Switches: Where 3 or more switches are ganged and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.

2. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least six (6) times.

B. Test ground-fault circuit interrupter operation with both local and remote fault simulations according to manufacturer recommendations.

C. Replace damaged or defective components.

3.4 CLEANING

A. General: Internally clean devices, device outlet boxes and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 16140

## SECTION 16190 - SUPPORTING DEVICES

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes secure support from the building structure for Electrical items by means of Hangers, Supports, Anchors, Sleeves, Inserts, Seals and Associated Fastenings.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type of product specified.

### PART II - PRODUCTS

2.1 COATINGS

A. Coating: Supports, support hardware and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish and inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

2.2 MANUFACTURED SUPPORTING DEVICES

A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C clamps with retainers, ceiling trapeze hangers, wall brackets and spring steel clamps.

1. Expansion Anchors: Carbon steel wedge or sleeve type.

2. Toggle Bolts: All steel spring-head type.

B. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps and cap screws.

C. U-Channel Systems: 16-gage steel channels, with 9/16-inch diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

2.3 FABRICATED SUPPORTING DEVICES

A. General: Shop or field fabricated supports or manufactured supports assembled from U-Channel components.

B. Steel Brackets: Fabricated of angles, channels and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

C. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snap-lock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:

   a. 3-inch and smaller: 20-gage
   b. 4-inch to 6-inch: 16-gage

2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.

3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

**PART III - EXECUTION**

3.1 INSTALLATION

A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.

B. Coordinate with the building structural system and with other electrical installation.

C. Raceway Supports: Comply with the NEC and the following requirements:

1. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.

2. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

3. Support parallel runs of horizontal raceways together on trapeze-type hangers.

4. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use ¼ inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

5. Space supports for raceway's types not covered by the above in accordance with NEC.

6. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.

7. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.

8. In interior spaces provide a minimum of ¼ inch space for all conduits installed on

the exterior building walls. Approved "clamp-back" or strut devices shall be used.

D. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers and other devices.

E. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.

F. Conduit Seals: Install bushing seals for conduit penetrations of slabs on grade and exterior walls below grade. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

G. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, bus ways, cabinets, panelboards, transformers, boxes, disconnect switches and control components in accordance with the following:

1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry and machine screws, welded threaded studs, or spring-tension clamps on steel. Do not weld conduit, pipe straps or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

END OF SECTION 16190

## SECTION 16195 - ELECTRICAL IDENTIFICATION

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes Identification of Electrical Materials, Equipment and Installations.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

### PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Ideal Industries, Inc.
2. National Band and Tag Co.
3. Panduit Corp.
4. Seton Name Plate Co.
5. Standard Signs, Inc.
6. W.H. Brady, Co.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

A. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width. Colors to match color schemes noted herein.

B. Underground Line Marking Tape: Permanent, bright colored, continuous printed, metallic strip, plastic tape compounded for direct burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.

C. Wire/Cable Designation Tape Markers: Vinyl or vinyl cloth, self adhesive, wrap-around, cable/conductor markers with pre-printed numbers and letter.

D. Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, switchboard branch breakers, motor control centers and other electrical equipment. Nameplates shall be securely attached with self-tapping stainless steel screws, if the screw end is protected; otherwise rivets shall be used. Letters shall be approximately ½" high minimum. Embossed self-adhesive tape is not acceptable for marking equipment.

E. Cable Ties: Fungus inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50 degrees F to 350 degrees F. Provide ties in specified colors when used for color coding.

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**PART III - EXECUTION**

3.1 INSTALLATION

A. Lettering and Graphics: Coordinate names, abbreviations, colors and other designations used in Electrical Identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.

B. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

C. Identify Junction, Pull, and Connection Boxes: Install on outside of box cover. Label box covers with identity of contained circuits. Use pressure-sensitive plastic labels at exposed locations and similar labels concealed boxes. Color code boxes as indicated below. Method shall be by colored adhesive not less than 4 square inches for 4" boxes and larger boxes. Permanent type "magic" markers are not accepted as a means of identification.

120/208 volt blue

D. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal and communications lines, install continuous underground plastic line marker, located directly above line at 6 inches below finished grade where multiple lines are installed in a common trench or concrete envelope. Provide marker tape to cover 2/3 of the overall width.

E. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

| **230/120 Volts** | **Phase** |
|---|---|
| Black | A |
| Red | B |
| White | Neutral |
| Green | Ground |

G. Use conductors with color factory-applied the entire length of the conductors except as follows:

1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.

   a. Apply colored, pressure-sensitive plastic tape in half- lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration minimum width 2".

H. Tag or label conductors as follows:

1. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking

tapes.

2. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

I. Install equipment/system circuit/device identification as follows:

1. Apply equipment identification labels of engraved plastic-laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2 inch high lettering on 1½ inch high label (2 inch high where two lines are required), white lettering in blue field for normal power equipment other face colors shall match the equipment served. Text shall match terminology and numbering of the Contract Documents and shop drawings.

2. All Phenolic labels shall be securely attached to the equipment by self-tapping stainless steel screws.

3. Name plate colors shall be as follows:

....Blue surface with white core for 120/230 Volt Equipment.

J. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker. Pencil in all spare and leave spaces blank.

K. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match the surface color scheme specified. This includes covers on boxes above lay-in and other type accessible ceilings.

L. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by pressure sensitive label applied to the conduit or outlet; designate "use" and "location served".

END OF SECTION 16195

## SECTION 16452 - GROUNDING

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### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Solid Grounding of Electrical Systems and Equipment. It includes basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.

1.3 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

### PART II - PRODUCTS

2.1 GROUNDING AND BONDING PRODUCTS

A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

B. Conductor Materials: Copper

2.2 WIRE AND CABLE CONDUCTORS

A. General: Comply with Division 16 Section "Wires and Cables". Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

B. Equipment Grounding Conductor: Green insulated

C. Grounding Electrode Conductor: Stranded cable

D. Bare Copper Conductors: Conform to the following:

| | | |
|---|---|---|
| 1. | Solid Conductors: | ASTM B-3 |
| 2. | Assembly of Stranded Conductors: | ASTM B-8 |
| 3. | Tinned Conductors: | ASTM B-33 |

2.3 MISCELLANEOUS CONDUCTORS

A. Ground Bus: Bare annealed copper bars of rectangular cross section, full-size rated.

B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.

C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

2.4 CONNECTOR PRODUCTS

A. General: Listed and labeled as Grounding Connectors for the materials used.

B. Pressure Connectors: High conductivity-plated units

C. Bolted Clamps: Heavy-duty units listed for the application

2.5 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel with high strength steel core and electrolytic grade copper outer sheath, molten welded to core.

1. Size: 3/4 inch by 10 feet

**PART III - EXECUTION**

3.1 APPLICATION

A. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

1. The raceway system shall not be relied on for ground continuity .Install an equip-ment ground conductor in all power related conduits. Size conductor as required by NEC Table 250-122. Data and Signal conduits do not require a separate grounding conductor unless required by the manufacturer of the equipment to be installed.

C. Signal and Communications: For telephone, alarm, and communication systems, provide a #6 AWG minimum green insulated copper conductor in raceway from the grounding electrode system to each terminal equipment location. Leave 3' pigtail wiring at termination point where equipment boards are shown. Make direct connection where equipment is provided.

3.2 INSTALLATION

A. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.

B. The electrical service shall be grounded by three (3) means:

1. To the cold water main, if metallic and in direct contact with the earth for at least 10 feet as per the NEC Article 250-81.

2. To the steel frame of the building, provided the building frame is effectively grounded.

3. To ground rod(s)

C. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use ¾ inch by 10 ft. ground rods except as otherwise indicated. Drive rods until tops are 6 inches below finished floor or final grade except as otherwise indicated. All ground connections shall be accessible.

D. Metallic Water Service Pipe: Provide insulated copper ground conductors, sized as indicated, in conduit from the building main service equipment, or the ground bus, to main

metallic water service entrances to the building. Connect ground conductors to the main metallic water service pipes by means of ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fitting. Do not install a grounding jumper around dielectric fittings. Bond the ground conductor conduit to the conductor at each end.

E. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

3.3 CONNECTIONS

A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.

2. Make connections with clean bare metal at points of contact.

3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.

4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.

B. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.

C. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.

D. Compression-Type Connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.

3.4 FIELD QUALITY CONTROL

A. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2 point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding

System".

B. Service Grounding Test

1. After completion of the electrical grounding and bonding systems, test the ground resistance with a ground resistance tester. Where test shown resistance-to-ground is over 25 ohms, provide additional ground rods until the minimum of 25 ohms is achieved.

C. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are detected that exceed those indicated the provisions of the Contract, covering changes will apply.

D. Report: Prepare test reports of the ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.5 CLEANING AND ADJUSTING

A. Restore surface features at areas disturbed by excavation and re-establish original grades. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition. Include necessary topsoil, fertilizing, liming, seeding, sodding, sprigging, or mulching.

END OF SECTION 16452

## SECTION 16470 – PANEL BOARDS

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes Lighting and Power Panel Boards and Associated Auxiliary Equipment Rated 600 V or Less

1.3 DEFINITIONS

A. Panel Boards: A panel board with thermal magnetic circuit-breaker branches, designed for residential and light commercial projects, operating at 600 V and below, available in both single and 3-phase versions, and equipped with combination flush/surface mounting trim.

B. Over-current Protective Device (OCPD): A device operative on excessive current that causes and maintains the interruption of power in the circuit it protects.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for each type panel board, accessory item, and component specified.

C. Shop Drawings from manufacturers of panel boards including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features and voltage rating.

D. Include the following:

1. Enclosure type with details for types other than NEMA Type 1.
2. Bus configuration and current ratings.
3. Short-circuit current rating of panelboard.
4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.

1.5 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.

B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code".

C. NEMA Standard: Comply with NEMA PB1, "Panel Boards".

D. UL Standards: Comply with UL 61, "Panel Boards", and UL 50, "Cabinets and Boxes".

**PART II - PRODUCTS**



2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Cutler Hammer
2. Square D
3. Siemens

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Over-current Protective Devices (OCPDs): Provide type, rating, and features as indicated on the schedules. Tandem circuit breakers shall not be used. Multiple breakers shall have common trip.

B. Circuit Breakers shall be bolt-on type.

C. 100% rated copper Ground and Neutral Bus (unless noted otherwise).

D. Enclosures: Cabinets, flush or surface mounted as indicted. NEMA Type 1 enclosure.

E. Front: Secured to box with concealed trim clamps except as indicated. Front for surface-mounted panels shall be same dimensions as box. Fronts for flush panels shall overlap box except as otherwise specified.

F. Directory Frame: Metal, mounted inside each panel door.

G. Bus: Hard drawn copper of 98 percent conductivity

H. Main and Neutral Lugs: Bolt-on type

I. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors.

J. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the OCPD ampere ratings indicated for future installation of devices.

K. Feed-through panels are not permitted.

M The use of series breakers is not permitted.

N. Flash protection boundary and the incident energy for the electrical equipment shall be determined in accordance with IEEE 1584 and NFPA 70E requirements.

2.3 IDENTIFICATION

A. Panel Board Nameplates: Engraved laminated plastic or metal nameplate for each panel board mounted with self-tapping stainless steel screws.

**PART III - EXECUTION**

3.1 INSTALLATION

A. General: Install panel boards and accessory items in accordance with NEMA PB 1.1,

"General Instructions for Proper Installation, Operation and Maintenance of Panel Boards Rated 600 Volts or Less" and manufacturers' written installation instructions.

B. Mounting Heights: Top of trim 6'-2" above finished floor, except as indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.

D. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval before installing. Pencil all spares. Spaces shall be left blank.

E. Install filler plates in unused spaces.

F. Provision for Future Circuits at Flush Panel Boards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future.

G. Wiring in Panel Gutters: Train conductors neatly in groups, bundle and wrap with wire ties after completion of load balancing.

3.2 GROUNDING

A. Connections: Make equipment grounding connections for panelboards as indicated.

B. Provide ground continuity to main electrical ground bus indicated.

3.3 CONNECTIONS

A. All connections shall be provided per UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Quality Control Program: Conform to the following:

1. Procedures: Field tests and Inspections will be made by the Engineer at time of completion of the work and in accordance these Specifications.

2. Schedule tests with at least one (1) week in advance notification.

B. Visual and Mechanical Inspection: Include the following inspections and related work:

1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date Drawings and Panel Board Schedules.

2. Exercise and perform of operational tests of all Mechanical components and other operable devices in accordance with manufacturer's Instruction Manual.

3. Check panel board mounting, area clearances and alignment and fit of components.

4. Check tightness of bolted electrical connections with calibrated torque wrench.

3.5 CLEANING

A. Upon completion of installation, inspect interior and exterior of panel boards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16470

## SECTION 16476 – DISCONNECTS

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### PART I - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes Equipment and Service disconnects.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for Switches and Accessories specified in this Section.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code", Article 100.

### PART II - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Cutler-Hammer Products; Eaton Corp.
2. Siemens
3. Square D Company

2.2 ENCLOSED SWITCHES

A. Enclosed Non-Fusible Switch: NEMA KS 1, Type HD, handle lockable with 2 padlocks.

B. Enclosed Fusible Switch, 800 Amperes and Smaller: NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.

C. Enclosure: NEMA KS 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.

D. Outdoor Locations: Type 3R

E. Other Wet or Damp Indoor Locations: Type 4

F. All switches shall be "Heavy Duty" rated for the voltage required.

G. Coordinate all fuse rated switches with the equipment to be furnished. Furnish fuses.

H. Safety switches shall be third-party listed.

I. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the open position.

J. Switches shall have handles whose positions are easily recognizable in the "on" or "off" position. For safety reasons, padlocks shall be provided for switches located in the public areas.

K. Switches shall have nonteasible, positive, quick make-quick-quick-break mechanisms.

L. Switches shall be properly labeled. See section 16195, Electrical Identification.

**PART III - EXECUTION**

3.1 INSTALLATION

A. Install enclosed switches level and plumb.

B. Where fuses are required, the fuses shall be matched with the equipment supplier's requirements.

C. Provide one additional set of fuses for each disconnect switch.

3.2 FIELD QUALITY CONTROL

A. Testing: After installing enclosed switches and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

B. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance. Otherwise, remove and replace with new units and re-test.

3.3 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, construction debris and repair damaged finish including chips, scratches and abrasions.

END OF SECTION 16476

## SECTION 16515 - INTERIOR LIGHTING 29.1

### PART I - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:

1. Outline drawings of fixtures indicating dimensions and principal features.

2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.

3. Data on batteries and chargers of emergency lighting units.

4. Shop Drawings from manufacturers detailing non-standard fixtures and indicating dimensions, weights, methods of field assembly, components, features and accessories.

5. Non-returnable samples, when requested by Engineer, for verification purposes of specific individual fixtures.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Listing and Labeling: Provide fixtures that are listed and labeled for their indicated use on the Project.

C. Coordination of Fixtures With Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system. Provide plaster or sheet-rock trims when required on the project whether indicated or not at no additional cost to the Owner. Coordinate with Architectural Plans before ordering fixtures.

1.5 WARRANTY

A. Minimum warranty period on emergency lights shall be three (3) years from date acceptance. Warranty shall include all parts (less lamps).

B. All other lighting products shall be warranted for a period of not less than 1 year from date of acceptance. This warranty does not include miscellaneous parts which are external to the product (i.e. lamps) which are considered maintenance item.

**PART II - PRODUCTS**

2.1 FIXTURES - GENERAL

A. Comply with the requirements specified in the Articles below and the Lighting Fixture Schedule on the Drawings.

2.2 FIXTURE COMPONENTS - GENERAL

A. Metal Parts: Free from burrs and sharp corners and edges.

B. Sheet Metal Components: Steel, except as indicated. Components are formed and supported to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating and free from light leakage under operating conditions. Arrange to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in the operating position. Light seal strips inside the fixture will not be allowed.

D. Reflecting Surfaces: Minimum reflectances as follows, except as otherwise indicated:

1. White Surfaces: 85 percent

2. Specular Surfaces: 83 percent

3. Diffusing Specular Surfaces: 75 percent

4. Laminated Silver Metalized Film: 90 percent

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic

1. Plastic: Highly resistance to yellowing and other changes due to aging, exposure to heat and UV radiation.

2. Lens Thickness: 0.125 inches minimum

2.3 SUSPENDED FIXTURE SUPPORT COMPONENTS

A. Single-Stem Hangers: ½ inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

B. Twin-Stem Hangers: Two, ½ inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.

C. Rod Hangers: 3/16 inch diameter cadmium plated, threaded steel rod.

2.4 FLUORESCENT FIXTURES

A. Electronic Ballast:

1. Ballast to be "UL listed, Class P".

2. Ballast to be "Sound Rated A".

3. Ballast enclosure size shall be same as or smaller than, magnetic ballast.

4. Light regulation shall be +/- 10% input voltage variation.

5. Ballast shall have high power factor (minimum of 90%).

6. Lamp current crest factor shall be equal to, or less than, 1.7.

7. Input current third harmonics shall not exceed ANSI recommendations (32% total harmonic distortion, 27.5% of the third triplets).

8. Flicker shall be 15% or less with any lamp suitable for the ballast.

9. Ballast design shall withstand line transients per IEEE 587, Category A.

10. Ballast case temperature shall not exceed 25 degrees C rise over 40 degrees C ambient.

11. Ballast shall meet FCC Rules and Regulations, Part 18.

12. Parallel wiring between the ballast and fixture is recommended.

13. Minimum of five (5) years warranty is required with each electronic ballast.

14. The manufacturer shall have not less than 5 years of experience in manufacturing electronic ballast.

B. Provide disconnecting means per NEC 410.130 G.

C. Low Temperature Ballast Minimum Starting Temperature: Minus 20 degrees C

D. Where compact fluorescent light fixtures are specified, "High Power Factor" electronic ballast shall be standard.

2.5 FLUORESCENT LAMPS

A. All fluorescent lamps to be {41} K-rated unless noted otherwise.

2.6 EXIT SIGNS

A. Conform to UL 924, "Emergency Lighting and Power Equipment".

1. Arrows: Include as indicated.

B. Emergency Exit Signs shall be of the "LED" style.

C. Units shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy code, NFPA-101, and NEMA Standards.

D. BATTERY-It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and – negative terminal.

E. CHARGER- It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD battery is used to disconnect the battery from the load and prevent damage from a deep discharge during extended power

outage.

F. ADDITIONAL FEATURES- Pilot light to indicate the unit is connected to AC power. The battery shall have rate discharge pilot light, unless self-diagnostic type. Test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.

G. WARRANTY-The entire unit shall be warranted for 3 years. The battery must have an additional 2 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

H. LED-The use of LED is required due to their reliable performance, low power consumption, and limited maintenance requirements. Maximum LED failure rate shall be 25% within a seven (7) year period; otherwise, if exceeded, manufacturer shall replace the complete unit at no charge to the owner.

2.7 EMERGENCY LIGHTING UNITS

A. Conform to UL 924, "Emergency Lighting and Power Equipment" requirements for "Unit Equipment". Provide self-contained units with the following features and additional characteristics as indicated.

B. Units shall be completely self-contained, provided with maintenance-free battery, automatic charger, and other features. Luminaire must be third-party listed as emergency lighting equipment, and meet or exceed the following standards: NEC, NC Building Code, Volume X Energy code, NFPA-101, and NEMA Standards.

C. BATTERY-It shall be sealed, maintenance-free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of 0 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive and – negative terminal.

D. CHARGER- It shall be fully automatic solid state type, full wave rectifying, with current limiting. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load. The unit shall be activated when the voltage drops below 80%. A low voltage disconnect switch shall be included if LEAD battery is used to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

E. ADDITIONAL FEATURES- Pilot light to indicate the unit is connected to AC power. The battery shall have rate discharge pilot light, unless self-diagnostic type. Test switch to simulate the operation of the unit upon loss of AC power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.

F WARRANTY-The entire unit shall be warranted for 3 years. The battery must have an additional 2 more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

2.8 FINISH

A. Steel Parts: Manufacturer's standard finish applied over corrosion-resistant primer, free of streaks, runs, holidays, stains, blisters, and defects. Remove fixtures showing evidence of corrosion during project warranty period and replace with new fixtures.

B. Paint parts after fabrication.

**PART III – EXECUTION**

3.1 INSTALLATION

A. Setting and Securing: Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved Shop Drawings.

B. Support For Recessed and Semi-Recessed Fixtures: Units shall be supported independent from suspended ceiling. Install fixture with support wires at 2 diagonal corners to the structure or building steel.

1. Fixtures of Sizes Less Than Ceiling Grid: Center in the acoustical panel. Support fixtures independently with at least two ¾ inch metal channels spanning and secured to the ceiling tees.

2. Install support clips or screws for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corners.

3. Support wires shall be not less than the support wires for the ceiling system.

C. Support for Suspended Fixtures: Brace pendants and rods that are 4 feet long or longer to limit swinging. Support stem mounted single unit suspended fluorescent fixtures with twin stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.

D. Lamping: See Schedule on Drawings, or provide standard lamp for the rating of the fixture.

E. Where mounting height for fixtures are not scheduled, coordinate with the Engineer before any installation.

3.2 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Emergency Battery Units Test: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy for a period of not less than 90 minutes to demonstrate proper operation of Emergency Lighting installation. Include the following in tests of emergency lighting equipment.

1. Duration of supply
2. Low battery voltage shut-down
3. Normal transfer to battery source and retransfer to normal
4. Low supply voltage transfer

C. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

D. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes. The battery test shall be done 10 days prior to final inspection by the State Construction Office. Any unit which fails the test must be repaired or replaced and tested again. Copy of the test report shall be sent to the State Construction Office.

3.3 ADJUSTING AND CLEANING

A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION 16515

## PART 4- COMPENSATION FOR ELECTRICAL

The work of furnishing and installing electrical work in the North & South Bound Rest Area Service Building and Vending Building in accordance with the plans and specifications, completed and accepted, will be paid for at the contract lump price for " Electrical installation for the N & SBL Rest Area Building & Vending Building". Such price and payment will be full compensation for all work of constructing the North & South Bound Lane Rest Area service building and Vending Building, including but not limited to furnishing all transportation, materials, labor, tools, equipment, fees and incidentals necessary to complete the work. Payment will be made under:

"Electrical Installation Rest Area Serv Bldg NBL / SBL". . . . . Lump Sum

"Electrical Installation Vend Building NBL / SBL" . . . . . Lump Sum