

Rest Area Site Work



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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 (WBL).....Lump Sum
Landscape Planting (EBL).....Lump Sum

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							

<i>Pennant</i> + <i>Endurance</i> + <i>Gallery</i>	Metolachlor + Prodiamine + Isoxaben	Liquid (5G) + 65 WDG + 75 DF	3750 + >5,000 + 5,000	2 - 3 pts. (40#) + 2# + 1#	1.95 - 2.93# (2#) + 20 lbs. + 1#	NA	Spring application; use tank agitation when mixing.
Post-emergent							
<i>Roundup</i>	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 Yard
Post-Emergent Herbicidal Treatment for Plant Beds.....Square Yard

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 Col-Met Commercial Grade Metal Edging or equivalent. Metal Edging will be 3/16" (4.8mm) hot rolled low carbon steel (ASTM-A-36, ASTM-A-283, ASTM-A-569) with a 6" width. Edging will include a minimum of 4 stakes per 10' length. Stakes will be 16" long. Prefabricated corners and prefabricated chamfered ends shall be used per manufacturer instructions. 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 pine bark mulch (approximately 2-2 1/2" size) . 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 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:

Mulch for PlantingCY

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. Should a problem occur with the on site water system the contractor will be required to furnish water from an alternative source with no additional compensation to the contractor. All applicable sections of Section 1060, 'Landscape Development Materials' and Section 1670, 'Planting' of the Standard Specifications will apply.

Water during the 12 month establishment period is an incurred cost incidental to the overall cost of the landscape planting.

Payment will be made under:

Water for PlantingM / 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 'Temporary 72" Chain Link Fence,' measured in linear feet satisfactorily installed and accepted and 'Temporary 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 (WBL) Lump Sum
Site Demolition (EBL) Lump Sum

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.

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 (WBL)	LS
Landscape and Site Grading (EBL)	LS
Topsoil	CY

STORMWATER COLLECTION SYSTEM

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:

General

The work covered by this provision consists of excavation, fabrication, furnishing, installing all items associated with the storm water collection system, including but not limited to, 6000 gal underground cistern, cistern access risers, pre-cistern filter, system monitor, sensors and controller, drain pipe fittings, overflow pipes, ventilation pipe(s), municipal make-up water connections and equipment, irrigation pump and the making of proper electrical and plumbing connections to collect (and monitor) the storm water as shown on the plans and as directed by the Engineer.

The storm water collection system involves the directive process of rainwater harvesting from the roof leaders that is diverted through a filter and stored in an underground cistern for future site irrigation use.

D) SUMMARY- Rainwater Harvesting System

A. Section Includes:

1. Rainwater prefilters.
2. Storage tanks.
3. Distribution pumps.
4. Controls.
5. Secondary filters.
6. Additional purification.
7. Expansion tanks.
8. Pressure switches.

REFERENCES

- B. American Society of Mechanical Engineers (ASME) - International Boiler and Pressure Vessel Code.
- C. Underwriters Laboratories, Inc. (UL) - Listed Products Directory.

SYSTEM DESCRIPTION

- D. Customized rainwater harvesting system consisting of manufactured components integrated into automated system.
- E. Design Requirements:
 1. Filter, store, and distribute harvested rainwater.
 2. Protect public health and safety.
 3. Mitigate scale and corrosion.
 4. Provide aesthetically pleasing appearance.
- F. Treatment Method: May include particulate filtration, ultraviolet treatment, carbon filtration, or a combination thereof.

SUBMITTALS

- G. Submittals for Review:
 1. Shop Drawings: Include system layout, components, wiring diagrams, and accessories.
 2. Product Data: Provide for system components; include dimensions, capacities, operating characteristics, utility connections, and accessories.
 3. Engineer sealed and certified drawing(s) on the placement and structural integrity, bearing capacity and operational systems within the cistern.
- H. Quality Control Submittals:
 1. Certificates of Compliance: Pressure vessel test reports per ASME Code Rules, Section VIII, Division 1, Form U-1.
- I. Closeout Submittals:
 1. Operation and Maintenance Data:

- a. Provide instructions on operation, calibration, troubleshooting, and servicing equipment.
- b. Include layout drawings, parts lists, and component manufacturer's product data.

QUALITY ASSURANCE

J. Manufacturer Qualifications:

1. Minimum 3 years experience in work of this Section.
2. Successful completion of minimum of 5 previous projects of similar scope and complexity.

K. Installer Qualifications:

1. Minimum 3 years experience in work of this Section.
2. Successful completion of minimum of 5 previous projects of similar scope and complexity.
3. Maintain factory trained technicians on staff to provide field service and warranty work.

L. Electrical Components: Listed by UL.

DELIVERY, STORAGE AND HANDLING

- M. Do not deliver system components until time needed for installation, and after proper protection can be provided.
- N. Protect components from damage and corrosion.
- O. Leave protective coverings in place until just prior to installation.

PRODUCTS

MANUFACTURERS

P. Acceptable Manufacturers - Storage Tanks:

Q.

1. Loomis
2. ACF Environmental.
3. Containment Solutions, Inc., Conroe, TX.
4. Norwesco.
5. Xerxes.

R. Acceptable Manufacturers - Pumps and Pump Skids:

1. Dab
2. Goulds.
3. Grundfos.

- S. Acceptable Manufacturers – Controls, Sensors and Float Switches:
1. Control Systems, Inc.
 2. RainHarvest Systems
 3. Flowline.
 4. Goulds.
 5. Jay R. Smith Mfg. Co.
- T. Acceptable Manufacturer - Rainwater Filters and Storage Tank Accessories:
1. Jay R. Smith Mfg. Co.
 2. Graf
 3. Rainwater Technologies
- U. Substitutions: [only by approval of the Engineer/Landscape Architect)

COMPONENTS

V. Rainwater Filter:

Commercial grade rainwater harvesting installations. High efficiency, below ground, self cleaning, 0.35 mm mesh filter with lockable lid.

W. Storage Tank:

1. Polyethylene, produced with resins meeting FDA specifications for potable water storage.
2. Storage capacity: 6000 gallons.
3. Manhole extensions and lid/riser combinations for access at ground level.
4. Ventilation: To suit project conditions.

**** OR ****

X. Storage Tank:

1. Modular tank system with PVC liner, designed to specific project requirements.
2. Penetrations and pump connections designed into tank configuration.
3. Storage capacity: 6000 gallons.
4. Manhole extensions and lid/riser combinations for access at ground level.
5. Ventilation: To suit project conditions.

**** OR ****

Y. Storage Tank:

1. Precast reinforced concrete
2. Penetrations custom manufactured.

3. Storage capacity 6000 gallons.
4. Manhole extensions and lid/riser combinations for access at ground level.
5. Ventilation: To suit project conditions.

Z. Pumps and Pump Skids:

1. Pump capacity: 30 gallons per minute (or minimum GPM spec'd to supply the irrigation system) at PSI consistent with what is applicable for the irrigation system
2. Submersible pumps: Manufactured specifically for submersible operation.
3. Stainless steel construction.
4. Connected to floating filter intake.
5. Low water cutoff switch.
6. Plumbed to allow for removal without entering tank.
7. Connected to power supply by power cable and waterproof connections.

AA. Storage Tank Accessories:

1. Smoothing inlets:
Description: Stainless steel smoothing inlet for a [4] [8] inch inlet pipe.
2. Floating filter and hose:
Description: Stainless steel filter housing and mesh fabric, and polyethylene floating ball.
3. Overflow device:
Description: Impact-resistant ABS plastic overflow device with support strut and clamp for 4 inch overflow piping.
4. Level indicator:
Description: Wireless storage tank level sensor.
5. Float switch:
Description: Polyethylene switch
6. Second source storage tank float switch:
Description: Polyethylene switch level and float housing with flexible cable; control normally closed solenoid valve.

BB. Control Panel:

1. Housed in Nema 4 hinged wall mount enclosure with back plate, fully integrated into rainwater harvesting system, prefabricated and configured to run pumps as required.

2. System controller to monitor water level, backup water source valve control, and filter rinse cycle.
3. Service monitoring and alerts.
4. Integrated tank mounted sensors.

CC. Expansion Tanks and Pressure Switches:

1. Pressure tank: Sized to system requirements and to meet or exceed manufacturer's specifications; minimum flow rate of 3 x pump system.
2. Pressure switch, gauge, boiler drain, and brass nipple.

ACCESSORIES

- DD. Bulkhead fittings, sized to match system inlet, outlet, pump flow rate, vents, and other penetrations.
- EE. Vent assembly: PVC rodent-proof cap for tank air and vacuum relief; extend from top of tank to above grade.
- FF. Waterproof electrical connection box: Located in manway, field installed.

SOURCE QUALITY CONTROL

- GG. Assemble and test systems and/or equipment in factory prior to shipment to Project site.
- HH. Hydrostatically test prefabricated pump assembly in factory prior to shipment to Project site.

INSTALLATION

- II. Install system components in accordance with manufacturer's instructions and approved Shop Drawings.
- JJ. Arrange equipment so that components requiring removal or maintenance are readily accessible without disturbing other components. Arrange for clear passage between components.
- KK. Connect to utility supplies and equipment.
- LL. Ground components in accordance with component manufacturer's instructions.
- MM. Install prefilters at time storage tanks are installed.
- NN. Do not bury filters deeper than manufacturer's recommended depth unless a vault is installed.

FIELD QUALITY CONTROL

Include the following for on-site startup services by System Integrator.

- OO. System Integrator; provide startup services to include:
 1. Installation oversight and technical support.
 2. Terminate and test control system wiring and operation of electrical components.
 3. Demonstrate proper pump and controls operation.
 4. Make adjustments to meet user-defined system performance.
 5. Review operation and maintenance procedures with Owner's representative

Compensation

Stormwater Collection 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:

- Stormwater Collection System (WBL) Lump Sum**
- Stormwater Collection System (EBL) Lump Sum**

STORMWATER DRAINAGE SYSTEM

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 water drainage and related work indicated on the drawings or in the specifications in general as follows:

General

The work covered by this provision consists of excavation, fabrication, furnishing, installing all items associated with the storm water drainage system, including but not limited to, drop inlets, subsurface drain pipes, fittings, downspout adapters, cleanouts, and connections, all at required depths to facilitate proper flow, as shown on the plans and as directed by the Engineer.

Drainage Structures

The drainage structure shall meet all NC Department of Transportation Standard Specifications and as defined by the plans and special provisions as defined for this project.

Materials

The landscape catch basin structures, riser, and outlets shall be constructed of high impact polyolefin plastic (rated for heavy loads). A 'universal outlet' for each opening

shall be standard. The inlet grate shall be cast iron, galvanized steel or approved equal. The inlet grate shall be from the same manufacturer as the catch basin and shall be suitable for pedestrian traffic. If necessary, 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) or polyvinyl chloride (PVC) meeting requirements of ASTM, NCDOT, and manufacturers specifications. To be installed as noted below and on the plans. All fittings, adapters, and connection shall be installed according to applicable specifications.

For Drainage from Drop Inlet or Catch basins	For Permeable Paver Subsurface Drainage	For Storm Water Pipe to Cistern
Smooth Core (3"-6") CPP ASTM-F-2306-"S" (12"-60") CPP ASTM-F-2306-"S"	Single Wall (perforated) (3"-10") CPP AASHTO-M-252-"C" (12"-60") CPP AASHTO-M-294-"C"	PVC (DWV) SCH 40

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

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:

- Stormwater Drainage System (WBL) Lump Sum**
- Stormwater Drainage System (EBL) Lump Sum**

9" CONCRETE BORDER - CLASS A CONCRETE

General: The work covered by this item shall consist of furnishing and constructing 9" wide concrete border in coordination with the installation of the permeable pavers and accordance with the dimensions as shown in the drawings and as described herein.

The 9" concrete border construction shall conform to all applicable requirements of Section 848 (Sidewalks and Driveways) of the Standard Specifications.

Method of Measurement

The quantity of 9" concrete border to be paid for shall be the actual number of square yards of 9" concrete border, 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 "9" Concrete Border " 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:

9" Concrete Border 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 and joints 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

PERMEABLE PAVERS

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

The placement of the permeable pavers shall include, but is not limited to, the excavation and final level and grading of the earth base, the placement leveling and compaction of all stone subbase material, the installation of geotextile fabric where deemed necessary, the placement leveling and compaction of the concrete pavers and joint aggregate, and the completion, cleaning and protection of the permeable paver system until the completion of all construction activities.

All completed sections of permeable pavers shall be covered or protected from any construction debris, soil, or degradation of the permeability of the surface until site construction is completed or final acceptance of the staged construction is approved by the Engineer.

Materials and Construction

Paver shall be Pavestone "Eco-Venetian Stone", Belgard "Subterra", Unilock "Eco Priora" 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. The concrete edging and storm water drainage system (separate pay items) are instrumental in the placement of the permeable pavers and shall be installed in coordination with the pavers and as noted on the plans and details. Edging shall be placed in line and plumb with proposed grades and sidewalks.

See further 'material' notes below defining aggregate for sub(base) and filler.

Submittals

- A. Manufacturer's drawing and details: Indicate perimeter conditions, junction with other materials, expansion and control joints, paver installation, and details. Indicate layout, pattern, and relationship of paving joints to fixtures and project formed details.
- B. Minimum 3 lb (2 kg) samples of subbase, base and bedding aggregate materials.
- C. Sieve analysis of aggregates for subbase, base and bedding materials per ASTM C 136.
- D. Soils report indicating density test reports, classification, and infiltration rate measured on-site under compacted conditions, and suitability for the intended project.

E. Permeable concrete pavers:

1. Manufacturer's product catalog sheets with specifications.
2. Four representative full-size samples of each paver type, thickness, color, and finish. Submit samples indicating the range of color expected in the finished installation.
3. Accepted samples become the standard of acceptance for the work of this Section.
4. Manufacturer's written product specifications.

Paver Installation Subcontractor:

1. A copy of Subcontractor's current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
2. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
3. Written Method Statement and Quality Control Plan that describes material staging and flow, paving direction and installation procedures, including representative reporting forms that ensure conformance to the project specifications.

Quality Assurance:**A. Paver Installation Subcontractor Qualifications:**

1. Utilize an installer having successfully completed concrete paver installation similar in design, material and extent indicated on this project.
2. Utilize an installer holding a current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.

B. Regulatory Requirements and Approvals: Specify applicable licensing, bonding or other requirements of regulatory agencies.

C. Review the manufacturers' quality control plan, paver installation subcontractor's Method Statement and Quality Control Plan with pre-construction meeting of representatives from the manufacturer, paver installation subcontractor, general contractor, engineer and/or owner's representative.

Mock-Ups:

1. Install a 10 ft x 10 ft (3 x 3 m) paver area.
2. Use this area to determine surcharge of the bedding layer, joint sizes, lines, laying pattern(s), color(s) and texture of the job.
3. This area will be used as the standard by which the work will be judged.

4. Subject to acceptance by owner, mock-up may be retained as part of finished work.
5. If mock-up is not retained, remove and properly dispose of mock-up.

Delivery, Storage, and Handling

- A. General: Comply with all product requirement sections.
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged container packaging with identification tags intact on each paver bundle.
 1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
 2. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by forklift or clamp lift.
 3. Unload pavers at job site in such a manner that no damage occurs to the product or existing construction
- D Storage and Protection: Store materials in protected area such that they are kept free from mud, dirt, and other foreign materials.

Environmental Requirements:

- A. Do not install in rain or snow.
- B. Do not install frozen bedding materials.

Maintenance:

- A. Extra materials: Provide 100 sq feet of extra material (representative sample of pavers) for use by owner for maintenance and repair.
- B. Pavers shall be from the same production run as installed materials.

Crushed Stone Filler, Bedding, Base and Subbase:

- A. Crushed stone with 90% fractured faces, LA Abrasion < 40 per ASTM C 131, minimum CBR of 80% per ASTM D 1883.
- B. Do not use rounded river gravel.
- C. All stone materials shall be washed with less than 1% passing the No. 200 sieve.
- D. Joint/opening filler, bedding, base and subbase: conforming to ASTM D 448 gradation as shown in Tables 1, 2 and 3 below:

Note: No. 89 or finer gradation may be used to fill permeable pavers with narrow joints.

Table 1

ASTM No. 8 Grading Requirements

Bedding and Joint/Opening Filler

Sieve Size Percent Passing

12.5 mm (1/2 in.) 100

9.5 mm (3/8 in.) 85 to 100

4.75 mm (No. 4) 10 to 30

2.36 mm (No. 8) 0 to 10

1.16 mm (No. 16) 0 to 5

Table 2

ASTM No. 57 Base

Grading Requirements

Sieve Size Percent Passing

37.5 mm (1 1/2 in.) 100

25 mm (1 in.) 95 to 100

12.5 mm (1/2 in.) 25 to 60

4.75 mm (No. 4) 0 to 10

2.36 mm (No. 8) 0 to 5

Table 3

Grading Requirement for ASTM No. 2 Subbase

Sieve Size Percent Passing

75 mm (3 in.) 100

63 mm (2 1/2 in.) 90 to 100

50 mm (2 in.) 35 to 70

37.5 mm (1 1/2 in.) 0 to 15

19 mm (3/4 in.) 0 to 5

E. Gradation criteria for the bedding and base:

Note: D_x is the particle size at which x percent of the particles are finer. For example, D_{15} is the particle size of the aggregate for which 15% of the particles are smaller and 85% are larger.

1. D_{15} base stone / D_{50} bedding stone < 5 .
2. D_{50} base stone / D_{50} bedding stone > 2 .

Accessories:

A. Provide accessory materials as follows:

Note: Curbs will typically be cast-in-place concrete or precast set in concrete haunches. Concrete curbs may be specified in another Section. Do not use plastic edging with steel spikes to restrain the paving units.

Edge Restraints

9" Concrete Border or Metal landscape Edging (as defined in the plans, details or specifications).

2. Geotextile Fabric:

Note: See ICPI publication, Permeable Interlocking Concrete Pavements for guidance on geotextile selection. Geotextile use may be necessary if found to be instrumental in the construction of the permeable paver systems due to manufacturer specification or soil and aggregate tests.

Execution:

Examination:

The elevations and surface tolerance of the soil subgrade determine the final surface elevations of concrete pavers. The paver installation contractor cannot correct deficiencies excavation and grading of the soil subgrade with additional bedding materials. Therefore, the surface elevations of the soil subgrade should be checked and accepted by the General Contractor or designated party, with written certification presented to the paver installation subcontractor prior to starting work.

A. Acceptance of Site Verification of Conditions:

1. General Contractor shall inspect, accept and certify in writing to the paver installation subcontractor that site conditions meet specifications for the following items prior to installation of interlocking concrete pavers.

Compaction of the soil subgrade should be determined by the project engineer. If the soil subgrade requires compaction, compact to a minimum of 95% standard Proctor density per ASTM C 698. Compacted soil density and moisture should be checked in the field with a nuclear density gauge or other test methods for compliance to specifications.

Stabilization of the soil and/or base material may be necessary with weak or continually saturated soils, or when subject to high wheel loads. Compaction will reduce the permeability of soils. If soil compaction is necessary, reduced infiltration may require drain pipes within the open-graded sub base to conform to local storm drainage requirements.

- a. Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
 - b. Provide written density test results for soil subgrade to the Owner, General Contractor and paver installation subcontractor.
 - c. Verify location, type, and elevations of edge restraints, [concrete collars around] utility structures, and drainage pipes and inlets.
2. Do not proceed with installation of bedding and interlocking concrete pavers until subgrade soil conditions are corrected by the General Contractor or designated subcontractor.

Preparation:

- A. Verify that the soil subgrade is free from standing water.
- B. Stockpile joint/opening filler, base and subbase materials such that they are free from standing water, uniformly graded, free of any organic material or sediment, debris, and ready for placement.
- C. Edge Restraint Preparation:

Install edge restraints per the drawings [at the indicated elevations].

Installation:

The minimum slope of the soil subgrade should be 0.5%. Actual slope of soil subgrade will depend on the drainage design and exfiltration type. All drainpipes, observation wells, overflow pipes, geotextile (if applicable) and impermeable liner (if applicable) should be in place per the drawings prior to or during placement of the subbase and base, depending on their location. Care must be taken not to damage drainpipes during compaction and paving. No mud or sediment can be left on the base or bedding aggregates. If they are contaminated, they must be removed and replaced with clean materials.

A. General

1. Any excess thickness of soil applied over the excavated soil subgrade to trap sediment from adjacent construction activities shall be removed before application of the [geotextile] and subbase materials.
2. Keep area where pavement is to be constructed free from sediment during entire job. [Geotextiles] Base and bedding materials contaminated with sediment shall be removed and replaced with clean materials.

3. Do not damage drainpipes, overflow pipes, observation wells, or any inlets and other drainage appurtenances during installation. Report any damage immediately to the project engineer.

B. Geotextiles

1. Place on [bottom and] sides of soil subgrade. Secure in place to prevent wrinkling from vehicle tires and tracks.

2. Overlap a minimum of [0.3 in (12 in.)] [0.6 m (24 in.)] in the direction of drainage.

C. Open-graded subbase and base

1. Moisten, spread and compact the No. 2 subbase in 4 to 6 in. (100 to 150 mm) lifts [without wrinkling or folding the geotextile. Place subbase to protect geotextile from wrinkling under equipment tires and tracks.]

2. For each lift, make at least two passes in the vibratory mode then at least two in the static mode with a minimum 10 t (10 T) vibratory roller until there is no visible movement of the No. 2 stone. Do not crush aggregate with the roller.

3. The surface tolerance of the compacted No. 2 subbase shall be $\pm 2 \frac{1}{2}$ in. (± 65 mm) over a 10 ft (3 m) straightedge.

4. Moisten, spread and compact No. 57 base in 100 mm (4 in.) lift over the compacted No. 2 subbase with a minimum 10 t (10 T) vibratory roller until there is no visible movement of the No. 57 stone. Do not crush aggregate with the roller.

5. The surface tolerance the compacted No. 57 base should not deviate more than. ± 1 in. (25 mm) over a 10 ft (3 m) straightedge.

In-place density of the base and subbase may be checked per ASTM D 4254. Compacted density should be 95% of the laboratory index density established for the subbase and base stone.

D. Bedding layer

1. Moisten, spread and screed the No. 8 stone bedding material.

2. Fill voids left by removed screed rails with No. 8 stone.

3. The surface tolerance of the screeded No. 8 bedding layer shall be $\pm 3/8$ in (10 mm) over a 10 ft (3 m) straightedge.

4. Do not subject screeded bedding material to any pedestrian or vehicular traffic before paving unit installation begins.

E. Permeable interlocking concrete pavers and joint/opening fill material

1. Lay the pavers [paving slabs] in the pattern(s) and joint widths shown on the drawings. Maintain straight pattern lines.

2. Fill gaps at the edges of the paved area with cut units. Cut pavers subject to tire traffic shall be no smaller than 1/3 of a whole unit.
3. Cut pavers and place along the edges with a [double-bladed splitter or] masonry saw.
4. Fill the openings and joints with [No. 8] stone.

Note: Some paver joint widths may be narrow and not accept most of the No. 8 stone. Use joint material that will fill joints such as washed ASTM No. 9 or No. 10 stone. These smaller stone sizes are recommended for filling joints in pedestrian applications that use 2 3/8 in. (60 mm) thick pavers.

5. Remove excess aggregate on the surface by sweeping pavers clean.
6. Compact and seat the pavers into the bedding material using a low-amplitude, 75-90 Hz plate compactor capable of at least 4,000 lbs (18 kN) centrifugal compaction force. This will require at least two passes with the plate compactor.
7. Do not compact within 6 ft (2 m) of the unrestrained edges of the paving units.
8. Apply additional aggregate to the openings and joints, filling them completely. Remove excess aggregate by sweeping then compact the pavers. This will require at least two passes with the plate compactor.
9. All pavers within 6 ft (2 m) of the laying face must be left fully compacted at the completion of each day.
10. The final surface tolerance of compacted pavers shall not deviate more than $\pm 3/8$ (10 mm) under a 10 ft (3 m) long straightedge.
11. The surface elevation of pavers shall be 1/8 to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.

Field Quality Control:

- A. After sweeping the surface clean, check final elevations for conformance to the drawings.
- B. Lippage: No greater than 1/8 in. (3 mm) difference in height between adjacent pavers.

The minimum slope of the finished pavement surface should be 1%. The surface of the pavers may be 1/8 to 1/4 in. (3 to 6 mm.) above the final elevations after compaction. This helps compensate for possible minor settling normal to pavements.

- C. The surface elevation of pavers shall be 1/8 to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.

Protection:

A. After work in this section is complete, the General Contractor shall be responsible for protecting work from sediment deposition and damage due to subsequent construction activity on the site.

References:

A. American Society for Testing and Materials (ASTM)

1. C 67, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
2. C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
3. C 136, Method for Sieve Analysis for Fine and Coarse Aggregate.
4. C 140, Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8 – Freezing and Thawing.
5. D 448, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
6. C 936, Standard Specification for Solid Interlocking Concrete Pavers.
7. C 979, Specification for Pigments for Integrally Colored Concrete.
8. D 698, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5-lb (2.49 kg) Rammer and 12 in. (305 mm) drop.
9. D 1557, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (4.54 kg) Rammer and 18 in. (457 mm) drop.
10. D 1883, Test Method for California Bearing Ratio of Laboratory-Compacted Soils.
11. D 4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

C. Interlocking Concrete Pavement Institute (ICPI)

1. Permeable Interlocking Concrete Pavement manual.

Method of Measurement and Basis of Payment

The work of furnishing and installing Permeable 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 "Permeable 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, preparation and construction of the subbase, the installation of pavers and any other incidentals necessary to complete the work.

Payment will be made under:

Permeable PaversSF

ORNAMENTAL WELDED WIRE FENCE

General: The work covered by this section shall consist of furnishing and installing the Ornamental Welded Wire Fence, and all associated items, in accordance with dimensions and finishes as shown on the plans, the details, and as described herein.

PRODUCT

Manufacturer:

The fencing system shall be manufactured by a single source. The fence shall be fabricated to allow for a 72 inch nominal finished height. The color of the fence system shall be Black.

Materials:

- A. Structural Components: All posts and rails used in the fence system shall be manufactured from coil steel having a minimum yield strength of 55,000 psi. The steel shall be galvanized to meet the requirements of ASTM A525 with a zinc coating weight of 0.60-1.0 ounces per square foot.
- B. Infill: Section infill wires shall be steel with a minimum yield strength of 50,000 psi. The steel shall be galvanized to meet the designation of "regular coating" in accordance with requirements of ASTM A641-98.
- C. Concrete: the posts shall be set in a concrete base in accordance to manufacturer specification as applicable to specific site and its conditions.

Finish:

- A. Pretreatment: A five-stage non-chrome pretreatment shall be applied. The final stage shall be a dry-in-place activator, which produces a uniform chemical conversion coating for superior adhesion.
- B. Coating: Fence materials shall be coated with a TGIC polyester powder-coat finish system. Epoxy powder coatings, baked enamel or acrylic paint finishes are not acceptable. The FencCoat finish shall have a cured film thickness of 2 mils minimum.
- C. Tests: The cured finish shall meet the following:
 - 1. Humidity resistance of 1,000 hours using ASTM D2247.
 - 2. Salt-spray resistance of 1,000 hours using ASTM B117.
 - 3. Outdoor weathering shall show no adhesion loss, checking or crazing, with only slight fade and chalk when exposed for 3 years in Florida facing south at a 45-degree angle.

Manufacture and Fabrication:

A. Fence Sections shall be manufactured with 1" square x 18 gauge (.049) tubing welded every 12" to the top and bottom of welded wire panels. Welded wire panels shall be comprised of [2 (.2625"), 4 (.2253"), or 6 (.192") gauge] (Washburn & Moen Standard) vertical wires and 6 (.192") gauge horizontal wires. Verticals of 2 and 4 gauge wire shall be placed 3½" on center. 6 gauge verticals shall be placed on 1¾" centers. Horizontal wires shall be 6 gauge and spaced to provide style differences but no further apart than would allow substantial rigidity of vertical wires. Horizontal and vertical wires shall be assembled by automatic machines or other suitable mechanical means that will ensure accurate spacing and alignment of all members of the finished fabric. The wires shall be connected at every intersection by electric resistance welding in accordance with all requirements in ASTM A185. Sections shall be capable of supporting a 550 lb. load applied vertically at midspan and a concentrated load of 225 lbs. applied horizontally at midspan without permanent deformation.

B. Posts shall be [1½" or 2"] square x 16 gauge (.065") steel tubing. Posts shall be spaced [72" on center (for traditional installation method) or 96" on center (for pass-by system)]. Steel rail ends shall be screwed to terminal posts to receive the 1" square top and bottom rails. The rails shall be secured to the rail ends by stainless steel screws. Inserts shall be used to couple sections for the pass-by system. Steel caps shall be provided with all posts.

C. Gates shall be assembled using panel material and gate ends with 1" or greater outside cross-section dimensions. Heavy-duty corner stampings shall be used to bolt each upright and rail intersection. All gates shall support a 300 lb. vertical load on the latch side of the gate without collapsing. Walk gates for BOCA Pool fences shall be self-closing and self-latching.

Submittals

Manufacturer's drawing, details, and finishes.

Warranty:

The entire fence system shall have a manufacturers written 8 year Limited Warranty against defects in workmanship and materials. In addition, the FencCoat finish shall be warranted not to crack, chip, peel, or blister for the same period.

Method of Measurement and Basis of Payment

The work of furnishing and installing of the Ornamental Welded Wire Fence as shown on the plans or as approved by the Engineer, when completed and accepted, will be paid for at the unit price per linear feet for "Ornamental Welded Wire Fence". 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, erection and construction of the post base, the installation of fence and all other incidentals necessary to complete the work.

Payment will be made under:

Ornamental Welded Wire FenceLF

SEGMENTED RETAINING WALL

General: Work includes furnishing and installing precast concrete modular block stone retaining wall units. Acceptable product and manufacturers are Triangle Precast Block Stone, Anchor Wall Natural Impressions, Redi Rock LedgeStone, and Manitou Stone (or approved equal) with a 4" light grey precast capstone 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.

Materials and Construction

Modular Wall Units

- A. Wall units shall be 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. **All exterior wall face(s) 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.

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).

Submittals

Modular Wall Block:

1. Manufacturer’s product catalog sheets with specifications.
2. Four representative full-size samples of the type, thickness, color, and finish. Submit samples indicating the range of color expected in the finished installation.
3. Accepted samples become the standard of acceptance for the work of this Section.
4. Manufacturer’s written product specifications.

Mock-Ups:

1. Install a 10 ft wide x 3 ft tall wall section
2. Use this area to determine block placement, pattern, drainage, and elevation requirements.
3. This area will be used as the standard by which the work will be judged.
4. Subject to acceptance by owner, mock-up may be retained as part of finished work.

No work on the final construction of the retaining wall shall proceed until the wall section is approved by the Landscape Architect.

5. If mock-up is not retained, remove and properly dispose of mock-up.

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 1/2" 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. The acceptable model is the "Elite Park Bench" distributed 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 orcaboard 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 (3' x 8') 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 damaged 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:

Relocated Picnic Shelter 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 as manufactured by American Flagpole, NorthStar or approved equal. 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

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 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

SODDING

Sodding (Tall Fescue/Bluegrass Mixture)

General: The sodding shall be prepared in accordance with all applicable requirements of Section 1664 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 supplier's 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 1/4 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 1/4 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:

SoddingSquare Yard

GRAVEL CONSTRUCTION ENTRANCE

Description

This work consists of furnishing, installing, and maintaining and removing any and all material required for the construction of a *Gravel Construction Entrance*.

Materials

Refer to Division 10

Item	Section
Filter Fabric for Drainage, Type 2	1056
Stone for Erosion Control, Class A	1042

Construction Methods

The Contractor will install a Gravel Construction Entrance in accordance with Standard Drawing No. 1607.01 and at locations as directed.

Compensation

Filter Fabric for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Stone for Erosion Control, Class A will be measured and paid for in accordance with Article 1610-4 of the *Standard Specifications*.

Such price and payment will be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of Gravel Construction Entrance.

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 1 to 4 inches in length by 1 to 4 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 Ton

STEPPING STONE

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

Materials: The Stepping Stone will consist of Tennessee flagstone or fieldstone, or approved equal available from local North Carolina source. The stone shall be similar in color and consistency as all other river stone or boulders used on the site. The stone shall be irregular in shape and size, but approximately 2' x 2' but not to exceed 3' in width or length. The stone shall be a minimum of 2" thick. The stepping stone will be placed on a aggregate base for leveling and stability. The cost of the aggregate will be incidental to the cost of the Stepping Stone.

A representative sample and the source of the Stepping 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 Stepping Stone as shown on the plans and as approved by the Engineer, when completed and accepted, will be paid for at the unit price per each "Stepping 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:

Stepping Stone EA

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BOULDERS

General

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

This pay item is separate and independent of the stone used for the waterfall.

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

The work of furnishing and installing boulders, when completed and accepted, will be paid for at the contract unit price per each 'Boulder'.

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:

BoulderEA

SPLIT RAIL FENCING RELOCATION

General: The work covered by this special provision consist of removing existing split rail fence (in areas directly affected by construction), stockpiling and then re- installing it at locations shown on the plans (to be provided during stage 1 const activities) 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 Fencing Relocation Linear Feet

IRRIGATION SYSTEM

General: The Contractor shall provide all materials and labor to install an Irrigation System utilizing rotors, spray heads and drip emitters in accordance with the plans and specifications. The contractor shall coordinate their work with all components to operate the system by drawing water from an underground 6,000 gallon cistern (tank specified elsewhere).

The Contractor shall provide all labor, equipment, and materials for the installation of the irrigation system including but not limited to layout, trenching, backfilling, providing and installing pipe, valves, filters, pressure regulators, pump, pressure tank, drip tubing, drains, controller, wiring, boring sleeves.

The Contractor shall be a North Carolina certified irrigation contractor familiar with all state and local regulations and ordinances concerning irrigation systems and obtain permits that are necessary for the installation of the irrigation system.

The Contractor shall lay out work as accurately as possible in accordance with the irrigation Design plan that is to be designed by the contractor and approved by the engineer.

The Contractor shall furnish a transferable certificate of warranty registration and a guarantee of work and materials for a one-year period from date of final acceptance of the system. Final payment for the system shall not be made unless this certification is presented to the Engineer.

The Contractor shall conduct his operations in such a manner to prevent injury to trees, shrubs, and turf or other types of vegetation that are to remain growing. When any such injuries to trees or shrubs occur, broken branches shall be removed and rough edges of scarred areas shaped and made smooth in accordance with generally accepted horticultural practice. All scarred areas and cut surfaces more than one (1) inch in diameter shall then be thoroughly covered with tree paint. Any plants that are damaged to such an extent as to destroy their value for landscape purposes shall be cut and disposed of and replaced in kind by the Contractor at no cost to the Department when so directed by the Engineer.

The Contractor shall be responsible for full and complete coverage of irrigated area and shall make any necessary minor adjustments or as directed by the Engineer at no additional costs. The Contractor shall prepare an "as-built" drawing on a blue-line print which shall include locations of all parts of the irrigation system installed by the Contractor. This may include, but is not limited to all system controllers, valves (automatic and manual), pipe, bores, drip tube, wires, wire splices, and any deviation from the contract bid documents. Two (2) copies of the "as-built" drawing shall be supplied to the Department of Transportation.

The Contractor shall be responsible for training personnel in the operation and maintenance of the irrigation system.

The Contractor shall balance and adjust the various components of the irrigation system as the overall operation of the system is most efficient. This includes synchronization of the controllers, adjustments to pressure valves, and individual station adjustments on the controllers.

Upon completion of the irrigation system installation, the Contractor shall schedule a final inspection with the Engineer. Final acceptance of the irrigation system shall take place upon approval of the Engineer that satisfactory installation is complete.

Testing:

Upon completion of the irrigation system, the entire system shall be tested for proper operation. All air will be flushed from the system and the Contractor will check all components for proper operation.

The Contractor shall perform pressure and leakage testing of irrigation lines. The Contractor shall notify the Engineer two (2) days in advance of testing. Testing shall be performed in the presence of the Engineer or his representative. All main line piping shall be flushed of air and placed under the available static pressure or the design pressure, whichever is greater, for a period of six (6) hours. The system piping shall be isolated from the source of supply pressure for the duration of the test. The pressure in the system piping shall be noted every hour and if an excessive pressure drop is noted, the reason(s) shall be determined and repairs effected.

Zone lateral lines shall be inspected while a particular irrigation zone is operating. Each emitter shall be inspected for leaks as will the route of the installed lateral piping.

Basis of Payment:

Basis of payment for this contract will be the lump sum price for the installation of the irrigation system. The above prices and payments will be full compensation for all work covered by this section.

Payment will be made under:

Landscape Irrigation (WBL).....Lump Sum

Landscape Irrigation (EBL).....Lump Sum

PARK STOVE

General: Outdoor Park Stoves shall be furnished and constructed on concrete foundations in accordance with details in the plans and shall be located as shown on the plans or as directed by the Engineer.

Outdoor Park Stoves shall be the product of a manufacturer regularly engaged in the design and manufacture of Park Stoves. Submit six (6) copies of shop drawings or submittal data to Engineer for approval.(See Park Stove Detail Sheet for size, design, material, etc.).

Method of Measurement :

The quantity of stoves to be paid for shall be the actual number of Outdoor Park Stoves with foundation slabs, complete in place and accepted .

Basis of Payment

Stoves, measured as provided above, shall be paid for at the contract unit price each for Outdoor Park Stoves. Such price and payment will be full compensation for the work of "Outdoor Park Stove," including but not limited to, furnishing all labor, materials, tools, equipment and all incidentals necessary to complete the work. Payment will be made under:

Payment will be made under:

Outdoor Park Stove EA

POWER WASHING EXISTING SIDEWALKS

General:

This work shall include all labor and materials necessary to power wash and deep clean existing sidewalks (outside the bldg. construction limits) in order to remove grease, beverage stains, gum, fluids, and other stains in general.

The contractor shall provide a list of all chemicals and cleaning agents they plan on using for maintenance as well as a detailed description of the deep cleaning methods, pressure washing system and their respective processes for approval by the Engineer prior to the commencement of work.

The work shall be staged and conducted in order to provide minimal disturbance to pedestrian or construction activities. Work shall not be conducted in a manner that is harmful to existing structures, landscaping or create run off discharge that is harmful to the environment. Any damage to these elements shall be the responsibility of the contractor to replace or correct to the satisfaction of the Engineer.

The work will be limited to all pedestrian sidewalks, uncompromised by site construction activities. All sidewalks within the construction area shall be the responsibility of the contractor to return to clean and power wash once staged construction is complete.

Basis of Payment

Basis of payment for this contract will be the lump sum price for the Power Washing of Existing Sidewalks for all work completed and accepted. Such price and payment will be full compensation for the work of " Power Washing of Existing Sidewalks", including but not limited to, furnishing all labor, materials, tools, equipment and all incidentals necessary to complete the work.

Payment will be made under:

Power Wash Existing Sidewalks- WBL LS
Power Wash Existing Sidewalks- EBL LS

PONDLESS WATERFALL**GENERAL**

The work required under this section consists of construction of the pondless waterfall feature that is noted in the plans, details and as specified herein.

The scope of work included in this section includes the furnishing of all materials, equipment and services necessary for the completion of the described waterfall system.

The furnishing and installation of materials shall include but not be limited to the following items:

- a. Water supply plumbing, pipes accessories and equipment.
- b. Basin overflow drain lines and plumbed equalizer line (between the waterfall basin and the in ground cistern), equipment, and all associated materials.
- c. All boulders, river stone and associated masonry work.
- d. Submersible Pumping Equipment.
- e. Liners, bulkhead fittings, waterproofing materials and equipment.
- f. All supplemental river rock.
- g. System Controls, timers, and utility access box(es).
- h. Waterfall weir, cap stone, fittings, nozzles and associated equipment.
- i. Utility Service connection and coordination to noted for power, fill water, and sewer.
- j. Stream side plants, planting medium, plant basket and associated material.
- k. Special Tools.

Coordination:

The installing Contractor(s) shall coordinate and schedule the waterfall contract work with all other associated project work.

QUALITY ASSURANCE:**Approved Pondless Waterfall Contractor:**

1. The contractor responsible for the construction and completion of the pondless waterfall shall have extensive experience with the installation, construction and maintenance of waterfalls, water features and/or ponds. They shall have completed a minimum of 5 project installation similar in nature and scope as defined in this project. They shall offer proof of workmanship, accreditation, and photographic samples of their work.

2. Plans, details and pictures of the contractor's previous work will assist in the process and discussion of how the proposed pondless waterfall feature will be constructed.

Approved Equipment Supplier:

1. The design shown on the drawings and the specifications listed herein are based on the design data, services, and materials readily available through national suppliers of pond, waterfall, fountain, and plumbing materials
2. The contractor shall use only use reputable equipment suppliers approved by the Engineer.

Pondless Waterfall Materials and Equipment:

A pre-construction meeting shall be arranged with the general contractor for the coordination of the contractor responsible for the pondless waterfall construction. This allows for a detailed explanation of the suggested installation techniques and the sequence of the installation.

PUMP:

1. Pump capacity: 3500 GPH; plumbed with a manual ball valve (in feeder line at spillway; placed in valve box) to restrict flow if necessary.
2. Acceptable manufacturers: Cal, Tsurumi, Aquascape or approved equal.
3. Two year manufacturer warranty (minimum).
4. Low water cutoff switch.
5. Plumbed to allow for removal without entering tank.
6. Connected to power supply by power cable within valve box.
7. Contractor supplies plug in exterior grade timer (pump plugged in to timer within valve box).

ROCK, STONE, AND BOULDERS:

1. It is the responsibility of the pondless waterfall contractor to supply all river rock, stone and boulders for the completion of the waterfall and adjoining areas.
2. Multiple sizes and grades of river stone and boulders shall be integrated within the design in order to give the stream, waterfall and the immediate surrounding area a realistic and natural mountain stream character.

3. The boulders supplied shall range in size from large (approx 5 ton), medium (3-4 ton) and small (1-2 ton). A minimum of three additional larger boulders shall be provided and placed for sitting rocks adjacent to the waterfall feature (as noted in the plans and details).
4. The river stone supplied shall range in size from large (4"-8"), medium (2"-4") and small (1/2" -2").
5. Each step in the waterfall stream shall have integrated flat rocks leveled (and sealed with waterfall foam) to assist in the cascade falls of the stream.
6. The stream areas will be made up of embankments, riffles, and ponding area(s), comprised of varying sizes of river stone and boulders, to add character to the waterfall's natural effect.
7. The basin area will be filled with river stone and washed graveled as defined on the plans and as approved by the Landscape Architect.

PLANTS:

1. It is the responsibility of the pondless waterfall contractor to supply the plants that will be integrated within the stream and basin area.
2. The plants shall be comprised of native regional perennials (qt cont), forbs (qt cont), deciduous and evergreen shrubs (#1 cont) that grow within the stream bank conditions.
3. The plants shall be placed within pond mesh baskets (filled with approved soil and topped with river stone) and set flush within the stream and basin areas.

Final start-up and adjustment meeting shall be provided for the proper adjustments to be made to the pondless waterfall system to meet the performance levels established. It is also the time to familiarize the maintenance staff of the correct procedures to operate the pondless waterfall system equipment. Before final inspection of the water feature all the following items need to be complete:

- a. Electrical connections made and tested.
- b. Hydraulic piping and fittings complete and tested for leaks, repaired if necessary, and flushed clean.
- c. The water basin cleaned and filled to the correct operating depth.

Job site visits by NCDOT project engineers and designers can be made during certain construction phases of the project.

INDUSTRY STANDARDS AND APPLICABLE CODES:

- A. The materials shall be installed in accordance with all applicable provisions of the most recent edition of the following:

ANSI
ASTM
ASSE
ASME
AWWA
CS
NEMA
NSF
UL
NEC
OSHA
NFPA

American National Standards Institute
American Society for Testing and Materials
American Society of Sanitary Engineering
American Society of Mechanical Engineers
American Water Works Association
Commercial Standards
National Electrical Manufacturers Association
National Sanitation Foundation
Underwriters Laboratory
National Electric Code
Occupational Safety and Health Act
National Fire Protection Agency

Other state or local code(s) which are applicable.

- B. The above referenced guidelines shall be considered minimum standards for the materials or the installation practices applicable for the pondless waterfall system.

SHOP DRAWINGS AND SUBMITTALS:

The plumbing and water supply systems noted on the plans shall be considered schematic in design. Final design specifications shall be defined and supplied by the contractor, in keeping with the contract work, noted minimum specifications, and in coordination with all other applicable site work.

- A. The contractor shall submit drawings in accordance with the conditions of the Contract Specification section describing the size(s), location(s), and installation details of the interconnecting piping, waterfall management equipment and electrical systems.

B. The Landscape Architect may add other drawings during the period of construction as required for clarification.

C. This specification shall be considered an integral part of the accompanying drawings. Anything omitted from one and embodied in the other is considered essential to the contract and must be furnished by the Contractor.

D. All pertinent data on any substitute system(s), including engineering performance calculations on the pumping system(s), drainage, equipment, and electrical system diagrams and schematics shall be provided to Engineer for review and evaluation.

E. Submittals for the pump, liner, underlayment, bulkheads, sealants, pump vault, waterfall weir shall be provided to the Engineer/Landscape Architect for review and approval.

F. Material submittals for the boulders, flat waterfall rocks and river stone shall be from a single supplier. The landscape architect can approve the material on site, or if feasible, visit the supplier for approval at the source.

G. The contractor shall provide a list of suitable plant material recommended for the noted waterfall planting areas. The plant material, once approved from the list, will be inspected (if local to NC) at the source by a NCDOT horticulturalist.

H. Submittals shall be rejected if they are difficult to read due to poor image, drafting quality, insufficient scale, or missing data.

Submittals shall include the following:

- shop drawings and product information for all equipment and materials furnished.
- complete Material list.
- equipment space layout showing all electrical and mechanical equipment in addition to all piping and conduit.
- installation details for each piece of equipment being provided.

SUBSTITUTIONS:

A. Submittals for equal items shall include the following information where applicable:

1. Operation Design Description.
2. Component materials and finishes.
3. Pump curve(s).
4. Certification of conformance with specified codes and standards.

B. Proposed substitutions for equipment or material must be submitted within (30) working days prior to construction for consideration as approved equals. Proposals for substitutions shall be made only by the prime bidders in writing to Engineer and sub-contractors shall not make any proposals to the Landscape Architect for substitution.

1. All equipment supplied to the Contractor shall be supplied by reputable pond or plumbing equipment suppliers unless otherwise approved.

C. Submittals of equal systems or components may be rejected by the Engineer or Landscape Architect if it found not to meet the minimal criteria set forth in the plans, contract or specifications.

GENERAL INSTALLATION:

A. Protect all pipes, conduits, equipment and other parts of the work against injury by exposure to the weather while stored, during construction, or after installation.

B. Install and connect all equipment in accordance with manufacturer's instruction and recommendations unless otherwise noted. If specified installation is contrary to the manufacturer's instruction, cease installation of affected components or systems and notify the Engineer.

C. Accurately place all large stones and boulders to rigidly support additional weight without displacement, movement or rolling.

PIPE INSTALLATION:

A. General installation:

1. Make all pipe runs as direct as possible using a minimum number of fittings.
2. Flexible PVC pipe, sized and approved for the specified flow and pressure, shall be used for the feeder pipe to the waterfall weir. It shall be buried at an approved depth and/or protected from puncture or damage.
3. Cut all pipe and tubing ends square. Remove rough edges and burrs to create a smooth unobstructed flow.
4. Protect all openings in piping during construction to prevent entrance of foreign matter.
5. All connections shall be made with manufacturer approved adhesives, joint compounds or fittings.

GUARANTEE:

A. The waterfall Contractor(s) shall issue a guarantee that any equipment found defective within one (1) year of the final acceptance shall be replaced at no cost to the Department.

B. The guarantee does not extend to damage incurred through operation and maintenance by the Owner. The Owner will assume full responsibility for the proper operation and maintenance of the waterfall upon final acceptance. Mechanical waterfall systems shall be furnished by the Contractor unless otherwise specified.

C. The contractor shall guarantee all plant material to be living and in sufficient health within one (1) year of the final acceptance or shall be replaced at no cost to the Department.

Basis of Payment:

Basis of payment for this item of work will be the lump sum price for the installation of the "Pondless Waterfall" The above prices and payments will be full compensation for all work covered by this section.

Payment will be made under:

Pondless Waterfall.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. 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 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 polyester/fiberglass, constructed with ultraviolet inhibitors. 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:

1" PVC Water Pipe, SCH 80	LF
3" PVC Water Pipe, SCH 80	LF
1" Gate Valve and Box	EA
3" Gate Valve and Box	EA
PVC Water Pipe, SCH 80 Repair	LF

SITE SANITARY SEWER SYSTEM

Polyvinyl Chloride (PVC) Sewer Pipe and Fittings

Polyvinyl chloride (PVC) sewer pipe and fittings will conform to ASTM D-3034 - (SCH-80) 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 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 '3" Sanitary Gravity Sewer, SCH 80' and '6" Sanitary Gravity Sewer, SCH 80'. 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:

- 3" PVC Gravity Sewer, SCH 80 LF
- 6" PVC Gravity Sewer, SCH 80 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:

- Sanitary Sewer Cleanout 4" 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

SEEDING AND MULCHING:

(WestEd)

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

Shoulder and Median Areas

August 1 - June 1

20# Kentucky Bluegrass
 75# Hard Fescue
 25# Rye Grain
 500# Fertilizer
 4000# Limestone

May 1 - September 1

20# Kentucky Bluegrass
 75# Hard Fescue
 10# German or Browntop Millet
 500# Fertilizer
 4000# Limestone

Areas Beyond the Mowing Pattern, Waste and Borrow Areas:

August 1 - June 1

100# Tall Fescue
 15# Kentucky Bluegrass
 30# Hard Fescue
 25# Rye Grain
 500# Fertilizer
 4000# Limestone

May 1 - September 1

100# Tall Fescue
 15# Kentucky Bluegrass
 30# Hard Fescue
 10# German or Browntop Millet
 500# Fertilizer
 4000# Limestone

Approved Tall Fescue Cultivars

2 nd Millennium	Duster	Magellan	Rendition
Avenger	Endeavor	Masterpiece	Scorpion
Barlexas	Escalade	Matador	Shelby
Barlexas II	Falcon II, III, IV & V	Matador GT	Signia
Barrera	Fidelity	Millennium	Silverstar
Barrington	Finesse II	Montauk	Southern Choice II
Biltmore	Firebird	Mustang 3	Stetson
Bingo	Focus	Olympic Gold	Tarheel
Bravo	Grande II	Padre	Titan Ltd
Cayenne	Greenkeeper	Paraiso	Titanium
Chapel Hill	Greystone	Picasso	Tomahawk
Chesapeake	Inferno	Piedmont	Tacer
Constitution	Justice	Pure Gold	Trooper
Chipper	Jaguar 3	Prospect	Turbo
Coronado	Kalahari	Quest	Ultimate
Coyote	Kentucky 31	Rebel Exeda	Watchdog
Davinci	Kitty Hawk	Rebel Sentry	Wolfpack
Dynasty	Kitty Hawk 2000	Regiment II	
Dominion	Lexington	Rembrandt	

Approved Kentucky Bluegrass Cultivars:

Alpine	Bariris	Envicta	Rugby
Apollo	Bedazzled	Impact	Rugby II
Arcadia	Bordeaux	Kenblue	Showcase
Arrow	Champagne	Midnight	Sonoma
Award	Chicago II	Midnight II	

Approved Hard Fescue Cultivars:

Chariot	Nordic	Rhino	Warwick
Firefly	Oxford	Scaldis II	
Heron	Reliant II	Spartan II	
Minotaur	Reliant IV	Stonehenge	

On cut and fill slopes 2:1 or steeper add 20# Sericea Lespedeza and 15# Crown Vetch January 1 - December 31.

The Crown Vetch Seed should be double inoculated if applied with a hand seeder. Four times the normal rate of inoculant should be used if applied with a hydroseeder. If a fertilizer-seed slurry is used, the required limestone should also be included to prevent fertilizer acidity from killing the inoculant bacteria. Caution should be used to keep the inoculant below 80° F to prevent harm to the bacteria. The rates and grades of fertilizer and limestone shall be the same as specified for *Seeding and Mulching*.

All disturbed areas adjacent to sodding operations shall be seeded with an approved mix similar to the sod being used. The Engineer will determine the limits of this seeding and the mix to be used.

Fertilizer shall be 10-20-20 analysis. 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 and as directed.

TEMPORARY SEEDING:

Fertilizer shall 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. German Millet, or Browntop Millet shall 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 shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre. 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 and as directed.

SUPPLEMENTAL SEEDING:

The kinds of seed and proportions shall be the same as specified for *Seeding and Mulching*, and the rate of application 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 shall 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 shall be six inches.

LAWN TYPE APPEARANCE:

All areas adjacent to lawns must be hand finished as directed to give a lawn type appearance. Remove all trash, debris, and stones $\frac{3}{4}$ " and larger in diameter or other obstructions that could interfere with providing a smooth lawn type appearance. These areas shall be reseeded to match their original vegetative conditions, unless directed otherwise by the Field Operations Engineer.

SPECIALIZED HAND MOWING:**Description**

This work consists of specialized hand mowing around or under fixed objects, including but not limited to guardrails, signs, barriers and slopes in a method acceptable to the Engineer.

Specialized hand mowing shall be completed with mechanically powered trimmers, string trimmers, hand operated rotary mowers, or self-propelled mowers of sufficient size and quality to perform the work timely and efficiently.

The quantity of mowing to be performed will be affected by the actual conditions that occur during the construction of the project. The quantity of mowing may be increased, decreased or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Measurement and Payment

Specialized Hand Mowing will be measured and paid for as the actual number of man hours worked while hand mowing along the surface of the ground, as directed. Where an area has been mowed more than once, as directed, separate measurement will be made each time the area is mowed.

Payment will be made under:

Pay Item	<u>Pay Unit</u>	
Specialized Hand Mowing		MHR

MINIMIZE REMOVAL OF VEGETATION:

The Contractor shall minimize removal of vegetation at stream banks and disturbed areas within the project limits as directed.

STOCKPILE AREAS:

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

ACCESS AND HAUL ROADS:

At the end of each working day, the Contractor shall install or re-establish temporary diversions or earth berms across access/haul roads to direct runoff into sediment devices. Silt fence sections that are temporarily removed shall be reinstalled across access/haul roads at the end of each working day.

WASTE AND BORROW SOURCES:

Payment for temporary erosion control measures, except those made necessary by the Contractor's own negligence or for his own convenience, will be paid for at the appropriate contract unit price for the devices or measures utilized in borrow sources and waste areas.

No additional payment will be made for erosion control devices or permanent seeding and mulching in any commercial borrow or waste pit. All erosion and sediment control practices that may be required on a commercial borrow or waste site will be done at the Contractor's expense.

SPECIAL SEDIMENT CONTROL FENCE:

Description

This work consists of the construction, maintenance, and removal of *Special Sediment Control Fence*. Place special sediment control fence as shown on the plans or as directed.

Materials

(A) Posts

Steel posts shall be at least 5 ft. in length, approximately 1 3/8" wide measured parallel to the fence, and have a minimum weight of 1.25 lb/ft of length. The post shall be equipped with an anchor plate having a minimum area of 14.0 square inches, and shall have a means of retaining wire in the desired position without displacement.

(B) 1/4" Hardware Cloth

Hardware cloth shall have 1/4" openings constructed from #24 gauge wire. Install hardware cloth in accordance with Standard Drawing No. 1606.01.

(C) Sediment Control Stone

Sediment Control Stone shall meet the requirements of Section 1005 of the *Standard Specifications*. Install stone in accordance with Standard Drawing No. 1606.01.

Construction Methods

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

Measurement and Payment

1/4" *Hardware Cloth* will be measured and paid for in accordance with Article 1632-5 of the *Standard Specifications*.

Sediment Control Stone will be measured and paid for in accordance with Article 1610-4 of the *Standard Specifications*.

INSTALLATION OR REPAIR OF ELECTRICAL OR PHONE SERVICE LINES**General**

The work covered by these provisions consists of installation or repair of electrical or phone service lines 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.

NOTE: Underground Electric / Phone Lines damaged during construction must be repaired within48 – 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.

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:

Electric Line - Install / RepairLF
Phone Line - Install / RepairLF

3" PVC SLEEVE

General: The work covered by the provision shall consist of furnishing and installing duct pipe as shown on the plans under sidewalks before they are poured (open cut).

Material: The duct shall be rigid (Polyvinyl Chloride) heavy wall, UL approved for underground use without concrete encasement per UL 651 "Rigid Non-Metallic Conduit or Encasement".

Installation: Excavate, place encasement pipe and backfill so that encasement is in line with piping. Backfill shall be compacted to 95% where beneath walks, drives or other concrete pads.

Method of Measurement and Basis of Payment:

Measurement and payment for PVC Duct shall be at the contract unit price per linear foot for "3" PVC Sleeve" as installed, and will be full compensation for all work covered by this section.

Payment will be made under:

3" PVC Sleeve.....LF