ADDENDUM # 1

From: Lena Butler, Purchasing Supervisor
To: All Bidders
Project: RFB # 19-0363-SHIRE LANE CULVERT REPLACEMENT
Date: March 25, 2019

This addendum is related to the County’s Request for Bids “RFB # 19-0363-SHIRE LANE CULVERT REPLACEMENT” and is hereby made a part of said Request for Bids to the same extent as though it were originally therein.

ATTACHMENT “A”
Civil specifications prepared by W.K. Dickson & Co., Inc. for Shire Lane Culvert Replacement Project.

ATTACHMENT “B”
Drawing prepared by W.K. Dickson & Co., Inc. for Shire Lane Culvert Replacement.
CONTRACT DOCUMENTS AND SPECIFICATIONS

for

SHIRE LANE CULVERT REPLACEMENT
WKD PROJECT NO. 20180421.00.WL

February 12, 2019

Prepared for:
New Hanover County Engineering
230 Government Center Drive, Suite 160
Wilmington, NC 28403

BID DOCUMENTS – NOT RELEASED FOR CONSTRUCTION

CIVIL SPECIFICATIONS
PREPARED BY
W.K. DICKSON & CO., INC.
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(910) 762-4200
NC LICENSE NO. F-0374
Shire Lane Culvert Replacement
New Hanover County, North Carolina

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PART 1 GENERAL

1.1 SUMMARY:

A. The work covered by this section consists of preparatory work and operations, including but not limited to:
   1. Those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site.
   2. Those items including but not limited to: the establishment of all temporary fencing, staging areas, temporary access and haul routes, and other facilities necessary for work in the project.
   3. Those items necessary for the maintenance of vehicle and construction traffic; including but not limited to: portable and stationary construction signs, barricades, drums, cones, and other traffic control devices.
   4. Surveying and construction staking.
   5. Removal and re-establishment of survey control monuments located within the demolition limits.
   6. All barricades, barricade lights, and other phasing and detour devices.
   7. Performance bond, labor and materials bond, insurance.
   8. Those items for all other work in the various items on the project site which must be performed, or costs incurred prior to beginning work.
   9. This item also includes all work outside the limits of construction that is necessary to demobilize and restore areas disturbed by the Contractor to their original condition including, but not limited to, pavement rehabilitation, grading, seeding, mulching, cleaning, and disposal.

1.2 MEASUREMENT AND PAYMENT:

A. All work covered by this section will be paid for at the contract lump sum price for "Mobilization."

B. Should "Mobilization" exceed 5% of the total bid amount for the Contract, partial payments for the item of "Mobilization" will be made with the first and second partial pay estimates, paid on the Contract, and will be made at the rate of 50 percent of the lump sum price for "Mobilization" on each of these partial pay estimates, less retainage provided for in the Contract; the remaining amount over 5% shall be paid in the final pay request of the project. If the Mobilization bid amount does not exceed 5%, it shall be paid equally in the first two (2) partial pay estimates.

C. Payment will be made per lump sum.

END OF SECTION
SECTION 31 10 00  
SITE CLEARING

1.1 SUMMARY

A. Section Includes:
   1. Removing surface debris.
   2. Removing designated paving and curbs.
   3. Removing designated trees, shrubs, and other plant life.
   4. Removing abandoned utilities and structures where indicated.
   5. Protecting structures designated to remain.

1.2 REFERENCES

1.3 NCDOT Standard Specifications:

1.4 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pavement Removal
   1. Basis of Measurement: By square yard.
   2. Basis of Payment: Includes sawcutting, removal of full depth asphalt pavement, and concrete curb and gutter removal.

B. Pipe Removal
   2. Basis of Payment: Includes removal of existing 36” and 24” storm drainage pipes and 6” PVC water pipe. Removal of and pipe fittings is incidental to the cost of pipe removal.

C. Structure Removal
   1. Basis of Measurement: By each.
   2. Basis of Payment: Includes removal of existing curb inlet structures.

D. Tree Removal
   1. Basis of Measurement: By each.
   2. Basis of Payment: Includes removal of existing trees.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Section 200 of the NCDOT Standard Specifications.

B. Maintain one copy of document on site.

C. Conform to applicable code for environmental requirements and disposal of debris.
PART 2 PRODUCTS – Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing plant life designated to be removed is tagged or identified.

B. Identify waste area or salvage area for placing removed materials when materials are indicated to remain on site.

3.2 PREPARATION

A. Call local utility line information service indicated on Drawings not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 PROTECTION

A. Locate, identify, and protect from damage utilities indicated to remain.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect bench marks and survey control points from damage or displacement.

3.4 CLEARING

A. Remove trees and shrubs within areas indicated on Drawings.

B. Remove stumps, main root ball, root system, surface rock, and pavements to depth of 12 inches below proposed Subgrade elevation.

C. Clear undergrowth and deadwood without disturbing subsoil.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove paving and curbs: where indicated on Drawings partially remove paving and curbs. Neatly saw cut edges at right angle to surface.

C. Remove abandoned utilities. Indicate removal termination point for underground utilities on Record Documents.

D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
E. Do not burn or bury materials on site unless authorized in writing by authority having jurisdiction.

F. Leave site in clean condition.

END OF SECTION
SECTION 31 23 16
EXCAVATION AND FILL

1.1 SUMMARY

A. Section Includes:
   1. Excavation
   2. Fill Material
   3. Disposal of excess material.

B. Related Sections:
   1. Section 31 10 00 - Site Clearing:
   2. Section 31 25 13 - Erosion Controls:
   3. Section 31 23 16.13 - Trenching:

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Excavation:
   2. Basis of Payment: Includes excavating to required elevations, moving to fill areas, scarifying substrate surface, placing, compacting, and removing excess material from site. No payment will be made for over-excavating or for replacement materials.

B. Fill Material:
   1. Basis of Measurement: By the cubic yard.
   2. Basis of Payment: Includes excavating material at borrow site, supplying materials to Project site, stockpiling, scarifying substrate surface, placing where required, and compacting.

C. Disposal of excess material

1.3 REFERENCES

A. NCDOT Standard Specifications:

B. American Association of State Highway and Transportation Officials:

C. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
   2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
7. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

B. Dewatering Plan: Describe dewatering methods to be used to keep excavations dry if required.

C. Samples: Submit, in air-tight containers, 10-pound sample of each type of fill to testing laboratory.

D. Materials Source DOT Approval: Submit certification that aggregate and soil material suppliers are approved by the State Department of Transportation.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE


B. Maintain one copy of document on site.

C. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Project location.

1.7 PROJECT CONDITIONS

A. The near surface site soils generally consist of 4-6 inches of topsoil over very loose to medium dense sand.
PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Original surface soil typical of the area which can support native plant growth. It shall be free of large stones, roots, waste, debris, contamination, or other unsuitable material which might hinder plant growth.

B. Subsoil: Clean natural soil with a plasticity index of 15 or less that is free of clay, rock, or gravel lumps larger than 2 inches in any dimension, debris, waste, frozen material, and any other deleterious material that might cause settlement. Suitable material excavated from the site may be used as subsoil fill under optimum moisture conditions.

C. Granular Fill: Clean sand, slightly silty sand, or slightly clayey sand having a Unified Soil Classification of SW, SP, SP-SM, or SP-SC.

D. Structural Fill: Clean course aggregate Gradation No. 57 conforming to Sections 1005 and 1006 of the NCDOT Standard Specifications.

E. Borrow Material: Conform to subsoil requirements.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-woven, non-biodegradable, conforming to Section 1056 of the NCDOT Standard Specifications for Type I Engineering Fabric.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

3.2 PREPARATION FOR EXCAVATION

A. Call Local Utility Line Information service as indicated on Drawings not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.
E. Protect plant life, lawns, rock outcropping, and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 **SUBSOIL EXCAVATION**

A. Excavate subsoil to accommodate paving, landscaping, and construction operations.

B. Slope banks with machine to angle of repose or less until shored.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

D. Trim excavation. Remove loose matter.

E. Notify Engineer and testing agency of unexpected subsurface conditions.

F. Correct areas over excavated with granular fill and compact as required for fill areas.

G. Remove excess and unsuitable material from site.

H. Repair or replace items indicated to remain damaged by excavation.

I. Excavate subsoil from areas to be further excavated, re-landscaped, or regraded.

J. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

K. When excavating through roots, perform Work by hand and cut roots with sharp axe.

L. Remove from site excess subsoil not intended for reuse.

M. Benching Slopes: Horizontally bench existing slopes greater than 3:1 to key placed fill material into slope to provide firm bearing.

N. Stability: Replace damaged or displaced subsoil as specified for fill.

3.4 **SHEETING AND SHORING**

A. Sheet, shore, and brace excavations (if needed) to prevent danger to persons, structures, and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support excavations more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be left in place as part of the completed Work, cut off minimum 18 inches below finished subgrade, or design sheeting and shoring to be removed at completion of excavation work.
D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water, or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 SURFACE WATER CONTROL

A. Control and remove unanticipated water seepage into excavation.

B. Provide ditches, berms, and other devices to divert and drain surface water from excavation area as specified in Section 31 25 13 – Erosion Controls.

C. Divert surface water and seepage water within excavation areas into sumps or settling basins prior to pumping water into drainage channels and storm drains.

3.6 DEWATERING

A. Design and provide dewatering system (if needed) to permit Work to be completed on dry and stable subgrade.

B. Operate dewatering system continuously until backfill is minimum 2 feet above normal ground water table elevation.

C. When dewatering system cannot control water within excavation, notify Engineer and stop excavation work.
   1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
   2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.

D. Modify dewatering systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.

E. Discharge ground water and seepage water within excavation areas into sumps or settling basins prior to pumping water into drainage channels and storm drains.

F. Remove dewatering and surface water control systems after dewatering operations are discontinued.

3.7 PROOF ROLLING

A. Proof roll areas to receive fill, pavement and building slabs to identify areas of soft yielding soils.
   1. Use loaded tandem-axle pneumatic tired dump truck or large smooth drum roller.
   2. Load equipment to maximum 50 tons gross weight and make a minimum of four passes with two passes perpendicular to the others.

B. Undercut such areas to firm soil, backfill with granular fill and compact to density equal to or greater than requirements for subsequent fill material.
C. Do not proof roll or undercut until soil has been dewatered.

3.8 BACKFILLING

A. Scarify subgrade surface to depth of 4 inches.
B. Compact subgrade to density requirements for subsequent backfill materials.
C. Backfill areas to contours and elevations with unfrozen materials.
D. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
E. Place fill material in continuous layers and compact in accordance with Schedule at end of this Section.
F. Employ placement method that does not disturb or damage other work.
G. Maintain optimum moisture content of backfill materials to attain required compaction density.
H. Make gradual grade changes. Blend slope into level areas.
I. Remove surplus backfill materials from site.

3.9 TOLERANCES

A. Top Surface of Backfilling Within Building and Paved Areas: Plus or minus 1 inch from required elevations.
B. Top Surface of Backfilling Within Landscape Areas: Plus or minus 2 inches from required elevations.

3.10 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
C. Protect structures, utilities, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.
D. Repair or replace items indicated to remain damaged by excavation or filling.

3.11 FIELD QUALITY CONTROL

A. Request visual inspection of bearing surfaces by Engineer and inspection agency before installing subsequent work.
B. Laboratory Material Tests: In accordance with ASTM D1557 or AASHTO T180.
C. In-Place Compaction Tests: In accordance with the following:

D. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

E. Frequency of Tests:
   1. Building and Pavement Areas: Twice per lift for every 5,000 square feet.
   2. Landscape Areas: Twice per lift for every 10,000 square feet.

3.12 SCHEDULES

A. Under Pavement:
   1. Maximum 8-inch compacted depth.
   2. Compact material to a minimum of 95 percent of maximum density, except the top 12 inches.
   3. Compact top 12 inches to a minimum of 98 percent of maximum density.

B. Under Landscape Areas:
   1. Maximum 8-inch compacted depth.
      1. Compact to minimum 90 percent of maximum density.

END OF SECTION
SECTION 31 23 16.13
TRENCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Excavating trenches for utilities and utility structures.
   2. Bedding.
   3. Backfilling and compacting to subgrade elevations.
   4. Sheeting and Shoring.
   5. Dewatering.
   6. Compacting backfill material.

B. Related Sections:
   1. Section 31 23 16 - Excavation and Fill:
   2. Section 31 25 13 – Erosion Controls:
   3. Section 33 11 00 – Water Utility Distribution Piping:
   4. Section 33 42 13 – Stormwater Culverts:

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. General: Work of this Section will not be measured for payment but is included in the unit cost for the various utilities and structures installed.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
   2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

C. NCDOT Standard Specifications:

1.4 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

B. Utility Structures: Manholes, catch basins, inlets, valve vaults, hand holes, and other utility access structures as indicated on Drawings.

C. Trench Terminology:
   1. Foundation: Area under bottom of trench supporting bedding.
   2. Bedding: Fill placed under utility pipe.
   3. Haunching: Fill placed from bedding to center line of pipe.
   4. Initial Backfill: Fill placed from center line to 6 to 12 inches above top of pipe.
   5. Final Backfill: Fill placed from initial backfill to subgrade.

1.5 SUBMITTALS

A. Excavation Protection Plan if required: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of North Carolina.

B. Dewatering Plan if required: Describe methods of dewatering and disposal of water.


D. Samples: Submit to testing laboratory, in air-tight containers, 10-pound sample of each type of fill.

E. Materials Source: Submit name of imported fill material suppliers.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with Section 1505 of NCDOT Standard Specifications.

B. Maintain one copy of document on site.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.
1.8 COORDINATION

A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 PRODUCTS

2.1 BACKFILL MATERIALS

A. Subsoil Fill: Clean natural soil with a plasticity index of 15 or less that is free of clay, rock, or gravel lumps larger than 2 inches in any dimension; debris; waste; frozen material; and any other deleterious material that might cause settlement. Suitable material excavated from the site may be used as subsoil fill under optimum moisture conditions.

B. Granular Fill: Clean sand, slightly silty sand, or slightly clayey sand having a Unified Soil Classification of SW, SP, SP-SM or SP-SC.

C. Foundation Stone: Clean course aggregate Gradation No. 57 conforming to Sections 1005 and 1006 of the NCDOT Standard Specifications.

D. Bedding and Haunching Material:
   1. Rigid Pipe: Granular Fill.


F. Initial Backfill to 6 inches Minimum Above Utility:
   1. Rigid Pipe: Subsoil Fill.

G. Final Backfill to Subgrade:
   1. Under Pavement: Granular Fill.
   2. Under Landscape: Subsoil Fill.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-woven, non-biodegradable conforming to Section 1056 of the NCDOT Standard Specifications for Type 1 Engineering Fabric.

B. Concrete: Class A Concrete conforming to Section 1000 of the NCDOT Standard Specifications.
   1. Compressive strength of 3,000 psi at 28 days.
   2. Air entrained.
   3. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular aggregate.
   4. Maximum slump of 3.5 inches for vibrated concrete and 4 inches for non-vibrated concrete.
   5. Minimum cement content of 564 lbs per cubic yard for vibrated and 602 lbs per cubic yard for non-vibrated concrete.
PART 3 EXECUTION

3.1 PREPARATION

A. Call local utility line information service indicated on Drawings not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns, rock outcropping, and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.2 LINES AND GRADES

A. Excavate to lines and grades indicated on Drawings.

   1. Owner reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.3 TRENCHING

A. Excavate subsoil required for utilities.

B. Perform excavation within 48 inches of existing utility service in accordance with utility’s requirements.

C. Do not advance open trench more than 200 feet ahead of installed pipe.

D. Remove water or materials that interfere with Work.

E. Trench Width: Excavate bottom of trenches maximum 16 inches wider than outside diameter of pipe or as indicated on Drawings.

F. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

G. Maintain vertical faces to an elevation equal to 12 inches above top of pipe.
1. When Project conditions permit, side walls may be sloped or benched above this elevation.
2. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this Section.

H. Support Utilities and Structures:
   1. Keep trench width at top of trench to practical minimum to protect adjacent or crossing utility lines
   2. Support utilities crossing trench by means acceptable to utility company.
   3. Do not interfere with 45-degree bearing splay of foundations.
   4. Provide temporary support for structures above and below ground.

I. When subsurface materials at bottom of trench are loose or soft, excavate to firm subgrade or to depth directed by Engineer.
   1. Cut out soft areas of subgrade not capable of compaction in place.
   2. Backfill with foundation stone and compact to density equal to or greater than requirements for subsequent backfill material.


K. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Engineer.

L. Place geotextile fabric over trench foundation stone prior to placing subsequent bedding materials.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures, and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work unless approved by Engineer.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water, or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 SURFACE WATER CONTROL

A. Control and remove unanticipated water seepage into excavation.
B. Provide ditches, berms, and other devices to divert and drain surface water from excavation area as specified in Section 31 25 13 – Erosion Controls.

C. Divert surface water and seepage water within excavation areas into sumps or settling basins prior to pumping water into drainage channels and storm drains.

3.6 DEWATERING

A. Design and provide dewatering system to permit Work to be completed on dry and stable subgrade.

B. Operate dewatering system continuously until backfill is minimum 2 feet above normal ground water table elevation.

C. When dewatering system cannot control water within excavation, notify Engineer and stop excavation work.
   1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
   2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.

D. Modify dewatering systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.

E. Discharge ground water and seepage water within excavation areas into sumps or settling basins prior to pumping water into drainage channels and storm drains.

F. Remove dewatering and surface water control systems after dewatering operations are discontinued.

3.7 BEDDING, HAUNCHING, AND INITIAL BACKFILL

A. Place bedding full width of trench to the depth indicated on Drawings and compact to 95 percent maximum density. Excavate for pipe bells.

B. Install utility pipe and conduit in accordance with the respective utility section.

C. Support pipe uniformly along entire length of pipe.

D. Carefully place haunching material to center of pipe, rod and tamp material to fill voids and provide uniform support of pipe haunches. Compact to 90 percent maximum density.

E. Carefully place initial backfill to 6 inches above top of pipe or to depth indicated on Drawings. Compact to 95 percent maximum density.

3.8 FINAL BACKFILLING TO SUBGRADE

A. Backfill trenches to contours and elevations with unfrozen fill materials.
B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place fill material in continuous layers and compact in accordance with schedule at end of this Section.

D. Employ placement method that does not disturb or damage utilities in trench or foundation perimeter drainage.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day.

G. Protect open trench to prevent danger to the public.

3.9 DISPOSAL OF EXCESS MATERIAL

A. Dispose of excess material offsite and legally.

B. Furnish Engineer with certificate of disposal site or agreement from private property owner.

3.10 TOLERANCES

A. Top Surface of Backfilling: Plus or minus 1 inch from required elevations.

3.11 FIELD QUALITY CONTROL

A. Perform laboratory material tests in accordance with ASTM D1557 or AASHTO T180.

B. Perform in place compaction tests in accordance with the following:

C. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

D. Frequency of Tests: Two tests per lift for every 1,000 feet of trench.

3.12 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

3.13 SCHEDULE OF COMPACTION

A. Under Pavement:
   1. Granular Fill in maximum 8-inch loose lifts.
   2. Compact to minimum 95 percent maximum density except the top 12 inches.
   3. Compact top 12 inches to minimum 98 percent maximum density.
B. Under Landscape Areas:
   1. Subsoil Fill in maximum 8-inch loose lifts.
   2. Compact to minimum 90 percent maximum density.

C. In Unstable or Unsuitable Trench Foundation Areas:
   1. Foundation Stone in maximum 12-inch loose lifts.
   2. Compact to 98 percent maximum density.

END OF SECTION
SECTION 31 25 13
EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes installing, maintaining and removing:
   1. Silt Fence.
   2. Filtrexx Inlet Protection
   3. Seeding
   4. Permanent Soil Reinforcement
   5. Stone Check Dam

B. Related Sections:
   1. Section 31 10 00 - Site Clearing.
   2. Section 31 23 16 - Excavation and Fill.
   3. Section 32 92 19 - Seeding.
   4. Section 33 42 13 - Stormwater Culverts

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Silt Fence:
   2. Basis of Payment: Includes excavating, furnishing stakes and wire fence, and furnishing geotextile fabric. Also includes silt fence rock outlet if applicable.

B. Filtrexx Inlet Protection:
   2. Basis of Payment: Includes placing inlet protection at designated locations. Inlet protection to be installed and maintained throughout the project per manufacturer recommendation.

C. Seeding:
   2. Basis of Payment: Includes placing seeding in all disturbed areas.

D. Erosion Control Blanket (Permanent Soil Reinforcement Mat)
   2. Basis of Payment: Includes placing and maintaining erosion control blanket as designated on plans per the manufacturer’s recommendation.

E. Stone Check Dam
   2. Basis of Payment: Includes placing and maintaining stone check dams as designated on plans.
1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils
      Using a 4.54-kg (10-pound) rammer and a 457-mm (18-inch) drop.

B. ASTM International:
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of
      Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place
      by the Sane-Cone Method
   4. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of
      Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   5. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place
      by the Rubber Balloon Method.
   6. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of
      Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

C. NCDOT Standard Specifications:
   1. Standard Specifications for Roads and Structures, latest version, published by the
      North Carolina Department of Transportation.

1.4 SUBMITTALS

A. Product Data: Submit data on geotextile, posts, woven wire, concrete mix design, and pipe.

B. Manufacturer's Certificate: Certify products and aggregates meet or exceed specified
   requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Division 16 of NCDOT Standard Specifications.

B. Maintain one copy of document on site.

1.6 PRE-INSTALLATION MEETINGS

A. Convene minimum one week prior to commencing work of this Section.

PART 2 PRODUCTS

2.1 GEOTEXTILE MATERIALS

A. Engineering Fabric Materials: Non-biodegradable conforming to Section 1056 of NCDOT
   Standard Specifications:
   1. Silt Fence: Type 3, Class A or B Engineering Fabric.
   2. Under Rip Rap or Construction Entrances: Type 2 Engineering Fabric.
2.2 STONE, AGGREGATE, AND SOIL MATERIALS

A. Aggregate for Construction Entrance: Coarse aggregate, Gradation No. 4 or larger with maximum size of 3 inch, conforming to Sections 1005 and 1006 of the NCDOT Specifications.

B. Soil Fill: Clean natural soil with a plasticity index of 15 or less that is free of clay, rock, or gravel lumps larger than 2 inches in any dimension; debris; waste; frozen material; and any other deleterious material that might cause settlement. Suitable material excavated from the site may be used as soil fill under optimum moisture conditions.

2.3 PLANTING MATERIALS

A. General: Conform to North Carolina Board of Agriculture rules and regulations as specified in Section 1060 of NCDOT Standard Specifications for seed, agricultural ground limestone, fertilizers, and mulch.

B. Temporary Seed Mixture (Per General Notes Sheet 01):
   1. Late winter and early spring: Rye and Annual Lespedeza (Kobe)
   2. Summer: German Millet.
   3. Fall: Rye.

C. Permanent Seed Mixture:
   1. Per General Notes Sheet 01.

D. Fertilizer: Commercial grade; recommended for grass.

E. Lime: ASTM C602, Class O agricultural ground limestone containing a minimum 80 percent calcium carbonate equivalent.

F. Mulch: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

2.4 CONCRETE

A. Concrete: Class B concrete conforming to Section 1000 of the NCDOT Standard Specifications.
   1. Compressive strength of 2,500 psi at 28 days.
   2. Air entrained.
   3. Water cement ratio of 0.488 with rounded aggregate and 0.567 with angular aggregate.
   4. Maximum slump of 2.5 inches for vibrated concrete and 4 inches for non-vibrated concrete.
   5. Minimum cement content of 508 lbs per cubic yard for vibrated and 545 lbs per cubic yard for non-vibrated concrete.

2.5 ACCESSORIES

A. Posts for Silt Fence and Inlet Protection: Steel posts 5 feet long, 1-3/8 inches wide, minimum weight 1.25 lbs/ft. conforming to Section 1605 of NCDOT Standard Specifications.
B. Woven Wire Fence for Silt Fence: Minimum 32 inches high, minimum 5 horizontal wires, vertical wires spaced 12 inches apart, minimum 10 gage top and bottom wires, and minimum 12-1/2 gage; all other wires conforming to Section 1605 of NCDOT Standard Specifications.

C. Attachment Devices for Silt Fence: No. 9 staple, minimum 1-1/2 inches long, or other approved attachment devices.

2.6 SOURCE QUALITY CONTROL (AND TESTS)
   A. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.
   B. Make rock available for inspection at producer’s quarry prior to shipment. Notify Architect/Engineer at least seven days before inspection is allowed.
   C. Allow witnessing of inspections and tests at manufacturer’s test facility. Notify Architect/Engineer at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.
   B. Verify gradients and elevations of base or foundation for other work are correct.

3.2 SILT FENCE
   A. Install in accordance with Section 1605 of NCDOT Standard Specifications at locations shown on Drawings.
   B. Use wire fence with Class A fabric.
   C. Class B fabric may be used without woven wire backing subject to the following:
      1. Fabric is approved by Architect/Engineer.
      2. Maximum post spacing is 6 feet.
      3. Posts are inclined toward runoff source not more than 20 degrees from vertical.

3.3 INLET PROTECTION
   A. Install Filtrexx inlet protection as indicated on Drawings.

3.4 SITE STABILIZATION
   A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
B. Construct, stabilize, and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2:1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19 - Seeding at 75 percent of permanent application rate with no topsoil.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 – Seeding permanent seeding specifications.

E. Stabilize stockpiles immediately.

3.5 FIELD QUALITY CONTROL

A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

B. Perform laboratory material tests in accordance with ASTM D698, ASTM D1557 or AASHTO T180.

C. Perform in place compaction tests in accordance with the following:

D. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

E. Frequency of Tests: Twice per lift for every 10,000 square feet.

3.6 CLEANING

A. When sediment accumulation in sedimentation structures has reached a point one-half depth of sediment structure or device, remove and dispose of sediment.

B. Do not damage structure or device during cleaning operations.

C. Do not permit sediment to erode into construction or site areas or natural waterways.

D. Clean channels when depth of sediment reaches approximately one-half channel depth.

3.7 SCHEDULES

A. Ground Cover Schedule: See General Notes Sheet 01.

END OF SECTION
SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate base course on a prepared subgrade.

B. Related Sections:
   1. Section 31 23 16 - Excavation and Fill:
   2. Section 32 12 16 - Asphalt Paving:

UNIT PRICE - MEASUREMENT AND PAYMENT

C. Coarse Aggregate Type ABC:
   1. Basis of Payment: There will be no separate measure of payment. Items in this section are incidental to Section 32 12 16 – Asphalt Paving.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-pound) rammer and a 457-mm (18-inch) drop.

B. ASTM International:
   1. [ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).]
   2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

C. NCDOT Standard Specifications:

1.3 SUBMITTALS

A. Samples: Submit to testing laboratory 10-pound sample of each type of aggregate in airtight containers.

B. Materials Source: Submit name of imported materials suppliers.
C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE
A. Perform Work in accordance with Section 520 of NCDOT Standard Specifications.
B. Maintain one copy of document on site.
C. Furnish each aggregate material from single source throughout the Work.
D. Use sources participating in NCDOT Aggregate Quality Assurance/Quality Control Program.

PART 2 PRODUCTS

2.1 MATERIALS
A. Aggregate Base Course: Coarse aggregate Type A or B with a gradation of ABC conforming to Sections 1005, 1006, and 1010 of NCDOT Standard Specifications.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify substrate has been inspected and gradients and elevations are correct and dry.

3.2 PREPARATION
A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting as specified in Section 3123 16 – Excavation and Fill.
B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT
A. Place aggregate in minimum 4-inch and maximum 10-inch layers and roller compact to specified density. When total thickness is 10 inches or less, place in one layer. When total thickness is greater than 10 inches, place in two equal layers.
B. Have each layer of material compacted and approved prior to placing succeeding layers.
C. Level and contour surfaces to elevations and gradients indicated on Drawings.
D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Use mechanical tamping equipment in areas inaccessible to roller compaction equipment.
3.4 TOLERANCES

A. Maximum Variation from Thickness: 1/2 inch.

B. Maximum Variation from Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Laboratory Material Tests: Conform to Modified Proctor ASTM D1557 or AASHTO T180.

B. In-place Compaction Tests: Conform to:

C. Compaction:
   1. 100 percent of maximum when measured in-place by standard methods.
   2. 98 percent of maximum when measured in-place by nuclear methods.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Compaction Tests: Two tests per layer for every 5,000 tons of aggregate base course.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Asphaltic Concrete Paving: Surface, binder, and base courses.
   2. Prime Coat and Tack Coat.
   3. Surface Sealer.

B. Related Sections:
   1. Section 31 23 16 - Excavation and Fill:
   2. Section 32 11 23 - Aggregate Base Courses:
   3. Section 32 13 13 - Concrete Paving:

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Full Depth Pavement:
   1. Basis of Measurement: By square yard
   2. Basis of Payment: Includes preparing aggregate base course, prime coat, placing, compacting and rolling, and testing of intermediate and surface courses, and prime/tack coats and sealers.

1.3 REFERENCES

A. NCDOT Standard Specifications:

1.4 SUBMITTALS

A. Product Data: Submit product information and mix design.

B. Manufacturer’s Certification: Certify products are produced at a plant approved by NCDOT and that products meet or exceed specified requirements.

C. Installer Certification: Certify installer is on list of NCDOT approved contractors with an approved Quality Control Plan.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Division 6 of NCDOT Standard Specifications.

B. Maintain on site one copy of each document.
C. Obtain materials from same source throughout.

D. Installer Qualification: Company specializing in performing work of this Section with minimum 5 years’ experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not place asphalt base course or intermediate course when ambient air or road surface temperature is less than 35 degrees F. or surface is wet or frozen.

B. Do not place asphalt surface course when ambient air or road surface temperature is less than 50 degrees F. or wet.

C. Place bitumen mixture when temperature is not more than 15 degrees F. below temperature at when initially mixed and not more than maximum specified temperature.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Plant Mix Materials: Conform to Sections 1012 and 1020 of NCDOT Standard Specifications.

B. Prime Coat and Tack Coat: Conform to Section 1020 of NCDOT Standard Specifications.

2.2 ASPHALT PAVING MIX

A. General: Use Superpave mix design conforming to Section 610 of NCDOT Standard Specifications.

B. Base Course: Type B-25.0B

C. Intermediate Course: Type I-19.0B

D. Surface Course: Type SF-9.5B

2.3 SOURCE QUALITY CONTROL AND TESTS

A. Submit proposed mix design of each class of mix for review prior to beginning Work.

B. Obtain materials from plant approved by NCDOT.

C. Test plant samples in accordance with Section 609 of NCDOT Standard Specifications.
PART 3 EXECUTION

3.1 EXAMINATION
   A. Verify compacted subgrade and aggregate base is dry and ready to support paving and imposed loads.
   B. Verify gradients and elevations of base are correct.
   C. Verify utility structure frames and lids are installed in correct position and elevation.

3.2 PRIME COAT
   A. Apply primer on aggregate base course at uniform rate of 0.2 to 0.5 gal/sq. yd. in accordance with Section 600 of NCDOT Standard Specifications.
   B. Apply primer to contact surfaces of curbs and gutters.
   C. Use clean sand to blot excess primer.

3.3 TACK COAT
   A. Apply tack coat on asphalt or concrete surfaces at uniform rate of 0.04 to 0.08 gallons/square yard in accordance with Section 605 of NCDOT Standard Specifications.
   B. Apply tack coat to contact surfaces of curbs and gutters.
   C. Coat surfaces of utility structures with oil to prevent bond with asphalt pavement. Do not tackcoat these surfaces.

3.4 PLACING ASPHALT PAVEMENT
   A. Install Work in accordance with Section 610 and 620 of NCDOT Standard Specifications.
   B. Place asphalt within 24 hours of applying prime coat.
   C. Place asphalt and base courses to the thicknesses and dimensions shown on the Drawings.
   D. Place surface course to thicknesses and dimensions shown on the Drawings.
   E. Compact each course by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
   F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.5 JOINTS
   A. Traverse Joints:
      1. When Work is suspended long enough to allow mixture to chill, construct transverse joint.
      2. Use butt joint when traffic will not pass over pavement.
3. Use sloped wedge ahead of the end of pavement when traffic will pass over pavement. Place paper parting strip to removal of wedge.
4. Tack coat edge of pavement prior to placing adjoining pavement.

B. Longitudinal Joints:
1. Tack the edge of longitudinal joints prior to placing adjoining pavement.
2. Pinch joint by rolling immediately behind the paver.
3. Offset longitudinal joints in each layer by approximately 6 inches.

3.6 TOLERANCES

A. Density Compaction: Minimum of 92 percent of Maximum Specific Gravity ($G_{mm}$).
B. Flatness: Maximum variation of 1/8-inch measured with 10-foot straight edge.
C. Compacted Thickness: Within 1/4-inch.
D. Variation from Indicated Elevation: Within 1/2-inch.

3.7 FIELD QUALITY CONTROL

A. Perform Contractor Quality Control Program in accordance with Section 609 on NCDOT Standard Specifications.
B. Take 2 compaction tests (1 in each travel lane) in pavement area.
C. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.8 PROTECTION OF FINISHED WORK

A. Immediately after placement, protect pavement from mechanical injury for seven days or until surface temperature is less than 140 degrees F.

END OF SECTION
SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete curbs and gutters.

B. Related Sections:
   1. Section 31 23 16 - Excavation and Fill:
   2. Section 32 11 23 - Aggregate Base Courses:
   3. Section 32 12 16 - Asphalt Paving:
   4. Section 32 17 23 - Pavement Markings

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Concrete Curb and Gutter:
   1. Basis of Measurement: By linear foot
   2. Basis of Payment: Includes forms, reinforcement and concrete, accessories, placing, finishing, curing, and testing.

1.3 REFERENCES

A. American Association of State Highway Transportation Officials (AASHTO)
   1. AASHTO M 31 – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
   2. AASHTO M 32 – Standard Specification for Steel Wire, Plain for Concrete Reinforcement.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

C. ASTM International:
   3. ASTM A 615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

D. NCDOT Standard Specifications:

1.4 SUBMITTALS

A. Concrete Mix Design: Submit concrete mix design 30 days prior to use of concrete.
B. Product Data: Submit data on joint materials, admixtures, and curing compounds.
C. Manufacturer's Certification: Certify products are produced at a plant approved by NCDOT and that products meet or exceed specified requirements.
D. Installer Certification: Certify installer is on list of NCDOT prequalified contractors with an approved Quality Control Plan.
E. Process Control Plan: Submit process control plan for delivering and placing concrete.
F. Samples: Submit two sample panels, 2 inch x 12 inch in size, illustrating exposed aggregate finish.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Division 7 (Concrete Pavements and Shoulders) and Sections 846 (Concrete Curb, Curb and Gutter, Concrete Gutter, Shoulder Berm Gutter, Concrete Expressway Gutter and Concrete Valley Gutter) of NCDOT Standard Specifications, except as modified herein.
B. Maintain one copy of document on site.
C. Obtain cementitious materials from same source throughout.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section and prequalified by NCDOT.
B. Installer: Company specializing in performing Work of this Section and prequalified by NCDOT.
1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature or air temperature in the shade is 40 degrees F and falling or surface is wet or frozen.

B. Do not place concrete when air temperature in the shade is 95 degrees F and rising or when concrete temperature is greater than 95 degrees F.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Slip Form Methods: Use slip form methods wherever possible.

B. Fixed Form Materials: Metal conforming to Section 700 of NCDOT Standard Specifications.

2.2 JOINT MATERIALS

A. General: Conform to Section 1028 of NCDOT Standard Specifications.

B. Joint Filler: Sponge rubber or cork type conforming to ASTM D1751 (AASHTO M213) or bituminous, non-extruding, resilient type conforming to ASTM D1752 (AASHTO M153), Type 1; thickness as indicated on Drawings.

C. Silicone Sealant: Low modulus, cold applied, single component, chemically curing silicone material.
   1. Type NS: Non-sag silicone, toolable.
   2. Type SL: Self-leveling silicone, tooling not required.

D. Rubber Asphalt Sealant: Hot poured rubber asphalt joint sealer conforming to AASHTO M282 (ASTM D3406).

E. Bond Breaker:
   1. General: Product that does not stain or adhere to the sealant and is chemically inert and resistant to oils, gasoline, solvents, and primer.
   2. For On-Grade Pavements: Circular backer rod, diameter 25 percent larger than joint width.
      a. Type L, For Cold Pour Sealants Only: Closed cell expanded polyethylene foam. Use with Type NS silicone only.
      b. Type M, For Cold or Hot Pour Sealants: Closed cell polyolefin with closed skin over an open cell core.
   3. For Bridge Decks Only: Bond breaking tape, extruded polyethylene with pressure sensitive adhesive on one side, minimum 0.005 inches thick.

2.3 REINFORCEMENT

A. General: Conform to Section 1070 of NCDOT Standard Specifications.
B. Reinforcing Steel: ASTM A615 (AASHTO M 31); 60 ksi yield grade; deformed billet steel bars; epoxy coated finish.

C. Dowels and Tie Bars: ASTM A615 (AASHTO M 31); 60 ksi yield grade, plain steel, epoxy coated finish.

D. Welded Wire Fabric Steel: Deformed type, ASTM A497; unfinished.

2.4 CONCRETE MATERIALS

A. Concrete Materials: Provide fine aggregate, coarse aggregate, Portland Cement, fly ash, ground granulated blast furnace slag, water, air entraining agent, and chemical admixtures in accordance with Section 1000 of NCDOT Standard Specifications.

2.5 ACCESSORIES

A. Curing Compound: ASTM C309 (AASHTO M-148), Type 1 clear or translucent or Type 2 white pigmented.

B. Sandblasting equipment: Equipment to obtain desired level of exposed aggregate.

2.6 CONCRETE MIX

A. Mix and deliver concrete in accordance with Section 1000 of NCDOT Standard Specifications.

B. Class A Concrete for sidewalk, curb, curb and gutter, and other incidental site concrete: Air entrained, vibrated conforming to the following criteria:
   1. Compressive Strength: 3,000 psi at 28 days.
   2. Maximum Slump Vibrated: 3.5 inches.
   5. Maximum Water/Cement Ratio for Rounded Aggregate: 0.488.
   6. Air Entrainment: 6.0 percent plus or minus 1.5 percent.

C. Use accelerating admixtures in cold weather only when approved by the Engineer in writing. Use of admixtures will not relax cold weather placement requirements.

D. Use calcium chloride only when approved by the Engineer in writing.

E. Use set retarding admixtures during hot weather only when approved by the Engineer in writing.

2.7 SOURCE QUALITY CONTROL AND TESTS

A. Submit proposed mix design of each class of concrete to independent firm for review prior to commencement of Work.

B. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.
C. Test samples in accordance with ACI 301 for compressive strength (cylinders) and flexural strength (beams.)

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted base course is acceptable and ready to support paving and imposed loads.
B. Verify gradients and elevations of base are correct.
C. Verify utility structure frames and lids are installed in correct position and elevation.

3.2 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.
B. Coat surfaces of manhole, catch basin, and other utility structure frames with oil to prevent bond with concrete pavement.
C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.
B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.1 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.
B. Submit written request in advance of cutting or altering elements affecting:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   5. Work of Owner or separate contractor.
C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
   1. Fit the several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and non-conforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Cut pavements using concrete saw.

G. Restore Work with new products in accordance with requirements of Contract Documents.

H. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

I. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

J. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

K. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.2 PLACING CONCRETE

A. Place concrete in accordance with Section 700 of NCDOT Standard Specifications.

B. Place concrete using the slip form technique wherever possible.

C. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

E. Place concrete to pattern indicated on Drawings.

3.3 CURB AND GUTTER JOINTS

A. Provide sawn joints at 5-foot intervals. Provide 3/4 inch expansion joint at 30 feet maximum and between sidewalks and curbs and structures.

B. Align curb and gutter joints with pavement joints.

3.4 FINISHING

A. Curbs and Gutters: Light broom.
3.5 EXPOSED AGGREGATE

A. Apply surface retarder where exposed aggregate finish is indicated.

B. Wash exposed aggregate surface with clean water and scrub with stiff bristle brush exposing aggregate to match sample panel.

C. Sand blast concrete surfaces to achieve aggregate exposure surface to match sample panel.

3.6 CURING

A. Place curing compound on concrete surfaces immediately after finishing.

B. Cover with burlap or polyethylene film to protect from cold weather and rain.

3.7 JOINT SEALING

A. Separate pavement from vertical surfaces with 1/2 inch thick joint filler.

B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

C. Extend joint filler from bottom of pavement to within 1/2 inch of finished surface.

3.8 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.

B. Maximum Variation From True Position: 1/2 inch.

C. Maximum Variation in thickness: 1/2 inch.

3.9 FIELD QUALITY CONTROL

A. Prepare three concrete test beams for every 1,333 or less square yards of pavement for each class of concrete placed each day.

B. Prepare one additional test beam during cold weather and cured on site under same conditions as concrete it represents.

C. One slump test will be taken for each set of test cylinders taken.

D. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

E. Take one 4-inch diameter core for every 1,333 square yards or less of pavement for each class of concrete placed each day.
3.10 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian or vehicular traffic over pavement for 7 days minimum after finishing.

3.11 SCHEDULES

A. Concrete Curbs: Class A Concrete, compressive strength of 3,000 psi at 28 days, 4 inches thick, buff color Portland cement, light broom finish.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Final grade topsoil for finish landscaping.
2. Placing and lightly compacting topsoil.
3. Removing excess topsoil from site.
4. Installing Brick pavers.

B. Related Sections:
1. Section 31 23 16 - Excavation and Fill.
4. Section 32 92 19 – Seeding.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Topsoil:
1. Basis of Measurement: No separate payment shall be made.
2. Basis of Payment: Includes supplying topsoil materials, stockpiling, preparing and scarifying substrate surface, placing where required, and rolling.

B. Brick Pavers:
2. Basis of Payment: Includes providing leveling sand, mortar and installing brick pavers to rebuild the eroded driveway entrance as shown on the plans. Associated seeding and maintenance adjacent to this area is incidental.

1.3 REFERENCES

A. NCDOT Standard Specifications:

B. ASTM:

1.4 SUBMITTALS

A. Test Results: Submit results of topsoil tests to determine soil amendments required.
B. Samples: Submit to testing laboratory for independent test, in air-tight containers, 10 pound sample of topsoil.

C. Materials Source: Submit name and location of imported materials source.

1.5 QUALITY ASSURANCE

A. Furnish each topsoil material from single source throughout the Work.

B. Perform Work in accordance with applicable portions of Section 235, 500, and 560 of NCDOT Standard Specifications.

C. Maintain one copy on site.

PART 2 PRODUCTS

2.1 MATERIAL

A. Topsoil: Original surface soil typical of the area, which is capable of supporting native plant growth; free of large stones, roots, waste, debris, contamination, or other unsuitable material, which may be detrimental to plant growth; pH value of 5.4 to 7.0.

B. Suitable material excavated from site, amended per requirements of tests is acceptable.

C. Brick Pavers shall be Meet or exceed ASTM C902 Specification for Pedestrian and light traffic paving brick.
C. Scarify surface to depth of 6 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.4 PLACING TOPSOIL

A. Place topsoil in areas where seeding, sodding, and planting is required to thickness as scheduled. Place topsoil during dry weather.

B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.

C. Remove roots, weeds, rocks, and foreign material while spreading.

D. Manually spread topsoil close to plant material, buildings, and pavement to prevent damage.

E. Lightly compact placed topsoil.

F. Remove surplus subsoil and topsoil from site.

G. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.5 BRICK PAVERS

A. Install brick pavers to match the existing driveway section.

B. Refer to plans for installation detail.

3.6 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

3.7 PROTECTION OF INSTALLED WORK

A. Prohibit construction traffic over topsoil. Scarify and regrade disturbed areas.

3.8 SCHEDULES

A. Compacted topsoil thicknesses:
   1. Seeded Areas: 6 inches.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fertilizing.
   2. Seeding.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Seeding:
   2. Basis of Payment: Includes fertilizing, seeding, watering, mowing, and maintenance to specified time limit.

1.3 REFERENCES

A. ASTM International:

B. NCDOT Standard Specifications:

1.4 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.5 SUBMITTALS

A. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

B. Test Reports: Indicate topsoil nutrient and pH levels with recommended soil supplements and application rates.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

D. Invoices or proof of purchase to verify quantities specified.

E. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; and, types, application frequency, and recommended coverage of fertilizer.
1.6 QUALITY ASSURANCE
   A. Perform Work in accordance with Section 1660 of NCDOT Standard Specifications.
   B. Maintain copy of document on site.

1.7 QUALIFICATIONS
   A. Seed Supplier: Company specializing in manufacturing products specified in this Section with
      minimum 3 years documented experience.
   B. Installer: Company specializing in performing work of this Section with minimum 5 years
      documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING
   A. Deliver grass seed mixture in sealed containers showing percentage of seed mix, germination,
      inert matter and weeds; year of production; net weight; date of packaging; and location of
      packaging. Seed in damaged packaging is not acceptable.
   B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of
      manufacturer.

1.9 MAINTENANCE SERVICE
   A. Maintain seeded areas for 12 months from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 TOPSOIL MATERIALS
   A. Original surface soil typical of the area, which can support native plant growth; free of large
      stones, roots, waste, debris, contamination, or other unsuitable material, which may be
      detrimental to plant growth; pH value of 5.4 to 7.0.

2.2 SEED MIXTURE
   A. Furnish materials in accordance with North Carolina Board of Agriculture rules and regulations
      as specified in Section 1660 of NCDOT Standard Specifications for seed, agricultural
      ground limestone, fertilizers, and mulch.
   B. Temporary Seed Mixture (Per General Notes Sheet 01):
      1. Late winter and early spring: Rye and Annual Lespedeza (Kobe)
      2. Summer: German Millet.
      3. Fall: Rye.
   C. Permanent Seed Mixture:
      1. Per General Notes Sheet 01.
2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil, as indicated in analysis. When test is not available, use 10-10-10 mixture of Nitrogen, phosphoric acid, and soluble potash.

C. Lime: ASTM C602, Class T or Class O agricultural limestone containing a minimum 80 percent calcium carbonate equivalent.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

E. Erosion Fabric: Jute matting, open weave.

F. Herbicide: As required to combat type of weeds encountered.

G. Stakes: Softwood lumber, chisel pointed.

H. String: Inorganic fiber.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared soil base and topsoil are ready to receive the Work of this Section.

3.2 FERTILIZING

A. Apply lime at application rate recommended by soil analysis. Work lime into top 6 inches of soil.

B. Apply fertilizer at application rate recommended by soil analysis.

C. Apply after smooth raking of topsoil and prior to roller compaction.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 2 inches of topsoil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.3 SEEDING

A. Apply seed evenly in two intersecting directions at the rates shown above. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.
C. Planting Season:
   1. Mountain Region:
      a. Below 2,500 Feet: August 15 – September 1, March 1 – April 1.
   2. Piedmont Region:
      a. Fall: August 15 – September 15.
      b. Late Winter: February 15 – March 21.
   3. Coastal Plain Region: March to June.

D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

E. Roll seeded area with roller not exceeding 112 lbs/linear foot.

F. Immediately following seeding and rolling, apply mulch to thickness of 1/8 inch. Maintain clear of shrubs and trees.

G. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

3.4 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 12 inches. Space stakes at 5 feet on center.

B. Cover seeded slopes where grade is greater than 3 H:1 V with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

D. Secure outside edges and overlaps at 36 inch intervals with stakes.

E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.5 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.
E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

G. Immediately reseed areas showing bare spots.

H. Repair washouts or gullies.

I. Protect seeded areas with warning signs during maintenance period.

3.6 SCHEDULE

A. Lawn Area: Mix Type 1, 4-inch top soil.

B. Slopes: Mix type 2, 4-inch top soil.

END OF SECTION
SECTION 33 14 13
WATER DISTRIBUTION PIPING, VALVES, HYDRANTS, AND APPURTENANCES

PART 1 GENERAL

1.1 DESCRIPTION

A. Section Includes Installation of:
   1. Pipe and fittings for public water mains and service connections.
   2. Valves, fire hydrants, blowoffs, sampling stations, air release assemblies, and other water distributions appurtenances.

B. Related Requirements:
   2. Section 03 00 05, Concrete (For Smaller Projects).
   3. Section 09 91 00, Painting and Protective Coatings.
   4. Section 31 23 34, Excavating, Trenching, Dewatering and Backfilling.
   5. Section 33 01 12, Identification for Utilities Piping.
   6. Section 33 05 05.31, Hydrostatic Testing.
   7. Section 33 05 09.33, Thrust Restraint for Utility Piping.
   8. Section 33 05 13, Precast Concrete Manholes and Utility Structures.
   9. Section 33 14 14, Public Water Service Connections.
   10. Section 33 14 20, Disinfection of Water Pipelines, Facilities and Appurtenances.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T 180 – Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Society of Mechanical Engineers:

C. ASTM International:
   2. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3).
   3. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
8. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

D. American Water Works Association:
1. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
5. AWWA C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron threaded Flanges.
9. AWWA C500 – Metal-Seated Gate Valves for Water Supply Service.
12. AWWA C512 – Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service.
15. AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Moleculoarly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
16. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm), for Water Transmission and Distribution.
17. AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
18. AWWA C906 – Polyethylene Pressure Pipe and Fittings, 4-In. Through 65-In. for Waterworks.

E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP-60 – Connecting Flange Joints between Tapping Sleeves and Tapping Valves.

F. National Fire Protection Association:

G. NSF International:
2. NSF 372 – Drinking Water System Components - Lead Content.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Section 01 30 00, Administrative Requirements
B. Coordination:
   1. Coordinate Work of this Section with termination of water main connection at Site boundary, connection to CFPUA, and trenching.
   2. The existing system must be kept in operation at all times. Where connections are made to existing mains or other shutdowns are necessary, permission must be obtained and arrangements must be made with the CFPUA Distribution ORC, Utility Services Division for removing from service those mains that will be affected.
   3. No valves are to be operated unless a CFPUA representative is present. Any valves operated without a CFPUA representative present or a directive may be subject of penalties in accordance with CFPUA's ordinance.
   4. Notify CFPUA no less than 2 days prior to an event requiring a CFPUA representative to be present.
   5. The Contractor shall, at least 2 days in advance, notify citizens subject to interruption of service by means of door hangers or any other approved method of the starting time and duration of such interruption.

1.4 SUBMITTALS

A. Section 01 33 00, Submittals: Requirements for submittals.

B. Product Data/Source Quality:
   1. Manufacturer information regarding pipe, pipe fittings, valves, hydrants and appurtenances including component material, assembly and parts diagrams.
   2. Shop test results and inspection data, certified by manufacturer.

C. Testing Procedures:
   1. Submit proposed testing procedures, methods, apparatus, and sequencing. Obtain ENGINEER and CFPUA approval prior to commencing testing.

D. Manufacturer Instructions:
   1. Detailed instructions on installation requirements, including storage and handling procedures.

E. Manufacturer's Certificate:
   1. Certify that products meet or exceed specified requirements.

F. Field Quality-Control Submittals:
   1. Results of Contractor-furnished laboratory testing and field test results.

1.5 CLOSEOUT SUBMITTALS:

A. Section 01 70 00, Execution and Closeout Requirements.

B. Project Record Documents:
   1. Maintain accurate and up-to-date record documents showing modifications made in the field, in accordance with approved submittals, and other Contract modifications relative to buried piping Work.
   2. Record actual locations of piping mains, valves, hydrants, connections, thrust restraints, elevations, and other utilities found and not indicated on design plans.
C. Operations and Maintenance Data:
   1. Furnish in operations and maintenance manuals complete data for materials in accordance with Section 01 60 00, Product Requirements.

1.6 QUALITY ASSURANCE

   1. Cast manufacturer's name, pressure rating, and year of fabrication into valve body.

B. Materials in Contact with Potable Water: Certified according to NSF 61 and NSF 372.

C. Perform Work according to AWWA and PVC Pipe Association standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00, Product Requirements.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:
   1. Store materials according to manufacturer instructions.
   2. Block individual and stockpiled pipe lengths to prevent moving.
   3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
   4. Store PE and PVC materials out of sunlight.

D. Protection:
   1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
   2. Provide additional protection according to manufacturer instructions.

1.8 SITE CONDITIONS

A. Field Measurements:
   1. Verify field measurements prior to fabrication.
   2. Indicate field measurements on Shop Drawings.

1.9 WARRANTY

A. Section 01 70 00, Execution and Closeout Requirements.

B. Furnish 10-year manufacturer's warranty for valves.

PART 2 PRODUCTS

2.1 CFPUA MATERIAL SPECIFICATION MANUAL
A. Refer to CFPUA Material Specification Manual (MSM) for the following products:

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2.2 MATERIALS & ACCESSORIES

A. Bedding, Cover, and Backfill:
   1. As specified in Section 31 23 34, Excavating, Trenching, Dewatering and Backfilling.

B. Pipe Location Wire: As specified in Section 33 01 12, Identification for Utilities Piping.

C. Thrust Restraints: As specified in Section 33 05 09.33, Thrust Restraint for Utility Piping.

D. Service Connections: As specified in Section 33 14 14, Public Water Service Connections.

E. Vaults and Utility Boxes: As specified in Section 33 05 13, Precast Concrete Manholes and Utility Structures.

F. Fire Hydrant Drainage Gravel: Provide #57 Stone.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00, Execution and Closeout Requirements.

B. Identify project horizontal and vertical control points, establish easement and right-of-way lines, stakeout construction points for work and pipeline alignments, establish limits of disturbance.

C. Determine exact location and size of water mains, valves, hydrants, and appurtenances from Drawings

D. Verify location and elevation of existing facilities prior to excavation and installation of proposed interconnecting water mains, valves, and hydrants.
3.2 PREPARATION

A. Section 01 35 00, Special Procedures.
   1. Pre-construction Site Audio/Video Inspections and Photography:
      Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.

B. Section 01 70 00, Execution and Closeout Requirements.

C. All materials, unless otherwise directed, shall be unloaded as nearby as possible to the location of installation by the Contractor. Materials shall be handled with care to avoid damage.

D. All materials found during the progress of work to have flaws, cracks, or other defects will be rejected by the Engineer regardless of whether or not it has been installed and shall be replaced by and at the expense of the Contractor.

E. All PVC pressure pipe, upon delivery to the site and until such time as it is placed in the trench, shall be shielded from the weather and direct sunlight to prevent pipe deterioration.

F. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surfaces, interior linings and components. If any part of the coating, lining or components is damaged, the repairs or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer prior to attempting installation.

G. Pipe Cutting:
   1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
   2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
   3. Grind edges smooth with beveled end for push-on connections.

H. Remove scale and dirt on inside and outside before assembly.

I. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Placement: As specified in Section 31 23 34, Trenching, Excavation, Dewatering and Backfilling.
   1. All mains shall be laid and maintained at the required lines and grades with fittings, valves and appurtenances at the described locations. All pipe shall be laid to the depth as shown on the drawings, or when a depth is not indicated, with a minimum cover of thirty-six (36) inches. Grade lines shall be set by the Contractor. Realignments must be approved by the Engineer. The Contractor shall have suitable survey equipment on the site at all times.
   2. After placement in the trench the spigot end of the pipe shall be centered in the bell and the pipe shall be driven home and then brought to the proper line and
grade by tamping approved backfill material under it, except for the bell. Joint def-

deflection shall not exceed manufacturer’s limit.

3. The Work shall at all times progress with caution so as to prevent damage to un-
derground obstructions both known and unknown. Should an obstruction not shown on the drawings be encountered, the Engineer shall be immediately notified and he shall be responsible for alteration to the design should realignment be neces-
sary. Notify the Engineer far enough in advance to allow the realignment to be accomplished by deflection in the pipe joints.

B. Pipe and Fittings:
1. Handle and assemble pipe according to manufacturer instructions.
2. Install pipe and fittings in strict conformance with AWWA C600.
4. Joint Deflection: Maximum joint deflection shall meet requirements of AWWA C600 or AWWA Manual of Practice M23.
5. Prevent foreign material from entering pipe during placement. Seal pipe openings with watertight plugs during Work stoppages. and Work stoppages using plugs designed for that purpose. If trench contains standing water in joining zone, plug shall remain in place until the trench has been pumped dry before proceeding pipe laying.
6. Allow for expansion and contraction without stressing pipe or joints.
7. Install access fittings to permit disinfection of water system performed under Section 33 14 20 – Disinfection of Water Distribution Mains.
   a. Blowoffs shall be installed for pipe flushing, disinfection, and test sampling.
   b. Blowoffs shall be located as follows:
      1) Dead ends.
      2) Stub-outs greater than one pipe section in length for future interconnect-
ing mains.
      3) Valves closed against disinfection, flushing, and sampling.
   c. Blowoff should be installed as follows:
      1) Opening pointing downward.
      2) Minimum 24-inches clearance between opening and ground for proper sampling.
8. Cover: Measure depth of cover from final surface grade to top of pipe barrel and record.
9. Jointing:
   a. Fused HDPE:
      1) HDPE Pipe shall be joined by the butt-fusion process in accordance with pipe manufacturer’s directions.
      2) Contractor shall provide butt-fusion technicians who are trained and cer-
tified by the HDPE pipe manufacturer to complete the project. The date of technician certification shall not exceed 12 months before commencing construction.
      3) Butt-fusion means the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure.
      4) The internal and external beads resulting from the butt-fusion process shall be visible and examined for penetration 360 degrees around the pipe diameter.
5) DI/HDPE Mechanical Joint Adaptors shall be ductile iron mechanical joint fittings per CFPUA Material Specification Manual and shall be joined to the HDPE pipe by a heat-fused joint on one end, and connected to a ductile iron pipe valve, or fitting with a mechanical joint on the other end.

6) Solvent epoxy cementing, electro-fusion couplings and mechanical joining with bolt on wrap around clamps or mechanical joints without an adapter shall not be used for connections.

b. Push-On Joints:
   1) The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove dirt, grit, oil or excess coatings and other foreign matter. For ductile iron pipe, the gasket shall be flexed inward and inserted in the gasket recess of the bell socket.
   2) A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot ends, care will be taken to avoid contact with the ground.
   3) The joint shall be completed by forcing the plain end to the bottom of the socket with a forked tool or jacking device or other approved method. All pipe shall have depth mark prior to insertion. Pipe cut in the field shall be filed to resemble the spigot end of manufactured pipe.
   4) When deflection is required the joint shall be completed prior to setting the deflection. The deflection shall conform to applicable AWWA Standards or manufacturer’s recommendation.

c. Mechanical Joints:
   1) The inside of the socket, the outside of the spigot end and the gland shall be thoroughly cleaned and or washed with an approved solution to remove dirt, grit, oil or excess coatings and foreign matter to improve gasket seating.
   2) The gland shall then be placed on the plain end of the pipe with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end of the pipe.
   3) The pipe shall be inserted into the socket and the gasket pressed firmly and evenly into the gasket recess. The joint shall be kept straight during the assembly and any deflection required shall be done after the joint has been assembled but prior to tightening the bolts.

C. Valves:
   1. Valves shall be set and joined to the pipe and each type of joint as specified for pipe.
   2. Cast iron valve boxes shall be firmly supported, maintained centered and plumb over the operating nut of the valve. Outside of paved areas, valve boxes shall be set in a 2' diameter x 6" thick concrete collar. The box cover shall be flush with the surface of the finished pavement. All water main valve box lids shall have the word “WATER” cast in the lid.
   3. All reasonable effort must be made to locate valves/valve boxes, back of curb, in grass areas and at street corners, whenever possible.
   4. Valve boxes in areas that will require sod at a later date must be left one to two inches above existing grade (to allow for sod thickness).
   5. All valves must be centered over the operating nut/wheel and all valves, after being fully opened, will be backed off one-quarter turn to prevent them from being
jammed open. This procedure should take place only after the main has passed pressure testing and has been certified by the Engineer.

6. Should the operating nut be more than three feet below the final grade, an extension shall be supplied and installed by the Contractor. The extension shall bring the nut to within twelve (12) inches of final grade.

D. Installing Valves on Existing Mains
   1. When installing valves in existing mains (cutting-in), the Contractor shall insure that the pipe is kept clean at all times and no debris, ground water, mud, oil, etc., will make their way into the pipe.

E. Installation of Tapping Sleeves and Valves
   1. Install the tapping sleeve and valve and pressure test prior to making the tap.
   2. If leaks are present, the Contractor shall repair them to the satisfaction of the Engineer or Resident Project Representative.
   3. Complete the tapping operation and close tapping valve.
   4. Tapping valve shall not be opened until new main has been tested and certified for operation.

F. Hydrants
   1. Each hydrant shall be connected to the main with a 6-inch branch line.
   2. Hydrants shall be set with the pumper nozzle facing the roadway and with the center of the lowest outlet not less than 18 inches above the finished surrounding grade and the operating nut not more than 48 inches above the finished surrounding grade.
   3. Set fire hydrants with safety flange note more than 6 inches and not less than 2 inches above grade.
   4. The hydrant shall be set in a bed of # 57 stone which shall surround the barrel at least 12 inches in all directions.
   5. Hydrants and tees (runs and branches) shall be restrained using field-applied restraint system per CFPUA MSM.
   6. Provide support blocking and drainage gravel while installing fire hydrants; do not block drain hole.
   7. After main-line pressure testing, flush fire hydrants and check for proper drainage.

G. Thrust Restraints: As specified in Section 33 05 09.33, Thrust Restraint for Utility Piping.
   1. New main construction shall be restrained by means of field or factory applied systems as shown on the Engineer drawings.
   2. Thrust blocks in new mains is prohibited except when directed by the Engineer.
   3. Where a fitting or device is to be inserted into an existing main, thrust blocking shall be installed as directed by the Engineer or CFPUA.

H. Polyethylene (PE) encasement when indicated for ductile iron pipe and fittings:
   1. Encase piping in PE as indicated on Drawings to prevent contact with surrounding soil material or insulation from adjacent cathodic protection system.
   2. Comply with AWWA C105.
   3. Where pipe exits ground, terminate encasement 3 to 6 inches above surface.

I. Pipe Locator Wire: Install per Section 33 01 12, Identification for Utilities Piping.
J. Service Connections: As specified in Section 33 14 14, Public Water Service Connections.

K. Disinfection of Potable Water Piping Systems: As specified in Section 33 14 20, Disinfection of Water Distribution Mains.


3.4 FIELD QUALITY CONTROL

A. Section 01 70 00, Execution and Closeout Requirements.

B. Section 33 05 05.31, Hydrostatic Testing.
   1. Pressure test piping system according to AWWA C600.

C. Section 33 14 20, Disinfection of Water Pipelines, Facilities, and Appurtenances.

D. Pigging – Flushing and Cleaning Alternative for Large Mains
   1. For mains where flowrates cannot be achieved to create minimum cleaning velocities of 2 feet per second or greater, cleaning of the new piping system by pigging methods shall be established for the project by the Engineer. Pigging includes the following measures:
      a. Pig launching and retrieval equipment to minimize additional valves, fittings and auxiliary water supplies.
      b. Valves and blowoff assemblies, which are installed as part of the project, shall be used as much as possible to minimize the number of temporary ports required for pigging.
      c. Pig materials used shall be specifically manufactured for flushing and cleaning pressure pipes, bends and valves. The pigs shall be able to go through bends, open valves and fittings, and provide adequate cleaning of the pipe.
      d. Pigging shall be accomplished by the controlled and pressurized passage of a series of hydraulic or pneumatic polyurethane plugs of varying dimensions, coatings, and densities.
      e. Pigs shall be selected by the Contractor and approved by the Engineer.
      f. The Contractor shall provide means to enter the pig into the system, control and regulate flow, monitor flows and pressures, and to remove the pig from the system.
      g. The Contractor shall maintain constant surveillance of the pig while active in the pipe system and immediately report problems encountered or any malfunctions discovered in the piping system.

END OF SECTION
SECTION 33 14 20

DISINFECTION OF WATER PIPELINES, FACILITIES AND APPURtenances

PART 1  GENERAL

1.1  SUMMARY

A. Section Includes:
   1. Essential procedures for disinfecting new and repaired water mains. All new wa-
      ter mains, services, and appurtenances shall be disinfected before they are
      placed in service. All water mains taken out of service for inspection, repair, or
      other activities shall be disinfected before they are returned to service.
   2. Testing and reporting of results.

B. Each unit of constructed water main, services, and appurtenances shall be disinfect-
   ed with chlorine upon successful completion of the hydrostatic test. The disinfection
   procedure shall be performed in strict conformance with Cape Fear Public Utility Au-
   thority (CFPUA) procedures for disinfecting water mains, as outlined in paragraphs
   3.2 and 3.3 of this Section.

C. Related Requirements:
   2. Section 33 14 13 – Water Distribution Piping and Appurtenances.

1.2  REFERENCE STANDARDS

A. American Water Works Association:
   1. AWWA B300 – Hypochlorites.
   2. AWWA C651 – Disinfecting Water Mains.
   3. AWWA M12 – Simplified Procedures for Water Examination.
   4. APHA, AWWA, WEF – Standard Methods for the Examination of Water and
      Wastewater.

B. North Carolina Public Water Supply:
   1. NCPWS Rules Governing Public Water Systems Section .1000 – Disinfection of
      Water Supply Systems.

1.3  ADMINISTRATIVE REQUIREMENTS

A. Any event requiring a CFPUA representative to be present will require a 48 hour no-
   tice to schedule the event.

B. No valves are to be operated unless a CFPUA representative is present. Any valves
   operated without a CFPUA representative present or a directive may be subject to
   penalties in accordance with CFPUA’s Ordinance.
C. The Contractor shall pay particular attention to the scheduling requirements outlined in the procedures. The Contractor shall be responsible for furnishing and installing all required chlorine injection and monitoring ports at no additional cost to CFPUA.

D. The mains will in no case be accepted by CFPUA for public use until the CFPUA Engineer approves the mains as having been properly disinfected.

1.4 SUBMITTALS

A. Section 01 33 00 – Submittal Procedures.

B. Submittals:
   1. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.
   2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
   3. Disinfection Procedure: Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.
   4. Certify that final water complies with disinfectant quality standards of CFPUA.
   5. Test and Evaluation Reports: Indicate testing results comparative to specified requirements. All lab reports shall be from certified lab and submitted to CFPUA representative.
   6. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Disinfection Report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and completion.
   3. Test locations.
   4. Name of person collecting samples.
   5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
   6. Date and time of flushing start and completion.
   7. Disinfectant residual after flushing in ppm for each outlet tested.

1.6 QUALITY ASSURANCE

A. Perform Work according to AWWA C651.

B. QUALIFICATIONS
   1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years’ documented experience.
   2. Applicator: Company specializing in performing Work of this Section with minimum three years’ documented experience.
PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals:
   1. Calcium hypochlorite: Comply with AWWA B300.
   2. Sodium hypochlorite: Comply with AWWA B300.

2.2 CHLORINE RESIDUAL TEST KITS

1. Test kits shall use methodology conforming with *Standard Methods for the Examination of Water and Wastewater* or AWWA Manual M12.
2. Manufacturers:
   a. Hach Company.
   b. LaMotte.
   d. Hellige.
   e. Or equal.

PART 3 EXECUTION

3.1 PREVENTIVE AND CORRECTIVE MEASURES DURING CONSTRUCTION

Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is, therefore, essential that the procedures of this section be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination. Also, any connection of a new water main to the active distribution system prior to receipt of satisfactory samples may constitute a cross-connection. Therefore, the new main must be isolated until all bacteriological and other tests are satisfactorily completed.

A. KEEPING PIPE CLEAN AND DRY: Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize the entrance of foreign material. All openings in the pipeline shall be closed with watertight plugs when work is stopped at the end of the day or for other reasons.

B. JOINTS: Joints of all pipes in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

C. PACKING MATERIAL: All packing material shall consist of molded or tubular rubber rings, or other approved material. Lead or asbestos material in any form shall not be permitted.

D. SEALING MATERIALS: No contaminated material or any material capable of supporting prolific growth of microorganisms shall be used for sealing or lubricating joints. Sealing and lubricating material or gaskets shall be handled in a manner that avoids...
contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water. It shall be delivered to the job in closed containers and shall be kept clean. Soil conditions could warrant the upgrade of gasket material to a volatile resistant material.

E. CLEANING OF PIPE AND APPURTEANCES: If dirt enters the pipe, it shall be removed and the interior pipe surface cleaned. If, in the opinion of the CFPUA representative, the dirt remaining in the pipe will not be removed by the flushing operation, then the interior shall be cleaned by mechanical means such as a hydraulically propelled foam pig or other suitable device. The cleaning method used shall not force mud or debris into the interior pipe joint spaces and shall be acceptable to CFPUA.

F. FLOODING BY STORM OR ACCIDENT DURING CONSTRUCTION: If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section of pipeline shall be flushed until water from the pipe runs clear.

3.2 EXAMINATION

A. Section 01 70 00 – Execution and Closeout Requirements.

B. Chlorination Planning:

1. Before calling the CFPUA office for a time to be set up for disinfection, all of the following shall be installed or supplied by the Contractor at no cost to CFPUA. This list shall be checked and/or assembled before the CFPUA Engineering personnel arrive.
   a. A valve may be required to be installed in the line to be disinfected near the CFPUA water main connection.
   b. A blowoff of a brass or approved material faucet may be required to be installed at the dead end of the line, at all closed valves, and every 1,200 feet to be disinfected for flushing purposes and bacteria sampling. The opening to this blowoff should point downward, and there should be at least twenty-four inches clearance between the opening and the ground for proper sampling.
   c. Mains connecting other mains with open valves within the system to be disinfected may cause “short circuits” resulting in improper disinfection. Valves on these connecting mains shall be checked to see if they should be closed to eliminate this problem. Blowoffs should be at both sides of valves closed to prevent “short circuits”.
   d. Successful hydrostatic testing and CFPUA acceptance of said testing of the line is required before disinfection procedures.
   e. A clean container shall be used to mix and/or dissolve the hypochlorite.
   f. A clean, new wooden mixer shall be present for mixing and dissolving the hypochlorite.
   g. A pump for pumping the chlorine solution into the line shall be present. This pump shall be gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solutions may be fed with a hand pump; for example, a hydraulic test pump. Feed lines shall be of such material and strength as to withstand safely the maximum pres-
sures that may be created by the pumps. All connections shall be checked for tightness before the hypochlorite solution is applied to the main.

h. All temporary blowoffs and injection points shall be properly abandoned and physically disconnected when directed by CFPUA prior to the line being placed into service.

C. Verify that access fittings have been installed under Section 33 14 13 – Water Distribution Piping and Appurtenances.

D. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

3.3 DISINFECTION PROCEDURE FOR NEW WATER MAINS AND FIRELINES

A. Provide required equipment to perform Work of this Section.

B. Method of Chlorination:

1. Use the continuous feed method for disinfection of all new water mains. This method must give a minimum of 10 mg/L of chlorine residual at the end of the 24-hr period.

a. Continuous-Feed Method: The continuous-feed method is the process in which a concentrated solution of chlorine is injected into the water main. Caution shall be observed during the handling and injection of the chlorine solution as chlorine in any form is very toxic and any error could be harmful to the employees and to the public.

b. Preliminary Flushing: Before chlorine solutions are injected, the main shall be filled with potable water to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall not be less than 3.0 ft/sec (preferably 3.5 ft/sec) unless the CFPUA representative determines that conditions do not permit the required flow or that the flow will cause undue problems when discharged to waste. An acceptable flushing velocity shall then be determined and used.

c. Procedure for Chlorinating the Main:

1) Water supplied from the existing distribution system or other Approved public water supply shall be made to flow at a constant, measured rate into the newly installed water main. In the absence of a meter, the rate may be approximated by Approved method.

2) At a point, not more than 10 ft downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 50 mg/L and not greater than 100 mg/L free chlorine residual. To ensure that this concentration is provided, measure the chlorine concentration at regular intervals of distance and time in accordance with the procedures described in the current edition of Standard Methods for the Examination of Water and Wastewater or AWWA Manual M12, or by using Approved chlorine test kits.

3) During the application of the chlorine, valves shall be adjusted by or under the supervision of the CFPUA representative to prevent the chlorine solution from entering the existing water system. The chlorine injection
shall not cease until the entire water main is filled with a chlorine concentration of not less than 50 mg/L. All appurtenances and valves shall be operated to ensure that the chlorine solution has contact with them. The chlorinated water shall be allowed to remain for a period of not less than 24-hours.

4) At the end of the 24-hour period, the chlorine residual shall be measured and shall not be less than 10 mg/L in any samples collected along the water main and at the end of said water main.

C. Final Flushing:
   1. Clearing the Main of Highly Chlorinated Water: Highly chlorinated water shall not remain in prolonged contact with pipe. At the end of the 24-hour contact period, the water shall be removed in order to prevent damage to the pipe lining or corrosion damage to the pipe itself. The highly-chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system.
   2. Disposing of Highly Chlorinated Water: A neutralizing chemical shall be applied to the chlorinated water to be discharged to neutralize thoroughly the chlorine residual. Chlorine residual of water being disposed shall be neutralized by treating with one of the chemicals listed below:
      a. Ascorbic Acid
      b. Sodium Ascorbate
      c. Sulfur Dioxide
      d. Sodium Bisulfate
      e. Sodium Sulfite
      f. Sodium Thiosulfate

D. Bacteriological and Other Tests:
   1. Standard Conditions: After final flushing and before the new main is opened to the distribution system, two consecutive sets of acceptable samples, taken at least 24-hours apart, shall be collected from the new main. Samples shall be collected from every 1,200-ft of new water main, from the end of the water line, and from each branch. All samples shall be tested in accordance with Standard Methods for the Examination of Water and Wastewater. All samples shall show the absence of coliform organisms, and a free chlorine residual equal to the level present in the existing system and shall have no visible color or particulate matter. Must be submitted in the form of an official report by a certified lab.
   2. Special Conditions: If in the opinion of CFPUA, excess contamination has been allowed to enter the water main during construction or other events, bacteriological samples shall be taken at intervals of approximately 400 to 500 ft and shall be identified by location. Samples shall be taken of water that has stood in the new main for at least 16 hours after final flushing has been completed.
   3. Sampling Procedures: Sample collection shall be in accordance with Standard Methods for the Examination of Water and Wastewater. A copper or PVC assembly or a combination blowoff and sampling tap may be used for mains up to 8-inches diameter. Fire hydrants may not be used for sampling purposes. After samples have been collected, analyzed, and accepted, the sampling assemblies may be removed and retained for future use. All bacteriological analysis must be completed by a N.C. certified Drinking Water laboratory. The utility contractor
shall be responsible for all costs associated with the sampling and analysis of all samples required for acceptance. **All Lab Reports shall be delivered to the CFPUA Representative before any activation can proceed.**

E. Replace permanent system devices that were removed for disinfection.

### 3.4 DISINFECTION PROCEDURE FOR REPAIRED WATER MAINS

A. The following procedures apply primarily when mains are wholly or partially de-watered. After the appropriate repair procedures have been completed, the existing main may be returned to service prior to completion of the bacteriological testing to minimize the time customers are out of water. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure present little danger of contamination and require no disinfection.

B. The following procedure is considered as a minimum that may be used.

1. **Swabbing with Hypochlorite Solution:** The interior of all pipe and fittings used in making repair (particularly couplings and tapping sleeves) shall be swabbed with a five (5) percent hypochlorite solution (300 mg/l concentration) before they are installed.

2. **Flushing:** Thorough flushing is the most practical means of removing contamination introduced during repairs. If valve and hydrant locations permit, flushing toward the work location from both directions independently is recommended. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water and particulate matter are eliminated.

3. **Slug Chlorination:** When practical, in addition to the procedures above, the section of main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated with a high concentration of chlorine (as much as 300 mg/L), and the concentration allowed to stay in contact with the main for a minimum of 15 minutes. After chlorination, flushing shall be resumed and continued until discolored water is eliminated and the water is free of noticeable high chlorine odor. A chlorine residual of no greater than 3.0 mg/L shall be acceptable.

4. **Sampling:** Bacteriological samples shall be taken after repairs are completed to provide a record for determining the procedure's effectiveness. If the direction of flow is known, sample locations shall be determined. If the direction of flow is unknown, then samples shall be taken on each side of the main break. If bacteriological samples are unacceptable, the CFPUA representative shall determine corrective action. Daily sampling shall be continued until two successive daily samples are acceptable.

### 3.5 REPEAT DISINFECTION OF WATER MAIN

A. If the initial disinfection fails to produce satisfactory results as per specifications, the new main shall be refloshed, rechlorinated and resampled; CFPUA may also require further cleaning methods (i.e. pigging the line) if the disinfections fails twice. If check samples also fail to produce acceptable results, the new main shall be refloshed and rechlorinated by the continuous-feed method of chlorination until satisfactory results are obtained.
B. High velocities in the existing system, resulting from flushing the new main may disturb sediment that has accumulated in the existing mains. When check samples are taken, it is advisable to also sample water entering the new main.

### 3.6 CONNECTION TO EXISTING SYSTEM

A. The NCPWS certifications, final acceptance, opening of valves and activation of the existing water system will only be allowed after satisfactory samples and chlorine levels have been produced. All sampling devices and blowoffs must be removed from the water main by the contractor prior to acceptance by CFPUA. The CFPUA Operations Department will activate the system when their procedures are completed.

### 3.7 FIELD QUALITY CONTROL

A. Section 01 70 00 – Execution and Closeout Requirements.

END OF SECTION
PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe culverts.
   2. Structures
   3. Rip Rap Apron

B. Related Sections:
   1. Section 31 23 16.13 - Trenching

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings:
   1. Basis of Measurement: By the linear foot for drainage pipe as specified on plans
   2. Basis of Payment: Includes excavation, bedding, pipe, joints, fittings, and backfill.

B. Structures
   1. Basis of Measurement: By each unit of concrete drainage structures
   2. Basis of Payment: Includes preparation and installation of drainage structures

C. Rip Rap Apron
   1. Basis of Measurement: By each unit of 15” thick Class I Rip Rap
   2. Basis of Payment: Includes preparation and installation of rip rap apron at culvert end

1.3 REFERENCES

A. ASTM International:
   1. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.

B. NCDOT Standard Specifications:
1.4 SUBMITTALS

A. Product Data: Submit data on pipe, fittings and accessories.

B. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents:
   1. Accurately record actual locations of pipe runs, connections, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

B. Operation and Maintenance Data: Procedures for submittals.

PART 2 PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Reinforced Concrete Pipe (RCP): ASTM C76, bell and spigot or tongue and groove ends.
   1. Pipe Class: Class III and IV
   2. Fittings: Reinforced concrete.

2.2 BEDDING AND COVER MATERIALS

A. General: Conform to Section 31 23 16.13 - Trenching for bedding and backfill around and on top of pipe.

B. Bedding for Rigid Pipe (RCP): Clean sand, slightly silty sand, or slightly clayey sand having a Unified Soil Classification of SP, SP-SM or SP-SC.

C. Cover and Fill: Conform to Section 31 23 16.13 - Trenching.

2.3 ACCESSORIES

A. Geotextile Fabric: Non-woven, non-biodegradable conforming to Section 1056 of the NCDOT Standard Specifications for Type 1 Engineering Fabric.

B. Concrete: Class A Concrete conforming to Section 1000 of the NCDOT Standard Specifications.
   1. Compressive strength of 3,000 psi at 28 days.
   2. Air entrained.
   3. Water cement ratio of 0.488 with rounded aggregate and 0.532 with angular
aggregate.

4. Maximum slump of 3.5 inch for vibrated concrete and 4 inch for non-vibrated concrete.

5. Minimum cement content of 564 pounds per cubic yard for vibrated concrete and 602 pounds per cubic yard for non-vibrated concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 EXCAVATION AND BEDDING

A. Excavate pipe trench in accordance with Section 31 23 16.13 - Trenching.

B. Excavate to lines and grades shown on Drawings or required to accommodate installation of encasement.

C. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.

D. Provide sheeting and shoring in accordance with Section 31 23 16.13 - Trenching.

E. Place bedding material at trench bottom, level continuous layer not exceeding 8-inch compacted depth; compact to 95 percent per Section 31 23 16.13 - Trenching.

F. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION – PIPE

A. Install in accordance with manufactures instructions and as indicated on Drawings.

B. Install plastic pipe, fittings, and accessories in accordance with ASTM D2321.

C. Seal joints watertight.

D. Begin at downstream end and progress upstream.
E. Keep pipe and fittings clean until work is completed and accepted by Engineer.

F. Lay bell and spigot pipe with bells upstream.

G. Repair surface damage to pipe with protective coating with two coats of compatible bituminous paint coating.

H. Install cover at sides and over top of pipe

3.5 PIPE ENDS

A. Place fill at pipe ends to match embankment slopes, concrete aprons, adjacent construction, end sections, or end walls as indicated on Drawings.

3.6 ERECTION TOLERANCES

A. Lay pipe to alignment and slope gradients noted on Drawings; with maximum variation from indicated slope of 1/8 inch in 10 feet.

B. Maximum Variation from Intended Elevation of Culvert Invert: 1/2 inch.

C. Maximum Offset of Pipe From Indicated Alignment: 1 inch.

D. Maximum Variation in Profile of Structure from Intended Position: 1 percent.

3.7 FIELD QUALITY CONTROL

A. Request inspection prior to and immediately after placing bedding.

B. Soil Compaction Testing: In accordance with Section 31 23 16.13 - Trenching.

C. When tests indicate Work does not meet specified requirements, remove work, replace, and retest.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Protect pipe and bedding from damage or displacement until backfilling operation is in progress.

END OF SECTION
SHIRE LANE CULVERT REPLACEMENT
NEW HANOVER COUNTY,
NORTH CAROLINA

NEW HANOVER COUNTY OFFICIALS

JONATHAN BARNFIELD, JR.
CHAIRMAN, COUNTY BOARD OF COMMISSIONERS

JULIA OLSON-BOSWORTH
VICE-CHAIRMAN, COUNTY BOARD OF COMMISSIONERS

PATRICIA KUESEK
COUNTY COMMISSIONER

WOODY WHITE
COUNTY COMMISSIONER

ROB ZAPPLE
COUNTY COMMISSIONER

CHRIS COUGHERY
COUNTY MANAGER

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DESCRIPTION OF WORK

- REMOVAL OF 41 LF OF 36" CORRUGATED METAL PIPE (CMIP) AND CURB/REBAR STRUCTURES
- REMOVAL OF 49 LF OF 24" CORRUGATED PLASTIC PIPE (CPP)
- INSTALLATION OF 50 LF OF 36" REINFORCED CONCRETE PIPE (RCP) STORM DRAINAGE PIPE WITH PRECAST ENDS AND JUNCTION BOX
- INSTALLATION OF 34 LF 18" CLASS III RCP WITH STANDARD NC DOT CATCH BASINS
- BANK RESTORATION & STABILIZATION
- REMOVAL AND REPLACEMENT OF 85 LF OF 6" CiPFA WATER MAIN
- INCIDENTAL ASPHALT REMOVAL AND BRICK PAVING RESTORATION

NEW HANOVER COUNTY ENGINEERING
230 GOVERNMENT CENTER DRIVE, SUITE 160
WILMINGTON, NC 28403

PROJECT INFORMATION

NEW HANOVER COUNTY CONTRACT #19-0229

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NOTICE TO CONTRACTOR

1) THE CONTRACTOR SHALL FIGH THE DATABASE TO ACCURATE ELEVATIONS. THE CONTRACTOR SHALL IMMEDIATELY CONK M.A. BENNETT ETC., LLC IF ANY ERRORS ARE FOUND IN ELEVATIONS SHOWN.

2) PRIOR TO CONSTRUCTION, THE CONTRACTOR MUST CONTACT THE J. W. WOOL TO VERIFY THE LOCATION OF ANY APPARENT UTILITIES. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGES TO ANY APPARENT UTILITIES NOT LOCATED OR MARKED BY J. W. WOOL AND ANY DAMAGES TO ANY APPARENT UTILITIES FROM CONSTRUCTION ACTIVITIES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

611
Know what's below. Call before you dig.

811

Attachment A