Specifications
For
Water Line Extensions

FOR

IREDELL WATER CORPORATION
ID #01-49-025
And
Wayside Estates
ID #01-49-171
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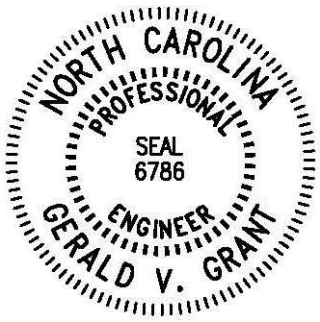

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Date

Contents

SECTION 01015
PROJECT REQUIREMENTS

1. GENERAL

1.1 Notice of Commencement of Work
CONTRACTOR shall notify OWNER at least 48 hours prior to beginning of the Work.

1.2 Responsibility for Materials and Equipment

1.2.1 Items Furnished by CONTRACTOR
CONTRACTOR shall be fully responsible for all materials and equipment which he has furnished. All items shall be unloaded promptly after arrival. All charges for demurrage due to negligence or delay by CONTRACTOR shall be paid by CONTRACTOR. Materials shall be handled by methods which will prevent damage. Materials shall be protected from exposure to the elements. All material shall be stored in accordance with the General Equipment Stipulations.

1.3 Preparation for Shipment
All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of ENGINEER. Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

1.4 Land For Construction Purposes
Any additional area required by CONTRACTOR shall be obtained from property owners by and at the expense of the CONTRACTOR. The OWNER shall not be liable for any damages caused by the CONTRACTOR to such premises. Yard areas shall be kept neat and clean.
The CONTRACTOR shall hold and save the OWNER free and harmless from liability of any nature or kind arising from any use, trespass, or damage occasioned by his operation on premises or third persons.

CONTRACTOR shall immediately move stored materials or equipment if any occasion arises, as determined by OWNER, requiring access to the storage area. Material or equipment shall not be placed on the property of OWNER until OWNER has agreed to the location to be used for storage.

1.5 Easements and Rights-of-Way
The easements and rights-of-way for the pipelines will be provided by OWNER. CONTRACTOR shall confine his construction operations within the limits indicated on the Drawings. CONTRACTOR shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies in order to avoid damage to property and interference with traffic.

1.5.1 On Private Property
Easements across private property are indicated on the Drawings. CONTRACTOR shall set stakes to mark the boundaries of construction easements across private property.

CONTRACTOR shall furnish, without charge, competent persons from his force and such tools, stakes, and other materials as OWNER may require in staking out the boundaries of construction easements. CONTRACTOR will not be required to provide an instrument person. The stakes shall be protected and maintained until completion of construction and cleanup.
CONTRACTOR shall not enter any private property outside the designated construction easement boundaries without written permission from the owner of the property.

1.5.2 Work Within Highway and Railroad Rights-of-Way.

Permits shall be obtained by OWNER. All Work performed and all operations of CONTRACTOR, his employees, or Subcontractors, within the limits of railroad and highway rights-of-way, shall be in conformity with the requirements and be under the control (through OWNER) of the railroad or highway authority owning, or having jurisdiction over and control of, the right-of-way in each case. All work within the Highway and Railroad Rights-of-Way shall conform to the requirements of those sections of the specifications. The CONTRACTOR shall provide all bonds and insurance required by the governing agency.

1.6 Notices to OWNERS and Authorities

CONTRACTOR shall, as provided in General Conditions, notify OWNERS of adjacent property and utilities when prosecution of the Work may affect them. When it is necessary to temporarily deny access to property, or when any utility service connection must be interrupted, CONTRACTOR shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices will conform to any applicable local ordinance and, whether delivered orally or in writing, will include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby. Utilities and other concerned agencies shall be contacted at least 24 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

1.7 Lines and Grades

All Work shall be done to the lines, grades, and elevations indicated on the Drawings. Basic horizontal and vertical control points will be established or designated by OWNER and are shown on the Drawings. These points shall be used as datums for the Work. All additional survey, layout, and measurement Work shall be performed by CONTRACTOR as a part of the Work.

CONTRACTOR shall provide an experienced instrument person, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement Work. In addition, CONTRACTOR shall furnish, without charge, competent persons from his force and such tools, stakes, and other materials as OWNER may require in establishing or designating control points, in establishing or designating control points, in establishing construction easement boundaries, or in checking survey, layout, and measurement Work performed by CONTRACTOR.

CONTRACTOR shall keep OWNER informed, a reasonable time in advance, of the times and places at which he wishes to do Work, so that horizontal and vertical control points may be established and any checking deemed necessary by ENGINEER may be done with minimum inconvenience to ENGINEER and minimum delay to CONTRACTOR.

CONTRACTOR shall remove and reconstruct Work which is improperly located.

1.8 Connections to Existing Facilities

Unless otherwise specified or indicated, CONTRACTOR shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, CONTRACTOR shall receive permission from OWNER or the owning utility prior to undertaking connections. CONTRACTOR shall protect facilities against deleterious substances and damage. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, material, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves and other appurtances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.9 Unfavorable Construction Conditions

During unfavorable weather, wet ground, or other unsuitable construction conditions, CONTRACTOR shall confine his operations to Work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect

adversely the quality or efficiency thereof, unless special means or precautions are taken by CONTRACTOR to perform the Work in a proper and satisfactory manner.

1.10 Cutting and Patching

As provided in General Conditions, CONTRACTOR shall perform all cutting and patching required for the Work and as may be necessary in connection with uncovering Work for inspection or for the correction of defective Work.

CONTRACTOR shall perform all cutting and patching required for and in connection with the Work, including but not limited to the following:

- Removal of improperly timed Work
- Removal of samples of installed materials for testing
- Alteration of existing facilities
- Installation of new Work in existing facilities

CONTRACTOR shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. CONTRACTOR shall not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without OWNER'S concurrence. Materials shall be cut and removed to the extent indicated on the Drawings or as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. Materials which are not salvable shall be removed from the site by CONTRACTOR. All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to ENGINEER, to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished. At any time when CONTRACTORs will be crossing city streets with heavy equipment or open cutting said streets, it will be necessary to get a permit from the OWNER for such action. CONTRACTORs with equipment entering OWNER or Department of Transportation maintained streets shall not spill debris or deposit mud, dirt, etc., on these streets without immediate cleanup. After two warnings, cleanup may be done by OWNER forces and backed charged to the offending CONTRACTOR.

1.11 Cleaning Up

CONTRACTOR shall keep the premises free at all times from accumulations of waste materials and rubbish. CONTRACTOR shall provide adequate trash receptacles about the site and shall promptly empty the containers when filled. Volatile wastes shall be properly stored in covered metal containers and removed daily. Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and antipollution laws. Adequate cleanup will be a condition for recommendation of progress payment applications. CONTRACTOR shall keep streets and roadways clean and accessible at all times. Street and roadway cleaning shall be required by and to the satisfaction of the authority having jurisdiction over the street or roadway.

1.12 Applicable Codes

References in the Contract Documents to local codes mean the following:

1993 North Carolina Building Code
North Carolina Occupational Safety and Health Standards for General Industry (1910)
North Carolina Department of Transportation

Other standard codes which apply to the Work are designated in the Specifications.

1.13 NSF Certification

The following materials which come in contact with the treated water shall have certification to ANSI/NSF 60 or 61.

Joining and sealing materials, such as solvents, cements, welding materials, and gaskets.
Pipe and fittings.
Coatings, linings, and paints.

1.14 Progress Meetings

CONTRACTOR shall schedule and hold regular progress meetings at least monthly and at other times as requested by OWNER or required by progress of the Work. CONTRACTOR and all subcontractors active on the site shall be represented at each meeting. CONTRACTOR may at his discretion request attendance by representatives of his suppliers, manufacturers, and other subcontractors.

CONTRACTOR shall preside at the meetings. Meeting minutes will be prepared and distributed by CONTRACTOR. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

1.15 Existing Utilities

CONTRACTOR shall be responsible for locating all existing utilities prior to an excavation. CONTRACTOR shall pay all costs for temporarily and permanently relocating all overhead and underground utilities. CONTRACTOR shall coordinate with the utility OWNER all other work near other utilities at least 1 week in advance of being near the other utility.

END OF SECTION

SECTION 01090
REFERENCE STANDARDS

1. GENERAL

1.1 Description

Throughout these specifications, references are made to specifications and standards issued by nationally recognized professional and/or trade organizations.

1.1.1 These referenced standards are generally identified by abbreviating the names of the specific organization followed by the specification/standard number.

1.1.2 Unless specifically indicated otherwise, all references to such standards refer to the latest edition available at the time of the bidding of this project.

1.2 Abbreviations

Wherever the following abbreviations are used in these specifications and other project documents, they are to be construed as the same as the respective expressions represented:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel institute
ANSI	American National Standards Institute, Inc.
ASTM	American Society of Testing Materials
AWWA	American Water Works Association
AWS	American Welding Society
FSS	Federal Specifications and Standards General Service Administrations
ACE US	Army Corps of Engineers
NAVFAC	Naval Facilities Command
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
SSPC	Steel Structures Painting Council
UL	Underwriters Laboratory

END OF SECTION

SECTION 01400

QUALITY CONTROL

1. TESTING SERVICES

All tests to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to the OWNER. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards.

Testing services provided by OWNER are for the sole benefit of OWNER; however, test results shall be available to CONTRACTOR. Testing necessary to satisfy CONTRACTOR's internal quality control procedures shall be the sole responsibility of the CONTRACTOR.

1.1 Testing Services Furnished by CONTRACTOR

Unless otherwise specified, CONTRACTOR shall provide all testing services in connection with the following:

- Concrete materials and mix designs
- Asphaltic concrete materials and mix designs
- Embedment, fill, and backfill materials
- All other tests and engineering data required for OWNER's review of materials and equipment proposed to be used in the Work CONTRACTOR shall obtain OWNER's acceptance of the testing firm before having services performed, and shall pay all costs for these testing services.

1.2 Testing Services Furnished by OWNER

Unless otherwise specified, OWNER shall provide for tests made on the following materials and equipment:

- Concrete
- Asphaltic concrete
- Moisture-density and relative density tests and embedment, fill, and backfill materials
- In-place field density tests on embedments, fills, and backfill
- Other materials and equipment at the discretion of OWNER

Testing, including sampling, will be performed by OWNER or the testing firm's laboratory personnel, in the general manner indicated in the Specifications. OWNER shall determine the exact time, location, and number of tests, including samples. Arrangements for delivery of samples and test specimens to the testing firm's laboratory will be made by OWNER. The testing firm's laboratory shall perform all laboratory tests within a reasonable time consistent with the specified standards and shall furnish a written report of each test.

CONTRACTOR shall furnish all sample materials and cooperate in the testing activities, including sampling. CONTRACTOR shall interrupt the Work when necessary to allow testing, including sampling, to be performed. CONTRACTOR shall have no claim for an increase in Contract Price or Contract Times due to such interruption. When testing activities, including sampling, are preformed, in the field by OWNER or the testing firm's laboratory personnel, CONTRACTOR shall furnish personnel and facilities to assist in the activities.

If initial tests performed by OWNER fail to meet the requirements of the specifications, CONTRACTOR shall reimburse OWNER for all costs associated with retesting. CONTRACTOR shall reimburse OWNER for all testing services which are not properly scheduled.

1.3 Transmittal of Test Reports

Written reports of tests and engineering data furnished by CONTRACTOR for OWNER's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.

END OF SECTION
SECTION 02222

EXCAVATING, BACKFILLING & COMPACTING FOR UTILITIES

1. DESCRIPTION

The CONTRACTOR shall furnish all labor, material, equipment, and supplies, and shall perform all earthwork including excavation and backfill, pavement removal, sheathing, bracing, shoring, pumping or bailing, dewatering, restoration and cleanup, all as indicated, specified and/or necessary to complete the work.

1.1 Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

1.2 Related Work

Reference the following specifications for related work:

02270	Erosion and Sediment Control
02575	Pavement Repair and Resurfacing
02933	Seeding and Mulching
3300	Cast-in-Place Concrete
D-2487	ASTM Uniform Soil Classification System, 1991 (US Army Corp of Engineers Standard as revised by the US ACE and the Bureau of Reclamation in 1952)
D-698	ASTM Compaction Testing
P-1926	OSHA Regulations

1.2.1. Any reference to NCDOT standard specifications was obtained from the "Standard Specifications for Roads and Structures" dated January, 2002, published by the North Carolina Department of Transportation.

2. MATERIALS

2.1 Fill Material shall be classified as ML-low plasticity silt or better by the Unified Soil Classification System and tabulated below:

	Unified Class	Description
Class I		1/4" - 1-1/2" well graded stone including coral, slag, cinders, crushed stone and crushed shells
Class II	GM	Coarse gravel well graded
	GP	Coarse gravel poorly graded
	SW	Coarse sands well graded
	SP	Coarse sands poorly graded
Class III	GM	Silty-sandy gravel
	GC	Clayey-sandy gravel
	SM	Silty-sands
	SC	Clayey-sands
Class IV	ML	Inorganic silts and fine sands

Fill material shall exhibit a plasticity index of less than 20 and Standard Proctor maximum density at optimum moisture greater than 90 pounds per cubic foot. The following materials are unacceptable:

	Unified Class	Description
Class IV	CL	Inorganic clays - low plasticity
	MH	Inorganic elastic silts
	CH	Inorganic clays - high plasticity
Class V	OL	Organic silts
	OH	Organic clays
	PT	Highly organic soil

2.2 Washed Stone

Stone material where indicated shall be crushed stone or gravel of strong, durable nature and shall conform to standard size No. 57 per NCDOT Section 1000:

1 ½ "	100%
1"	95-100%
½ "	25-60%
#4	0-10%
#8	0-5%

2.3 Class C Concrete

Minimum 28-day compressive strength of 2000 psi.

3. CONSTRUCTION

3.1 Existing Facilities

3.1.1 Existing Utilities Shown on the Drawings

It shall be the CONTRACTOR's responsibility to conduct the work in such a manner as to avoid damage to or interference with any utilities services shown on the drawings. If such damage, interference, or interruption of service shall occur as a result of his work, then it shall be the CONTRACTOR's responsibility to promptly notify the ENGINEER of the occurrence and to repair or correct it immediately, at his own expense, and to the satisfaction of the ENGINEER and the OWNER of the Utility.

3.1.2 Existing Utilities Not Shown on the Drawings

It shall be the CONTRACTOR's responsibility to exercise all reasonable precaution in the performance of the work to avoid damage to or interference with any utilities services, even though not shown on the drawings. If such damage, interference, or interruption of service shall occur as the result of this work, then the CONTRACTOR's responsibility will be the same as stipulated in Paragraph 3.1.1 above.

3.2 Excavation and Backfill - General Requirements

3.2.1 Pavement, gutters, sidewalks, aprons and curbs which will be disturbed by excavation shall be removed and disposed of as a part of ordinary excavation. That which is to be removed shall be cut or sawn along clean straight lines from that which is to remain. Remove enough such that a minimum of twelve inches of undisturbed earth remain between the excavation and that which is to remain.

3.2.2 Where required, and as approved by the ENGINEER, sheeting and bracing shall be used to prevent injury to persons, caving of trench walls and to conform with all governing laws and ordinances. Sheeting and bracing shall be left in place until the trench is refilled to a safe limit. The top portion may then be removed, but the lower portion shall remain undisturbed.

3.2.3 It is the responsibility of the CONTRACTOR to provide an adequate dewatering system where required. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation. Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage, and does not cause damage to any portion of the work or adjacent property. All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage. The dewatering system shall be maintained until backfilling is completed or as otherwise directed by the ENGINEER. All damage resulting from the dewatering operation shall be repaired by the CONTRACTOR to the satisfaction of the ENGINEER and at no cost to the OWNER.

3.2 The CONTRACTOR shall erect, maintain, and safeguard temporary bridges, walkways, or crossings where it is necessary to maintain traffic. Where trenches are open in the vicinity of pedestrian or vehicular travel lanes, suitable carriers will be constructed and maintained and the work will be further protected from sunset to sunrise with a sufficient number of lights or flares to fully protect the public from

accidents on account of construction.

3.3 If the specified depth for foundations proves insufficient to reach firm ground, the ENGINEER shall be notified and will furnish instructions for proceeding with the work.

3.4 Rock, wherever used as a name for excavation material, shall mean boulders exceeding one-half cubic yard in volume or solid ledge rock, which in the opinion of the ENGINEER, requires for its removal drilling and blasting, or wedging or sledging and barring. Where rock excavation is necessary, the CONTRACTOR shall excavate the same as near the neat lines of the trench as practicable and he shall take all due precautions in the pursuance of the work. He will be held strictly responsible for all injury to life and to public and private property.

3.4.1 Rock shall be removed from the excavation to the following limits:
- Trenches - The diameter of the pipe plus 8-inches on each side, extending six inches below the pipe wall and bell.
- Structures - 12-inches beyond the vertical plane of the structure on all sides and on the bottom only to the depth necessary for proper installation.

3.5 Blasting

Prior to commencing any blasting operations the CONTRACTOR shall notify the ENGINEER and either the Local Fire Department - Fire Prevention Section or the County Fire Administrator (as applicable) and obtain blasting permits as required. The CONTRACTOR must furnish proof (certification) of insurance specifically covering any and all obligations assumed pursuant to the use of explosives.

All blasting operations shall be conducted in strict accordance with any and all decrees, rules, regulations, ordinances, laws as may be imposed by any regulatory body and/or agency having jurisdiction over the work relative to handling, transporting, use and storage of explosives. Blasting shall be done only by competent and experienced men whose activities shall be conducted in a workmanlike manner. Satisfactory information must be provided to the ENGINEER, that the blaster meets or exceeds the qualifications enumerated in OSHA Regulations Part 1926, Subpart U, Section 1926.901 - Blaster Qualifications.

The CONTRACTOR shall protect all structures from the effects of the blast and repair any resulting damage. If the CONTRACTOR repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the ENGINEER may direct the CONTRACTOR to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

3.5.1 Overburden

Undisturbed overburden may be deemed adequate in lieu of matting but only after the actual depth of the undisturbed overburden has been determined and adjudged sufficient by the ENGINEER. Under no circumstances will loose or fill overburden be adequate without the use of weighted mats.

3.5.2 Permission to Blast

The CONTRACTOR shall not be allowed to blast before 9 a.m. or after 3 p.m. without approval of the ENGINEER and OWNER. Blasting will not occur within any rights-of-way maintained by any agency (D.O.T., R.R., Gas, OWNER, etc.) without specific approval of the controlling agency and only in accordance with their respective requirements (as exceeded herein). The CONTRACTOR shall be held responsible for any and all injury to persons or damage to public or private property.

3.5.3 The CONTRACTOR shall not use excavated rock as backfill material. Dispose of rock which is surplus or not suitable for use as rip rap.

3.5.4 Monitoring

The CONTRACTOR shall notify the ENGINEER prior to any blasting. Additionally, the CONTRACTOR shall notify the ENGINEER before any charge is set. Following review by the ENGINEER regarding the proximity of permanent structures to the blasting site, the ENGINEER may direct the CONTRACTOR to

employ an independent, qualified specialty sub-contractor, approved by the ENGINEER, to monitor the blasting by use of seismograph, identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

3.6. Structure Excavation and Backfill

3.6.1 Structure Excavation shall be made at the locations shown on the plans and to the exact subgrade required. Bottom of excavations shall be level and in firm, solid material, with soft material or voids treated as specified. Excavated areas shall be kept free of water during the construction period. Where earth will stand, footing trenches may be cut to the exact size of the footings; otherwise, forms shall be used. Where necessary, sides of excavations shall be shored and sheathed, or cofferdams built, as required for protection of the work and personnel.

3.6.1.1 Wherever excavation for a foundation extends below the water table or where specifically indicated on the plans, washed stone shall be placed to a minimum thickness of 12 inches, unless otherwise shown, prior to placing the foundation. The washed stone shall be compacted to 90% of maximum as determined by the Standard Proctor test (ASTM D698).

3.6.1.2 If the specified depth for foundations proves insufficient to reach firm ground, the ENGINEER shall be notified for furnishing instructions and proceeding with the work.

3.6.1.3 An adequate dewatering system shall be provided at all structure excavations and elsewhere as directed by the ENGINEER. If a well-point system is used, the CONTRACTOR shall submit plans to the ENGINEER for approval. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation. Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage, and does not cause damage to any portion of the work or adjacent property. All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage. The dewatering system shall be maintained until backfilling is complete or as otherwise directed by the ENGINEER. All damage resulting from the dewatering operation shall be repaired by the CONTRACTOR to the satisfaction of the ENGINEER and at no cost to the OWNER.

3.7. Structure Backfill shall be done with material free from large clods, frozen earth, organic material or any foreign matter, and shall evenly and carefully be placed and tamped in horizontal layers. Compaction equipment specifically designed for these purposes must be present and operational at the job site and shall be utilized throughout to obtain uniform compaction. The degree of compaction and the density shall be determined by the Standard Proctor Test (ASTM D698), with compaction requirements as follows:

Percent of Maximum Density at Optimum Moisture	Location
98	Top 12" of fill pavement or surfacing
95	Full depth beneath all roads - paved or unpaved, driveways, sidewalks and undercut backfill for structure excavation
90	All other areas not defined above

3.7.1 No backfill shall be placed against a structural wall until all connecting structural members are in place. It shall be the CONTRACTOR's responsibility to provide compaction to such a degree that subsidence after placing shall not be detrimental to the stability or appearance of the structure, adjacent ground, or paved areas. The CONTRACTOR shall provide adequate protection to all structures during backfilling and shall use every precaution to avoid damaging or defacing them in any way. CONTRACTOR shall be responsible for the protection of all structures from damage or flotation prior to

backfill being placed.

3.7.2 Unless otherwise approved by the ENGINEER, liquid-retaining structures shall not be backfilled until tested for leakage.

3.8. Unstable Subgrade

Should unstable soil, organic soil, or soil types classified as fine-grained soils (silts and clays) by ASTM D-2487 be encountered in the bottom of pipe trenches or structure excavations, such soils shall be removed to a depth and width determined by the ENGINEER, properly disposed of and shall be backfilled with crushed stone conforming to the Department of Transportation Specifications, Size 57. Placement shall not exceed 12-inches loose and compacted to 90% of the dry density determined by the Standard Proctor Test ASTM D698 (Class C concrete may be substituted in place of #57 stone at the CONTRACTOR's option. A 24-hour cure must be given before proceeding with the work).

3.9. Site Grading

Site grading shall conform to the grades indicated by the finish contours on the plans. Where topsoil, pavement, gravel or crushed stone surfacing and other items are shown, rough grade shall be finished to such depth below finish grade as necessary to accommodate these items. All areas where structures are to be built on fill shall be stripped to such depth as necessary to remove turf, roots, organic matter and other objectionable materials.

3.9.1 Excavation shall be made to the exact elevations, slopes and limits shown on the plans. Material excavated may be used as fill material as long as it meets the material requirements established herein. Acceptable material must be stockpiled neatly onsite and clear of all unsuitable materials to be removed from the site.

3.9.2 Fill shall incorporate only acceptable materials defined herein. It shall not contain organic material, roots, debris or rock larger than 6 inches in diameter.

3.9.2.1 Where fill is to be placed, all existing vegetation, roots and other organic matter down to 12 inches below grade shall be stripped and disposed of as directed.

3.9.2.2 After clearing existing vegetation, at the ENGINEER's discretion, the site may require proof rolling to insure that all unstable material has been removed. Proof rolling shall be done in the ENGINEER's presence, utilizing a loaded dumptruck or similar pneumatic-tired vehicle with a minimum loaded weight of 25 tons.

3.9.2.3 Fill shall be placed in successive compacted layers not to exceed 6 inches compacted thickness. Each layer shall be spread evenly and compacted as specified below before the next layer is placed.

3.9.2.4 Rock shall not be incorporated in fill sections supporting pavement or structures.

3.9.2.5 Where natural slopes exceed 3:1, horizontal benches shall be cut to receive fill material. Slopes of less than 3:1 and other areas shall be scarified prior to placing fill material.

3.9.2.6 Borrow material, as required, shall be provided by the CONTRACTOR at his own expense. Borrow material on site may be utilized provided it complies with these specifications.

3.10. Compaction

Unless otherwise noted, each layer of fill and backfill and the top 12 inches of existing subgrade material in cuts shall be compacted by approved equipment as specified below. The degree of compaction and the density shall be determined by the Standard Proctor Test (ASTM D698).

	Percent of Max. Dry Density at Optimum Moisture Content
Top 12 inches of fill under pavement or surface	98%

Fill under roads and structures	95%
Fill and backfill in other areas	90%

Material too dry for proper compaction shall be moistened by suitable watering devices, turned and harrowed to distribute moisture, and then properly compacted. When material is too wet for proper compaction, operations shall cease until such material has sufficiently dried.

3.11. Compaction Tests

The CONTRACTOR shall provide compaction tests by an independent testing agency selected by the CONTRACTOR and approved by the ENGINEER. The compaction tests shall be taken at appropriate locations and frequency to demonstrate that the backfill (or fill) has been placed to meet the minimum compaction density required. The testing agency shall submit written test records to the ENGINEER for all compaction tests performed. Minimum testing shall be one test per 1000 LF of line. In the event that the soil compaction is not in compliance with these specifications, then the CONTRACTOR shall take corrective action, at no cost to the OWNER, to compact the soils within the limits of the specifications. The ENGINEER shall be notified within 24 hours of any failing compaction tests. Any retesting of failed areas shall be performed only after corrective measures have been made by the CONTRACTOR to bring the compacted soils into compliance. All retesting shall be performed with the ENGINEER present.

3.12. Site Restoration

3.12.1 General

All surfaces disturbed by the CONTRACTOR in the work shall be restored to a condition equal to or better than that which existed prior to commencement of the work, except as otherwise specified herein.

3.12.2 Pipe drains, headwalls, catch basins, curbs and gutters, and all incidental drainage structures shall be restored using like materials and details at no additional cost to the OWNER. The CONTRACTOR shall maintain drainage during construction.

3.12.3 All cuts, fills and slopes shall be neatly dressed off to the required grade or subgrade, as indicated on the plans.

3.12.4 Grassed areas shall be restored at no additional cost to the OWNER. Disturbed areas shall be covered with two (2) inches of topsoil, furnished by the CONTRACTOR from an approved source and of approved quality, then shall be fertilized, and seeded to match existing adjoining areas. All ditches shall be restored to their existing grade, line and cross section.

3.12.5 Paved surfaces shall be restored in accordance with the provisions of Section 02575.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENT CONTROL

1. DESCRIPTION

1.1. Erosion and sedimentation control shall be provided by the CONTRACTOR for all areas of the site denuded or otherwise disturbed during construction. The CONTRACTOR shall be responsible for all installation, materials, labor, and maintenance of erosion and sediment control devices, as well as removal of temporary erosion and sediment control devices shown on the plans or required to protect all downstream properties, natural waterways, streams, lakes, ponds, catch basins, drainage ditches, roads, gutters, natural buffer zones, and manmade structures.

1.2. Erosion and sediment control procedures and facilities shall conform to all legally regulated procedures for the control of erosion and sedimentation.

1.3. Related Work

See the following sections for related work.
02274 Plain Rip Rap
02275 Stone for Erosion Control
02933 Seeding and Mulching
02277 Silt Fence
02271 Engineering Fabrics

1.3.1 Erosion and sediment control procedures and facilities shall conform to Section 107, 225, and 1000 of the "Standard Specifications for Roads and Structures" Division 16 dated January, 2002, published by the North Carolina Department of Transportation and the "Erosion and Sedimentation Control Planning and Design Manual" as published by the North Carolina Sedimentation Control Commission.

2. MATERIALS

2.1. Washed stone to be used in temporary sediment basins shall be of strong, durable nature, resistant to weathering and shall be graded to conform to local and state Department of Transportation requirements.

2.2. Refer to other sections within these specifications as listed in Item 1.3 above for other material specification required in the installation of erosion and sediment control facilities.

3. INSTALLATION

3.1 General Requirements

3.1.1 The CONTRACTOR shall follow the erosion control construction sequence schedule as shown on the contract drawings, except that should circumstances dictate that extra precaution be taken to prohibit erosion and sedimentation on the project, the CONTRACTOR will, at his own expense, take preventative measures as needed.

3.1.2 The CONTRACTOR is required to maintain all erosion and sediment control facilities to insure proper performance throughout the construction phase and until such time all disturbed areas are permanently stabilized.

3.1.3 Upon completion of construction or successful permanent stabilization of all areas which were disturbed before or during construction operations or as indicated on the construction drawings, whichever occurs last, the CONTRACTOR shall remove all temporary erosion and sediment control devices and facilities from the project site. The CONTRACTOR shall retain these items for future use or properly dispose of these items offsite.

3.1.4 The CONTRACTOR shall provide temporary or permanent ground cover as called for on the construction plans within thirty (30) working days after disturbance of any areas on the site.

END OF SECTION

SECTION 02271
ENGINEERING FABRICS

1. DESCRIPTION

The work covered by this Section consists of the installation of an acceptable engineering fabric (filter fabric) appropriate for the application(s) called for on the plans or as required by field conditions. Placement of the fabric shall be an integral function of the construction of shoulder drains, subsurface drainage systems, temporary silt fences and placement of erosion control stone or rip rap facilities. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

1.1. Related Work

Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

1.1.1 Reference the following specifications for related work:

02270 Erosion and Sediment Control
02274 Plain Rip Rap
02275 Stone for Erosion Control
02277 Temporary Silt Fence

1.1.2. The filter fabric shall conform to Section 1056 of the "Standard Specifications for Roads and Structures" Division 2, Division 10 and/or Section 1605 (2B) dated January, 2002, published by the North Carolina Department of Transportation and the "Erosion and Sedimentation Control Planning and Design Manual" as published by the North Carolina Sedimentation Control Commission.

2. MATERIALS

Engineering fabric shall have material properties strictly conforming to those specified in Sections of the standard State Department of Transportation specifications. The CONTRACTOR shall provide engineering fabric(s) for various applications which meet or exceed the corresponding criteria for each different fabric utilized per the subject specification.

3. INSTALLATION

3.1 General Requirements

3.1.1 Engineering fabric installed under erosion control stone or rip rap shall be placed at locations, to the dimensions as shown on the plans or as directed by the ENGINEER.

3.1.2 Surfaces to receive filter fabric shall be graded to the lines and grades as shown on the plans, unless otherwise directed by the ENGINEER. The surface shall be free of obstructions, debris and pockets of soft or low density material.

3.1.3 At the time of installation, the fabric shall be free of defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

3.1.4 The filter fabric shall be laid smooth and free from tension, stress, folds, wrinkles, or creases. Horizontal overlaps shall be a minimum of 12 inches with the upper fabric overlapping the lower fabric. Vertical overlaps shall be a minimum of 18 inches with the upstream fabric overlapping the downstream fabric. In the event that the fabric is displaced or damaged during stone placement, the stone shall be removed and the fabric repositioned or replaced prior to replacement of the stone, all at no additional cost to the OWNER.

3.1.5 The placement of the filter fabric and stone shall be performed in a continuous manner as directed by the ENGINEER. The filter fabric shall be protected from damage due to the placement of stone or other materials by limiting the height of drop of the material or by placing a cushioning layer of sand on top of the fabric before dumping the material.

3.1.6 No more than 72 hours shall elapse from the time the fabric is unwrapped to the time the fabric is covered with stone or sand.

3.1.7 Filter fabric installed in association with shoulder drains or other subsurface drainage systems shall be installed in such a manner that all splice joints are provided with a minimum overlap of 2 feet. The overlap of the closure at the top of the trench shall be at least 6 inches and secured with mechanical ties. Where outlet pipe passes through the fabric, a separate piece of fabric shall be wrapped around the outlet pipe, flared against the side of the filled drain, and secured with anchor pins.

3.1.8 Field splices of filter fabric shall be anchored with anchor pins to insure that required overlap is maintained.

3.1.9 At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

3.1.10 Aggregate placement operations and the pipe installation shall be done so as to prevent damage to the filter fabric. Damaged sections of filter fabric shall be replaced at no cost to the OWNER.

3.1.11 The aggregate shall be compacted to a degree acceptable to the ENGINEER by the use of a vibratory corn pactor before making the filter fabric closure at the top of the trench.

3.1.12 Filter fabric installed in association with temporary silt fences shall be a water permeable filter type for the purpose of removing suspended particles from the water passing through it. Silt fences shall be constructed in accordance with local and state Department of Transportation requirements in the locations and to the configurations as shown in the plans and as directed by the ENGINEER. Should the requirements of local, regional or state authorities having jurisdiction over the project exceed the requirements of this section or other sections in this specification regarding temporary silt fences, the more stringent shall govern.

3.2 Physical Properties of Engineering Fabrics

PHYSICAL PROPERTIES OF ENGINEERING FABRICS

Physical Property	Test Method (Article 1056-2)	Type 1	Type 2	Type 3 Class A	Type 3 Class B
Min. Roll Width	---	---	---	36”	36”
Min. Fabric Weight	1	4.0 oz/yd^2	---	---	---
Min. Tensile Strength	2	90 lb.	200 lb.	50 lb.	100 lb.
Elongation	2	80 % max.	15% min.	30% max.	25% max.
Min. Burst Strength	3	150 psi	400 psi	100 psi	180 psi
Min. Puncture Strength	4	45 lb.	80 lb.	30 lb.	60 lb.
Apparent Opening Opening Size - Max/Min (U.S. Std. Sieve)	5	60/100	30/130	20/50	20/50
Min. Ultra-Violet Exposure Strength Retention	6	80 lb.	140 lb.	40 lb.	80 lb.
Fungus Resistance	7	No Growth	No Growth	No Growth	No Growth
Min. Permeability (Thickness x Permitivity)	8	8 0.2 cm/sec.	---	---	---
Min. Flow Rate	8	---	---	10 gal/min/ft^2	10 gal/min/ft^2
Typical Application	---	Shoulder Drain	Under Riprap	Temporary Silt Fence	

END OF SECTION

SECTION 02274

PLAIN RIP RAP

1. DESCRIPTION

The work covered by this section consists of the construction of plain rip rap at the locations designated on the plans or directed by the ENGINEER. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

1.1. Related Work

Any reference to standard specifications refers to the most current published date published of the following specification unless otherwise noted.

1.1.1. Reference 02270 Erosion Control for related work.

The plain rip rap shall conform to Section 868 of the "Standard Specifications for Roads and Structures" Division 8 dated January, 2002, published by the North Carolina Department of Transportation and the "Erosion and Sedimentation Control Planning and Design Manual" as published by the North Carolina Sedimentation Control Commission.

2. MATERIALS

2.1 Plain rip rap shall conform to the applicable State Department of Highway specifications.

2.2 Plain rip rap shall consist of quarry run stone or field stone and shall be classified by size into either Class 1 or Class 2. The class and thickness to be used shall be as called for on the plans.

2.3 Where broken concrete from demolished structures or pavement is available, it may be used in place of stone provided the CONTRACTOR obtains in advance, written authorization from the ENGINEER. Broken concrete containing reinforcing steel or wire mesh will not be permitted.

3. INSTALLATION

3.1 Unless otherwise directed by the ENGINEER, the stone shall be placed on slopes less than the angle of repose of the material and to the line, grade and slope as indicated on the plans. The stone shall be graded so that the smaller stones are uniformly distributed throughout the mass.

3.2 At locations where rip rap is required for channel changes and drainage ditches, the rip rap shall be placed prior to diverting the water into the channel changes and drainage ditches.

3.3 At locations where rip rap is required at the outlets of pipe culverts, the rip rap shall be placed immediately after completion of the pipe culvert installation.

END OF SECTION

SECTION 02275

STONE FOR EROSION CONTROL

1. DESCRIPTION

The work covered by this section consists of the furnishing, stockpiling if directed, placing and maintaining an approved stone liner placed in or at ditches, swales, pipe inlets, pipe outlets, and at other locations designated on the plans or directed by the ENGINEER. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications.

1.1. Related Work

Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

1.1.1. Reference the following specifications for related work:

02270 Erosion control
02274 Plain Rip Rap

1.1.2. The stone for erosion control shall conform to Section 876-4, 1042 and/or 1610 of the "Standard Specifications for Roads and Structures" dated January, 2002, published by the North Carolina Department of Transportation and the "Erosion and Sedimentation Control Planning and Design Manual" as published by the North Carolina Sedimentation Control Commission.

2. MATERIALS

2.1 Stone for erosion control shall conform to local and state Department of Transportation requirements.

2.2 Stone for erosion control shall be resistant to the action of air and water, be of a hard, durable nature and shall range in size as follows:

Class	Size
A	2" - 6"
B	5„ -15"

2.3 All stone shall meet the approval of the ENGINEER. While no specific gradation is required, the various sizes of stone shall be equally distributed within the required size range. The size of an individual stone particle will be determined by measuring along its long dimension.

3. INSTALLATION

3.1 Unless otherwise directed by the ENGINEER, the stone shall be placed on slopes less than the angle of repose of the material and to the line, grade and slope as indicated on the plans. The stone shall be placed so that the smaller stones are uniformly distributed throughout the mass. All stone shall be placed in a neat, uniform layer with an even surface meeting the approval of the ENGINEER.

3.2 At locations where stone is required for channel changes and drainage ditches, the stone shall be placed prior to diverting the water into the channel changes and drainage ditches.

3.3 At locations where stone is required at the outlet of pipe culverts, the stone shall be placed immediately after completion of the pipe culvert installation.

END OF SECTION

SECTION 02277

TEMPORARY SILT FENCE

1. DESCRIPTION

The work covered by this Section consists of the furnishing, installing, maintaining, replacing as needed, and removing of temporary silt fence. The CONTRACTOR shall furnish all equipment, tools, labor and materials necessary to complete the work in accordance with the plans and specifications. All materials and procedures shall conform to the latest version of local and state Department of Transportation requirements.

1.1. Related Work

Any reference to standard specifications refers to the most current published date published of the following specifications unless otherwise noted.

1.1.1. Reference the following specifications for related work:

02270 Erosion Control
02275 Stone for Erosion Control

All applicable local design manuals, codes and/or ordinances for Erosion and Sedimentation Control. (Were these design manuals, local codes and ordinances are more stringent then the State Department of Transportation, these codes and/or ordinances will control the erosion and sedimentation control procedures to be followed.)

The temporary silt fence shall conform to Section 1605 of the "Standard Specifications for Roads and Structures" dated January, 2002, published by the North Carolina Department of Transportation and Section 6.62.1 of the "Erosion and Sedimentation Control Planning and Design Manual" as published by the North Carolina Sedimentation Control Commission.

2. MATERIALS

2.1. General Requirements

Temporary silt fence shall be a water permeable filter type fence for the purposes of removing suspended particles from the water passing through it.

2.2. Posts

Either wood posts or steel posts may be used. Wood posts shall be a minimum of 6 feet long, at least 3 inches in diameter, and straight enough to provide a fence without noticeable misalignment. Steel posts shall be at least 5 feet in length, approximately 1-3/8 inches wide measured parallel to the fence, and have a minimum weight of 1.25 lb/ft of length. The post shall be equipped with an anchor plate having a minimum area of 14.0 square inches, and shall have a means of retaining wire and fabric in the desired position without displacement.

2.3. Woven Wire Fence

Wire fence fabric shall be at least 32 inches high, and shall have at least 6 horizontal wires. Vertical wires shall be spaced 12 inches apart. The top and bottom wires shall be at least 10 gage. All other wires shall be at least 12-1/2 gage.

2.4. Silt Fence Filter Fabric

The filter fabric shall meet the requirements of "Type 3 Engineering Fabric, Class A or B, per Section 1605 of the "Standard Specifications of Roads and Structures" dated January, 2002 published by the North Carolina Department of Transportation."

Silt fence which incorporates filter fabric meeting the requirements of these State Specifications but which fail to perform in an acceptable manner shall be replaced with silt fences which are capable of acceptable performance. All silt fences shall meet the local governmental requirements as well as the State's requirements.

2.5. Wire Staples

Wire staples shall be a No. 9 staple and shall be at least 1 1/2 inches long.

3. INSTALLATION

3.1. General Requirements

3.1.1. The CONTRACTOR shall install temporary silt fence as shown on the plans or as required by field conditions. The silt fence shall be constructed at the locations shown on the plans and at all other locations necessary to prevent sediment transport, as directed by the ENGINEER.

3.1.2. Class A synthetic filter fabric may be used only in conjunction with woven wire fence fabric backing. Filter fabric shall be attached to the wire fence fabric by wire or other acceptable means.

3.1.3. Class B synthetic filter fabric may be used without the woven wire fence fabric backing, subject to the following conditions:

- Post spacing is reduced to a maximum of 6 feet.
- The proposed fabric has been approved by the ENGINEER as being suitable for use without the woven wire fence fabric backing.
- Fence posts shall be inclined toward the runoff source at an angle of not more than 20° from vertical.
- Posts shall be installed so that no more than 3 feet of the post shall protrude above the ground. Where possible, the filter fabric from a continuous roll cut to the length of the barrier shall be used to avoid joints. When joints are necessary, securely fasten the filter cloth only at a support post with overlap to the next post. At the time of installation, the fabric will be rejected if it has defects, rips, holes, flaws, deterioration, or damage incurred during manufacture, transportation, or storage.

3.2. Maintenance and Removal

3.2.1. The CONTRACTOR shall inspect temporary silt fences at least once a week and after each rainfall and shall make any required repairs and remove and dispose of silt accumulation immediately. Should the fabric of the silt fence collapse, tear, decompose or become ineffective, the CONTRACTOR will replace it promptly at his own expense. The CONTRACTOR shall remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence.

3.2.2 The CONTRACTOR shall remove all temporary silt fence and associated appurtenances once all disturbed areas upland of the fence are properly and satisfactorily stabilized as called for on the plans.

END OF SECTION

PAVING REPAIR AND RESURFACING

1. DESCRIPTION

This section covers cutting and replacing pavement for the installation of utilities as shown on the plans and as specified herein. Any reference to sections of state specifications shall be in conformance with the state specifications referred to in the Section 1.2.1 Related Work.

1.1. Any reference to standard specifications refers to the most current published date of the following specification unless otherwise noted.

1.2. Related Work

See the following sections for related specifications:

02222	Excavating, Backfilling & Compacting for Utilities

Cast-in-Place Concrete:

MP 1	AASHTO
M81	AASHTO
M82	AASHTO
T96	AASHTO
T176	AASHTO

1.2.1. Any reference to NCDOT standard specifications was obtained from the "Standard Specifications for Roads and Structures" dated January, 2002 published by the North Carolina Department of Transportation.

2. MATERIALS

2.1 Aggregate Base Course shall be in accordance with the NCDOT 1010 Type B. Aggregate base course material shall consist of crushed stone, crushed stone, crushed or uncrushed gravel and other similar materials displaying hard, strong durable particles free from adherent coatings. All aggregate shall be from and approved sources in accordance with NCDOT Section 1005.

2.2 Bituminous Paving

2.2.1. Bituminous Prime Coat: Cut-back asphalt used as prime coat shall conform to NCDOT Section 600.

2.2.2 Bituminous Base Course: Shall conform to NCDOT Section 620, Articles 1 through 4, Type B25B.

2.2.3 Bituminous Tack Coat: Shall conform to NCDOT Section 605, Articles 1 through 9.

2.2.4 Bituminous Surface Coat: Shall conform to NCDOT Section 645, Type SF9.5B.

2.3. Portland Cement Course

Shall be composed of portland cement, coarse aggregate, fine aggregate and air entraining agent in accordance with Section 03300. Other admixtures may be added with the ENGINEER's approval. All concrete shall be Class A concrete with a minimum of 3500 psi compressive strength at 28 days. The concrete shall be air entrained to provide an air content of 4.5 percent plus or minus 1.5 percent.

3. CONSTRUCTION

3.1 Pavement Cutting

Where the existing pavement is to be cut for installation of pipe or other utilities, the CONTRACTOR shall cut the pavement neatly in advance of trenching. All pavement shall be cut to a straight edge with the method of cutting subject to approval of the ENGINEER. Pavement shall be cut 12 inches wider on each

side of the excavated area. Ragged or irregular edges will be redone. Concrete pavement shall be cut with a suitable concrete saw cutting equipment.

3.2 Trench Backfilling
Shall be in accordance to plans or as specified elsewhere herein.

3.3 Aggregate Base Course shall be placed and compacted in accordance with NCDOT Section 520, Article 8. The base course shall be placed at the same time with the trench backfilling.

3.3.1 If the base course is designed to be used as a temporary travel surface, the additional thickness shall be placed, compacted and maintained until the permanent surface is placed. When preparing the base course for the final surface course, the base course material shall be undercut to the thickness to accommodate the surface course(s) and removed from the site, unless otherwise directed by the ENGINEER. The final thickness of the base shall be within a tolerance of plus or minus 1/2 inch of the base thickness required on the plans.

3.3.2 Backfilling with soil above an elevation to accommodate the final base thickness, to be cut-out and replaced with base material at a later date, will not be allowed.

3.4 Prime Coat
Shall be applied to non-bituminous base course beneath bituminous plant mixed pavements unless otherwise shown in the plans. The prime coat shall be applied only when the surface to be treated is dry and the atmosphere temperature in the shade is 40° F or above. Prime coat shall not be applied when the weather is foggy or rainy. The base shall be clear of debris, dirt, clay or other deleterious material prior to placing the prime coat.

3.4.1 Application of the prime coat shall consist of asphalt grade AASHTO 81 for Grade RC-70 except Kinematic viscosity at 140° F, centistokes shall be a minimum of 30 and a maximum of 60; the distillate, percentage of volume of total distillate to 680°F, shall be as follows:

To 374°F	15 minimum
To 437°F	55 minimum
To 500°F	75 minimum
To 600°F	90 minimum

and the residue from the distillate to 680°F volume percentage of sample difference shall be a minimum of 50 or of shall be of asphalt grade AASHTO 82. The prime coat shall be applied at a rate of 0.18 to 0.45 gallons per square yard at an application temperature of 90° to 130°F.

3.5 Bituminious Concrete Surface Course, Type SF9.5B
The surface course shall conform to NCDOT Type SF9.5B. **Pavement shall be replaced within the same week that it is cut.** If inclement weather delays pavement replacement, the CONTRACTOR shall not cut additional pavement until he has notified the ENGINEER and received specific permission and instructions. Any deviation from this schedule could subject the CONTRACTOR to immediate shut-down or non-payment of additional work performed until pavement repair is complete.

3.5.1 The bituminous plant mix placement and compaction shall conform to NCDOT Section 610. If directed by the ENGINEER, density control and determination shall be in Accordance to NCDOT Section 610-10 and 610-13.

3.6 Portland Cement Concrete shall be placed over a compacted sub-base of CABC stone with the surface damp at time of placement. The concrete patch shall equal the thickness of the surrounding pavement, but shall not be less than 4 inches thick. The concrete shall be handled to prevent segregation and kept free from mud, soil or other foreign matter.

3.6.1 Concrete placement shall not be undertaken or shall be discontinued when any of the following conditions exist:

3.6.1.1. When the descending air temperature in the shade and away from artificial heat reaches 40°F.

3.6.1.2. When the subgrade or base course is frozen.

3.6.1.3. When the temperature of the concrete mix exceeds 90°F.

3.6.1.4..When the time after batching exceeds 90 minutes.

3.6.2 Concrete finishing shall consist of screeding and floating to assist consolidation. The surface texture shall closely resemble the texture of the surrounding pavement. A uniform surface texture shall be applied by burlap dragging or other method acceptable to the ENGINEER. The use of excessive water during finishing will not be permitted.

3.6.3 Concrete curing shall be accomplished with spray compounds, polyethylene film or other methods acceptable to the ENGINEER. In no instance shall the method of curing be allowed to damage the finished surface. Any concrete with excessive surface damage will be considered defective work and removed and replaced at the CONTRACTOR's expense.

3.6.4 Concrete shall be protected from cold for a minimum of 72 hours through thermal blankets or other means acceptable to the ENGINEER. Thermal protection will be required whenever the air temperature is expected to fall below 40°F. Concrete damaged as the result of freezing shall be removed and replaced at the CONTRACTOR's expense.

END OF SECTION

SECTION 02665
WATER LINES, VALVES, AND APPURTENANCES

1. DESCRIPTION

The CONTRACTOR shall furnish all labor, materials, equipment and supplies and shall perform all work necessary for the construction of water lines, valves and appurtenances; complete, disinfected, tested and ready for use. The water lines and valves shall be constructed of the size and at the locations shown on the plans.

1.1. Related Work

See the following Sections for related specifications

02222	Excavating, Backfilling & Compacting for Utilities
02933	Seeding & Mulching

1.2. References

Any reference to standard specifications refers to the most current published date of the following specifications unless noted:

AWWA	Specifications as listed.
ASTM	Specifications as listed.
NSF	Specifications as listed.

2. MATERIALS

All materials for water line shall be new and shall be furnished by the CONTRACTOR in accordance with the following requirements unless shown otherwise on the plans.

2.1. Water Lines, 2 Inch Through 16 Inch

2.1.1. Ductile Iron Pipe, 3 Inch and 4 Inch

- Pipe: AWWA C151 "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water and Other Liquids." Thickness Class 51 unless shown otherwise on the drawings
- Fittings: AWWA C110, ductile iron; or AWWA C153, ductile iron compact fittings. All fittings shall be mechanical, restrained joints with Megalug, Series 1100 as manufactured by EBBA Iron or approved equal.
- Joints: AWWA C111 push-on or mechanical for general buried service; AWWA C115 flanged for exposed service unless shown otherwise. Flange material shall match pipe material.
- Linings: AWWA C104 cement lining, standard thickness, bituminous exterior seal coat.

2.1.2. Ductile Iron Pipe, 6 Inch Through 16 Inch

- Pipe: AWWA C151 "Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water and Other Liquids." Thickness Class 50 unless shown otherwise on the drawings.
- Fittings: AWWA C110, ductile iron; or AWWA C153, ductile iron compact fittings. All fittings shall be mechanical, restrained joints with Megalug, Series 1100 as manufactured by EBBA Iron or approved equal.
- Joints: AWWA C111 push-on or mechanical for general buried service; AWWA C115 flanged for exposed service unless shown otherwise. Flange material shall match pipe material.
- Linings: AWWA C104 cement lining, standard thickness, bituminous exterior seal coat.

2.1.3 High-Density Polyethylene Pipe For Directional Borings, 6 inch

- Pipe: ASTM 3350-02 "Standard Specification for Polyethylene Pipe and Fittings Materials". Pipe shall be iron pipe size. Pipe shall be pressure rating 200 (DR 9) unless otherwise shown on the drawings. All HDPE pipe shall conform to National Sanitation Foundation (NSF) 61 and AWWA C906 and shall be "Blue Strip" designated for potable water.
- Fittings: N/A
- Joints: HDPE —HDPE joints shall be by "Butt Fusion". HDPE to DIP shall utilize a DIPS Fittings MJ Adapter conforming to AWWA C110 with stainless, reinforced support ring, retaining gland and T-bolts.

2.1.4. PVC Pipe, 2 Inch and 3 Inch

• Pipe: ASTM D-2241 "Polyvinyl Chloride (PVC) Pressure Pipe for Water". Pipe provided shall be iron pipe size. Pipe shall be pressure rating 200 (SDR 21) unless otherwise shown on the drawings. All PVC pipe shall bear the National Sanitation Foundation (NSF) potable water logo.

• Fittings: Ductile iron conforming to AWWA C104 and C110 or compact ductile iron fittings conforming to AWWA C153 for fittings size 2-inch through 12-inch. All fittings shall be mechanical, knukle joint restraints manufactured by Harco Corporation.

• Joints: Pipe; elastomeric gasket, push-on joints, conforming to ASTM F477 and ASTM 3139. Joints may be either integral bell and spigot or couplings.

2.1.5. PVC Pipe, 4 Inch Through 12 Inch

• Pipe: "Polyvinyl Chloride (PVC) Pressure Pipe for Water." Pipe provided shall be iron pipe size. Pipe shall be pressure rating 200 (SDR 21) unless otherwise shown on the drawings. All PVC pressure pipe shall bear the National Sanitation Foundation Seal (NFS).

• Fittings: Ductile iron fittings conforming to AWWA C110, or compact ductile iron fittings conforming to AWWA C153. All fittings shall be mechanical, restrained joints using "GripRing" by Romac Industries, Inc.

• Joints: Pipe; elastomeric gasket, push-on joints, conforming to AWWA SDR-21 and C111. Joints may be either integral bell and spigot or couplings.

2.2. Valves

All valves shall be mechanical, restrained joints with "GripRing" by Romac Industries, Inc. when installed on PVC pipe and restrained with Megalug, Series 1100 as manufactured by EBBA Iron or approved equal when installed on ductile iron pipe. All valves shall open counter clockwise (left) and close clockwise (right).

2.2.1. Gate Valves - Valves 2”-12” shall be resilient wedge type rated for 250 p.s.i.g. cold water working pressure. All ferrous components shall be ductile iron, ASTM A536. Valves 3”-12” shall be in full compliance with AWWA C515. The words “D.I.” or “Ductile Iron” shall be cast on the valve. The wedge shall be ductile iron or bronze encapsulated with EPDM rubber. The wedge shall be symmetrical and seal equally well with flow in either direction. The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of the AWWA C515 Standard. Stainless Steel stems are not acceptable. The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment. Bolting materials shall develop the physical strength requirements of ASTM A307 and may have either regular square or hexagonal heads with dimensions conforming to ANSI B18.2.1. Metric size socket head cap screws, therefore, are not allowed. The operating nut shall be constructed of ductile iron and shall have four flats at stem connection to ensure even input torque to the stem. All gaskets shall be pressure energized O-Rings. Stem shall be sealed by three O-Rings. The top two O-Rings shall be replaceable with valve fully open and while subject to full rated working pressure. O-Rings set in a cartridge shall not be allowed. Valve shall have thrust washers located with (1) above and (1) below the thrust collar to ensure trouble free operation of the valve. All internal and external surfaces of the valve body and bonnet shall have a fusion-bonded-epoxy coating, complying with ANSI/AWWA C550, applied electrostatically prior to assembly. Valves shall be American Flow Control’s Series 2500 Ductile Iron Resilient Wedge Gate Valve or approved equal.

2.2.2. Gate Valves greater than 12” shall be resilient wedge type rated for 250 p.s.i.g. cold water working pressure. Valves 16" and larger, for working pressures greater than 50 psi shall be provided with a spur or bevel gear operator. All ferrous components shall be ductile iron, ASTM A536. Valves shall be infull compliance with AWWA C515. The words “D.I.” or “Ductile Iron” shall be cast on the valve. The wedge shall be ductile iron encapsulated with EPDM rubber. The wedge shall be symmetrical and seal equally well with flow in either direction. The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of the AWWA C515 Standard. Stainless Steel stems are not acceptable.

The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment. Bolting materials shall develop the physical strength requirements of ASTM A307 and may have either Regular Square or hexagonal heads with dimensions conforming to ANSI B18.2.1. Metric size socket head cap screws are not allowed. The operating nut shall be constructed of ductile iron and shall have four flats at the stem connection to assure even input torque to the stem. All gaskets shall be pressure energized O-Ring type seals. Stem shall be sealed by three O-Rings. The top two O-Rings shall be replaceable with the valve fully open and while subject to full rated working pressure. O-Rings set in a cartridge shall not be allowed. The valve shall have thrust washers located with (1) above and (1) below the thrust collar to assure trouble-free operation of the valve. All internal and external surfaces of the valve body and bonnet shall have a fusion-bonded epoxy coating, complying with ANSI/AWWA C550, applied electrostatically prior to assembly. Valves shall be American Flow Control's Series 2500 Resilient Wedge Gate Valve or approved equal.

2.2.3. Tapping Sleeves and Valves shall be the type designed for making connections to existing water lines without loss of water or interruption of service. Sleeves shall be stainless steel full circle SST type by Romac Industries, Inc, suitable for 200 psi working pressure. Joints shall be suitable for the intended use. Tapping valves shall be resilient seat type with bodies and bonnets made of ductile iron for 250 p.s.i.g. working pressure. The mating valve flange to the tapping sleeve outlet must have a raised male face, conforming to MSS SP-60, to ensure true alignment of valve and tapping sleeve. The outlet end of the valve shall have the desired joint connection for the intended pipe. All interior and exterior ferrous surfaces shall be protected against corrosion by fusion-bonded epoxy coating. Coating shall be applied prior to assembly to assure coverage of all exposed areas, including bolt holes. Tapping valves shall be those manufactured by American Flow Control Series 2500 Ductile Iron 250 p.s.i.g. rating (accepts full-size shell cutter) or approved equal.

2.2.4. Butterfly Valves
Any required butterfly valves on water mains shall be direct bury with mechanical joint ends conforming to all requirements of AWWA C504. Unless otherwise shown on the construction plans, all butterfly valves shall be Class 150B. Each butterfly valve shall be furnished with a manual operator equipped with a 2" square operating nut. The operator shall open the valve when the operating nut is turned to the left or counterclockwise." The valve and operator shall be assembled for installation in a horizontal line with the main valve shaft horizontal and the operator shaft and operating nut aligned vertically to accept a valve key operated from the surface. Butterfly valves shall be shop painted for buried service in accordance with AWWA C504.

2.2.5. Valve Boxes

2.2.5.1. Each valve buried in the ground shall be provided with an approved type of valve box and cover. The boxes shall be adjustable slip-joint or screw type.

2.2.5.2. The valve boxes shall be made of close-grained gray cast iron, in three pieces, comprising the lower or base pieces which shall be belled at the bottom to fit around the stuffing box gland and rest on the valve bonnet, the upper part of which shall be flared on the lower end to telescope on a socket to receive the cap or cover. The cap or cover shall have the word "Water" cast on the upper surface in raised letters. All castings shall be thoroughly cleaned and heavily coated with asphalt or coal-tar varnish.

2.2.5.3. Each valve box shall be provided with a concrete valve marker/protector as detailed on the plan.

2.2.6. Air Valves for water lines shall be designed for a minimum of 200 psi pressure and sized as shown on the plans.

2.2.7. Air Valve Manholes shall be 4 feet in diameter precast concrete sections conforming to ASTM C-478. Tops shall be eccentric cone where cover permits unless otherwise shown. Frame and cover shall be good quality domestic manufacture conforming to ASTM A48, Class 30 or better. Cover shall be a

solid heavy duty casting with the word "Water" cast in the lid.

2.3. Fire Hydrants

2.3.1. Fire Hydrants shall conform to the standard specifications of the American Water Works Association (C502-80) and shall be of the three (3) way type. The hydrant valve opening shall not be less than four and one-half - (4- 1/2) inches. Each hydrant shall be equipped with two (2) two and one-half - (2-1A) inch hose connections and one (1) steamer connection. The hydrants shall be fitted with bell ends to accommodate the spigot end of six (6) inch ductile iron or PVC Plastic Pipe and have the standard one and one-half inch pentagon left opening operating nut.

2.3.2. The barrel of the hydrant shall be of proper length to permit a minimum of three-and-one half (3-1A) foot bury. Hydrant bury line shall be set true to grade. The valve shall be designed to close against the pressure of the distribution system and remain closed in the event of the upper part of the barrel being broken.

2.3.3. A flange shall be provided, above ground level, to permit adjusting the facing of the hydrant. The hydrant shall be so designed and constructed as to permit replacement of the upper portion of the barrel without digging.

2.3.4. Each nozzle shall have a cast iron cap, suitably attached to the hydrant barrel by means of a chain. Nozzle caps shall be provided with leather gaskets.

2.3.5. Hose nipples shall be of the removable type and shall conform to the existing hose nipples in use by the OWNER. On a new system they shall have National Standard Threads on the hose connection side unless otherwise directed by the ENGINEER. The CONTRACTOR shall check existing nipples before ordering.

2.3.6. Two standard hydrant wrenches shall be furnished.

2.3.7. All fire hydrants furnished for this project shall be of the type known as "breakable" in order that the hydrant barrel may be broken without damaging the lower portion of the hydrant in case of an accident.

2.3.8 Acceptable hydrant manufacturers are Mueller, American Darling, Clow, US Pipe and Waterous. Hydrant manufactuer and style (model) shall be approved before installation.

2.4. Steel Encasing Pipe shall be smooth wall, meeting or exceeding ASTM A-139 Grade B 35,000 psi minimum yield strength with minimum wall thickness as defined below.

Carrier Pipe	Casing Pipe	Wall Thickness D.O.T.	R.R.	Recommended Min. Tunnel
6-Inch Ductile Iron	14”	.250”	.281”	48”
8-Inch Ductile Iron	18”	.250”	.312”	48”
10-Inch Ductile Iron	20”	.250”	.344”	48”
12-Inch Ductile Iron	22”	.250”	.375”	48”
16-Inch Ductile Iron	28”	.312”	.469”	48”
18-Inch Ductile Iron	30”	.312”	.469”	48”
20-Inch Ductile Iron	32”	.375”	.501”	48”
24-Inch Ductile Iron	36”	.375”	.532”	48”

2.5. Carrier Pipe Supports With in Steel Casing shall be steel plate, cold formed structural collar with flanges and a minimum of four support legs welded to the collar. Each support leg shall have a foot or skid welded on the end extending beyond the front and back edge of the collar. The front and rear of each

foot shall be angled inwardly towards the collar to serve as a stable, effective skid during installation of the carrier pipe. The carrier support shall be securely fastened to the carrier pipe with a heavy duty ½ " grade 5 bolt and locking nut passing between the flanges, compressing the collar against the carrier pipe. The support device shall be a "Spider" or approved equal.

2.6. Bedding Material shall consist of washed coarse gravel. Gravel material shall be crushed stone or gravel of strong durable nature and shall conform to the standard size No. 57 per State Department of Transportation or Highways Construction Specifications.

2.7. Utility Line Locating Wire shall be 14 gauge solid copper trace wire with stub outs up into each valve box and within 6" of each valve box lid.

3. INSTALLATION

3.1. Trench Excavation and Backfill

3.1.1. Excavation shall conform to the lines and grades shown on the drawings. No trench shall be opened more than four hundred (400) feet in advance of the completed pipe work without the written permission of the ENGINEER. The lines of excavation of trenches shall be made so there will be a clearance of at least eight (8) inches on each side of the barrel of the pipe. The depth of the trench shall be such that the top of the pipe shall not be less than three feet below finished grade. Excavation shall not be carried below the established grades and any excavation below the required level shall be backfilled and thoroughly tamped as directed by the ENGINEER, at the CONTRACTOR's expense. Bell holes shall be excavated accurately by hand as required by manufacturer's specifications.

3.1.2. During excavation, the CONTRACTOR shall separate materials suitable for backfill from those which are not as defined in Paragraph 3.5 of this section. Suitable material shall be stockpiled near the trench for use as backfill. Unsuitable material shall be removed immediately or shall be stockpiled separately for dewatering or drying or for later removal.

3.1.3. Should unstable soil, organic soil, or soil types classified as inorganic clays or inorganic silts (Class IV, Unified soil classification CL or lower) be encountered at the bottom of pipe trenches or structure excavations, such soils shall be removed to a depth and width determined by the ENGINEER and properly disposed of offsite. The resulting undercut shall be backfilled and compacted with sandy soils which meet or exceeds the requirements of Class I or Class II soils, Unified Class SP or better. Placement and compaction shall conform to specifications herein.

3.1.4. All necessary dewatering, pumping, and bailing shall be performed in such a manner as to keep the trench in a satisfactory condition for pipe laying.

3.1.5. Do not use the following materials for pipe foundation or trench backfill within the zones indicated below.

- All zones: material classified as peat (PT) or organic (OL)(OH) under the Unified Soil Classification (USC) System, ASTM D2487 or material too wet or too dry to achieve minimum compacted density requirements
- Six inches beneath pipe: soft or unstable material and rock
- Beside pipe: Any material containing more than 75% fines passing #200 sieve

Where no excavated material is suitable for backfill, furnish suitable material from borrow sites at no additional cost to the OWNER.

3.1.6. Backfilling shall be done with material free from large clods, frozen earth, organic material or any foreign matter.
3.1.6.1. Around the pipe and to a depth of 12 inches above the pipe the backfill shall be carefully placed and compacted in layers not to exceed 6-inches compacted thickness. The backfill material shall be select and free of rock. Do not place backfill material on either side of the water main that is finer than the

material upon it is placed. Backfill with coarser material to the top of the pipe.

3.1.6.2. Twelve (12) inches above the crown of the pipe the backfill may contain rock but less than 6 inches in diameter. Backfill layers shall be horizontal and not exceed 12 inches loose thickness or 8 inches compacted.

3.1.6.3 Compaction shall be performed with suitable pneumatic compactors or approved equal. Compaction equipment specifically designed for trench compaction shall be present and operational at the jobsite and shall be utilized throughout the length and depth of the trench to achieve uniform compaction density.

3.1.6.4. Compaction Density shall be determined by the Standard Proctor Test (ASTM D698) and shall meet the minimum standards in Section 02222, Excavating, Backfilling & Compacting for Utilities.

3.1.6.5. Surplus material shall be disposed of by the CONTRACTOR at his expense.

3.1.6.6. Clean shoulders and pavement of excess material immediately after backfilling is complete.

3.2. Laying Water Mains, Hydrants And Specials

Proper and suitable tools for the safe and convenient handling and laying of pipe shall be used, and great care shall be taken to prevent the pipe coating from being damaged, particularly on the inside of the pipes.

3.2.1. All pipe shall be carefully examined for cracks and other defects and no pipe or castings shall be laid which is known to be defective. If any pipe or other casting is discovered to be cracked, broken or defective, after being laid, it shall be removed and replaced by sound pipe, without further charge.

3.2.2. Before laying pipe, the inside of the bell and the outside of the spigot of the pipe shall be thoroughly cleaned.

3.2.3. Pipe shall be laid to conform accurately to the lines and grades established by the ENGINEER. The pipe shall be properly bedded as shown on the plans and per manufacturer recommendations.

3.2.4. Lateral Separation of Sewers and Water Mains

Water mains shall be laid at least 10 feet laterally from existing or proposed sewers, unless local conditions or barriers prevent a 10-foot lateral separation, in which case the water main is laid in a separate trench, with the elevation of the bottom of the water main at least 18 inches above the top of the sewer, or the water main is laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least 18 inches above the top of the sewer.

3.2.5. Crossing a Water Main Over a Sewer

Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer, unless local conditions or barriers prevent an 18 inch vertical separation, in which case both the water main and sewer shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe, pressure tested in place without leakage prior to backfilling. The sewer manhole shall be of water-tight construction and tested in place.

3.2.6. Crossing a Water Main Under a Sewer

Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of ferrous materials and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.

3.2.7. Water lines shall not pass through or come into contact with any sewer manhole.

3.2.8. Concrete Blocking

All bends, tees and plugs, shall be blocked with 3000 psi concrete from the pipe to undisturbed ground to the dimensions shown on the plans. Plant mix concrete is preferred although field mix concrete (Sacrete or equal) may be used as long as it is properly mixed in clean containers with potable water. The concrete shall receive a 23.2-hour cure before being backfilled. The concrete placed against a plug shall contain a weakness plane (using heavy paper to make this joint), so that when struck with a hammer, it will separate and allow the plug to be removed. Restrained joint fittings shall also be used as directed by the ENGINEER. Restrained joints shall be Megalug, Series 1100 as manufactured by EBBA Iron or approved equal.

3.2.9. Valves, Specials and All Other Appurtenances are to be placed as shown on the drawings or at the location and in the manner designated by the ENGINEER. Any omissions of any of these appurtenances shall be corrected by the CONTRACTOR and the same set as originally planned without expense to the OWNER. Over Each valve box shall be provided with a standard concrete valve box protector/marker as shown on the plans and fitted with an operating nut extension, as required.

3.2.10. Hydrants shall be set true to grade, with the standpipe plumb. The base of the hydrant shall rest upon a slab of stone or concrete not less than 3.2 inches thick and 12 inches square. Beneath and around the base of the hydrant and to a point one foot above drip, at least a quarter of a yard of clean, crushed stone shall be placed, and the trench filled with earth. All other construction requirements shall be according to the detail on the plans.

3.2.11. Boring and Jacking

Where required, smooth wall steel pipe shall be jacked through dry bores slightly larger than the pipe, bored progressively ahead of the leading edge of the advancing pipe. As the boring and jacking operation progresses, each new section of the encasement pipe shall be butt-welded to the section previously jacked in place.

3.2.11.1. Unacceptable bores are those with excessive deflection or deflections in the bore resulting in less than 30 inches of soil cover above the casing, where upon the direction of the ENGINEER, shall require the bore to be abandoned. No bores will be accepted with a depth of more than 60 inches to top of casing without prior approval from ENGINEER and OWNER. The abandonment procedure will be at the CONTRACTOR's expense and will consist of cutting off the excess pipe, capping the remaining pipe in place, then filling the abandoned pipe with Portland cement grout (1:3 parts cement to sand) at sufficient pressure to fill all voids before moving to a new location.

3.2.11.2. The carrier pipe shall be fully supported along its entire length within the casing pipe. Carrier Pipe Supports With in Steel Casing shall be steel plate, cold formed structural collar with flanges and a minimum of four support legs welded to the collar. Each support leg shall have a foot or skid welded on the end extending beyond the front and back edge of the collar. The front and rear of each foot shall be angled inwardly towards the collar to serve as a stable, effective skid during installation of the carrier pipe. The carrier support shall be securely fastened to the carrier pipe with a heavy duty ½ " grade 5 bolt and locking nut passing between the flanges, compressing the collar against the carrier pipe. The support device shall be a "Spider" or approved equal.

3.2.11.3. Length of encasements shall be determined as follows

- Cut sections - Ditch line to ditch line
- Fill sections - 5 feet beyond toe of slope
- Curb sections - 3 feet beyond curb
- Future highway or railroad R/W - Extend full width of R/W or unless otherwise advised

3.2.11.4. Materials and workmanship shall also be governed by the requirements set for by the agency issuing the encroachment (Railroad, Department of Transportation, Pipeline Co., etc.). Any specific conditions other than listed herein pertaining to the encroachment are listed in the General Conditions.

3.2.12. Utility Line Marking Tape shall be placed above all PVC pipe used. The marking tape shall be laid continuously in the trench backfill approximately 12" above the pipe.

3.2.13. Tests

3.2.13.1 The pressure/leakage test of water mains shall be in accordance with Standard AWWA C600-82. The allowable leakage shall not exceed that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

L = Allowable leakage in gallons per hour
S = Length of line tested in feet
D = Nominal diameter of pipe, in inches
P = Average test pressure, in psi - 1.50 average system pressure in the area, but not less than 150 psi.

3.2.13.2. Where practicable, pipe lines shall be tested in lengths between line-valves or plugs of no more than 2,000 feet.

3.2.13.3. Pipe lines shall be tested before backfilling at joints, except where otherwise required by necessity, local ordinance or public convenience.

3.2.13.4. Duration of test shall be not less than 2 hours where joints are exposed, and not less than 24 hours where joints are covered, unless directed by the ENGINEER.

3.2.13.5. All visible leaks at exposed joints, and all leaks evident on the surface where joints are covered, shall be repaired and leakage minimized, regardless of total leakage as shown by test.

3.2.13.6. All pipe, fittings, and other material found to be defective under test shall be removed and replaced at the CONTRACTOR's expense.

3.2.13.7. Lines which fail to meet tests shall be repaired and retested as necessary, until test requirements are complied with.

3.2.13.8. Pipe lines with resilient gasket materials should be held under normal operating pressure at least 3 days before testing.

3.3. Disinfection

Before being placed in service, all new mains and repaired portions of, or existing mains shall be thoroughly flushed then chlorinated according to AWWA Standard C651 Section 5.2, Continuous-Feed Method (latest revision). This method shall be followed as outlined below with the exception that the lines shall be disinfected by the addition and thorough distribution of a chlorine solution in concentration sufficient to produce a chlorine residual of at least 50 milligrams per liter (or PPM), in accordance to Section .2203 of the "Rules Governing Public Water Supplies".

3.3.1. Preliminary Flushing

Before being chlorinated, the main shall be filled to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/s unless the OWNER, ENGINEER or job superintendent determines that conditions do not permit the required flow to be discharged to waste. Table 1 shows the rates of flow required to produce a velocity of 2.5 ft/s in pipes of various sizes. Note that flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity.

Table 1. Required Flow and Openings to Flush Pipelines (40 psi Residual Pressure in Water Main)

Pipe Diameter In.	Flow Required to Produce 2.5 ft/s (approx.) Velocity in Main gpm
4	100
6	200
8	400
10	600
12	900
16	1600

3.3.1.1. Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate into the newly laid water main. In the absence of a meter, the rate may be approximated by methods such as placing a Pitot gauge in the discharge or measuring the time to fill a container of known volume.

3.3.1.2. 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 3.30 mg/L chlorine residual. To assure that this concentration is provided, measure the chlorine concentration at regular intervals using appropriate chlorine test kits.

3.3.1.3. During the application of chlorine, valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service. Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances.

3.3.1.4. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be used for application of liquid chlorine. The preferred equipment for applying liquid chlorine is a solution-feed, vacuum-operated chlorinator and a booster pump. The vacuum-operated chlorinator mixes the chlorine gas in solution water; the booster pump injects the chlorine-gas solution into the main to be disinfected. Hypochlorite solutions may be applied to the water main with a gasoline or electrically powered chemical-feed pump designed for feeding chlorine solutions. Feed lines shall be of such material and strength as to safely withstand the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main.

3.3.1.5. Highly chlorinated water shall not be released into the distribution system. The chlorinated water shall remain in the line until the chlorine residual drops below 5 PPM or dissipated by other prior approved method. After this period, the water will be wasted by pumping into the air to dissipate the remaining chlorine residual. Pumping shall be at a rate not to exceed 25 GPM. Pressure and nozzle size shall be such as to produce an 8 foot (vertical) spray. The system should then be flushed with potable water and the sampling program started. Sampling shall consist of taking one representative sample every 5000 feet and at each blow-off. The samples shall then be tested by a state-approved laboratory for indication of bacteriologically satisfactory water. Three (3) copies of this laboratory test shall be submitted to the ENGINEER.

END OF SECTION

SECTION 02668
WATER SERVICE CONNECTIONS

1 DESCRIPTION:
Water service connections shall include tapping the main line and providing all saddles, corporation stops, fittings, service lines, copper setters, meters, meter boxes and other incidentals required for proper installation.

1.1 Related Work: See the following sections for related specifications:
Section 02933 - Seeding and Mulching

2. MATERIALS:
See attached materials list at end of document. Any shop drawings, catalog cuts and related data for service pipe and appurtenances shall be submitted to the Engineer for approval.

2.1 Copper Setter (Meter Setter) shall be of copper and brass, domestic manufacture and of the proper size for the service on which they are installed. The setters shall be equipped with a dual check valve outlet and padlock wings on the key valve. Instatite adapters, manufactured by Mueller Company, shall be installed on the Corporation side of setter and Multipurpose fitting with barb male adapter shall be installed on customer side of setter. Copper setters shall be Mueller B2404-2A7, or approved equal.

2.2 Corporation Stops shall be of brass, domestic manufacture and of the proper size for the service on which they are installed. Where dictated by the tapping angle, eighth or quarter bend couplings shall be provided. Suitable brass Instatite adapters, manufactured by Mueller Company, for coupling to service pipe shall be provided.

2.3 Tapping Saddles

2.3.1 Tapping Saddles on PVC lines shall conform to AWWA Standard C800 and saddle body to be made of bronze with a hinged brass strap with CC or Mueller threads. Saddle shall be designed for use on PVC pipe, and provide full circle support without cracking or distorting the pipe. The pressure capabilities shall equal, but not exceed the working pressure rating of the PVC pipe up to 200 PSIG. The seal between the pipe and top plate shall be provided through a EPDM O-Ring, permanently cemented to the underside of the clamp body.

2.3.2 Tapping Saddles on Ductile Iron lines shall conform AWWA Standard C800 and saddle body to be made of ductile iron, coated with fusion bonded black nylon, with CC or Mueller Threads, and with straps made of heavy gauge Stainless Steel, Type 304 (18-8), per ASTM A 240. All bolts and nuts shall be Stainless Steel also. Nuts shall be coated to prevent galling. Pressure shall be rating of pipe up to 350 psi maximum. Saddle shall be Romac Style 202NS or approved equal.

2.4 Service Pipe and Fittings:

2.4.1 Polyethylene Tubing:

Tubing:	ENDOT Endopure Polyethylene PE-3408/PE-4710, ASTM D2239 SIDR 7 200 psi
Fittings:	Brass Instatite connections manufactured by Mueller Company

2.5 Pipe Connection:
All pipe connections between corporation stop and meter setter shall be Instatite type, manufactured by Mueller Company.

2.6 Meters

2.6.1. General Water meters shall be 3/4 x 5/8 and conform to the standard specifications for cold water meters, velocity type meters, magnetic drive, as adopted by American Water Works Association C-708, most recent and shall be bottom load with Dialog 3G AMR Technology, manufactured by Master Meter Inc.. All water meters will be of the Frost Protective Design. They will have a bronze top and a bronze bottom.

2.6.2. Certification
The meters are to be accepted on a certificate furnished by the manufacturers that meters have met the requirements of the Standard Specifications for Water Meters, as adopted by the American Water Works Association.

2.6.3. Delivery
Registers shall be direct reading with sweep hand with Dialog 3G AMR Technology and shall record in gallons and totalized on five odometer wheels. All meters shall be equipped with a low flow or leak detector capable of measuring at 1/4-gallon per minute with 95% accuracy. The registers shall be of the hermetically sealed gear train and register type with magnet drive.

2.6.4. Connection
Three-quarters inch (3/4") connections for residential type meters.

2.6.5. Guarantee
Each and every meter shall be guaranteed for a period of two (2) years from date of purchase against faulty material and workmanship. DIALOG System registers are warranted to be free from material defects and workmanship defects for fifteen (15) years from date of Master Meter shipment.

2.7 Meter Boxes
The Meter Box shall be high-density Polyethylene of one-piece molded construction for durability and impact strength and shall have a wall thickness of no less than .550”. The Meter Box, with a ductile iron cover installed, shall be able to bear a 20,000lb load in a wheel load (H-20) style test. Meter Box shall be able to withstand a 200lb side load, applied with a 4"x4" plate 1" down for the top center of the box, without deflecting more than 1". The Meter Box shall be black on the exterior to prevent UV degradation, and bright white on the interior to reflect light and ease meter reading and service. The box shall be designed in such a way as to have a integral flange, no more that 3” from the top, to support the box in concrete, paving or soil, and a bottom flange a minimum of 1” wide, to help retard settling. The box shall have removable pre-cut pipe entry areas, 3” wide x 4” high, located on the center of each end (short side) of the box for single meter installations, and 3 pre-cut pipe entry areas (single in, dual out) for dual meter installations. The box shall be designed in such a way as to be securely stackable, and shall be available in 12” and 18” heights as installation conditions may require. The box shall weigh no more than listed weight for each meter size for safety and ease of handling, transport and installation. All dimensions shall be in accordance with the above drawing(s) for the appropriate size meter. The meter box shall be SBCF-XL as manufactured by Mid-States Plastics Inc.

3. INSTALLATION:
Service connections shall be installed at locations as designated by the Owner. Installation shall be made in a manner acceptable to the Engineer.

3.1 Taps
Proper size taps shall be made on the distribution line. A corporation stop, with the proper bend and service pipe adapter, shall be installed in the tap.

3.2 Service Pipe shall be connected to the corporation stop adapter with a Instatite coupling, manufacture by Mueller Company, approved by the Engineer. Pipe shall be cut to the required length and properly laid in the service ditch. Adequate provisions shall be made to protect against expansion and contraction.

3.3 Backfill of ditches and cleanup of the work area shall meet approval of the Engineer.

END OF SECTION

SECTION 02933
SEEDING AND MULCHING

1. DESCRIPTION

The work covered by this section consists of furnishing all labor, materials, and equipment to perform all necessary operations to topsoil, fine grade, fertilize, mulch and maintain temporary and permanent seeding of all graded, cleared, or disturbed areas during construction. The work covered by this section shall be in conformance with the latest version of local and state Department of Transportation requirements.

1.1. Related Work

See following sections for related work.

02110	Clearing and Grubbing
02210	Unclassified Excavation and Grading
02270	Erosion and Sediment Control
SS-A617A FS	Liquid Mulch Binder

The work covered by this section shall be in conformance with Section 1615, 1620 and 1660 of the "Standard Specifications for Roads and Structures" dated January, 2002, published by the North Carolina Department of Transportation and with Section 6.11 of the "Erosion and Sediment Control Planning and Design Manual" published by the Land Quality Section of the North Carolina Department of Natural Resources and Community Development unless otherwise stated herein. All seed shall be certified by the N.C. Crop Improvement Association.

2. MATERIALS

2.1. Topsoil

Topsoil shall be from stockpiles created from stripping and required excavation. Should additional topsoil be required in excess of that obtained from stripping and excavation, the contractor shall obtain material from other sources on the site where authorized by the OWNER, or from approved sources off the site. The topsoil shall be natural, friable soil, possessing characteristics of representative soils in the vicinity which produce heavy growths of crops of grass. It shall be obtained from naturally well-drained areas, shall be reasonably free from subsoil, brush, objectionable weeds, and other litter and shall be free from toxic substances, clay lumps, stones, roots and other objects larger than 1 inch in diameter, or any other material which might be harmful to plant growth or be a hindrance to grading, planting, and maintenance operations.

2.2. Fertilizer

Fertilizer shall be the product of an approved commercial fertilizer manufacturer and shall be 5-10-5 grade, uniform in composition, free-flowing material suitable for application with approved standard equipment. The fertilizer shall conform to the applicable State fertilizer laws and shall be delivered to the site in bags or other convenient containers each fully labeled and bearing the name, trademark, and warranty of the producer.

2.3. Lime

Lime shall be ground limestone containing not less than 85% of total carbonates and shall be ground to such fineness that at least 50% will pass through a 100-mesh sieve and at least 90% will pass through a 20-mesh sieve. Coarser materials will be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve, but no additional payment will be made for the increased quantity.

2.4. Mulch

Mulch shall be straw from wheat or oats. Materials for securing mulch may be one of the following.

- Mulch Netting: Lightweight plastic, cotton, jute, wire or paper nets shall be used.
- Peg and Twine: Bailing twine and soft wood pegs 1/2" x 1" x 12".
- Liquid Mulch Binder: RC-2 cut back asphalt conforming to the requirements of Federal

Specifications SS-A67IA, and asphalt emulsion shall conform to the requirements of Federal Specification SS-A-674, Type V.
• Seed: Seed used shall bear the official "certified seed" label inspected by North Carolina Crop Improvement Association. Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable. The seed used shall be that shown in seeding schedule specified herein or on the plans.

3. INSTALLATION

3.1. Seedbed Preparation

3.1.1. Clearing
Prior to or during grading and tillage operations, the ground surface shall be well drained, cleared of all brush, roots, stones larger than 2 inches in diameter, or any other material which may hinder proper grading, tillage, or subsequent maintenance operations.

3.1.2. Fine Grading
Areas to be seeded shall be graded as shown on the drawings or as directed and all surfaces shall be left in an even and properly compacted condition so as to prevent the formation of depressions where water will stand. Areas to be topsoiled shall be graded to a smooth surface and to a grade that will allow topsoiling to finished grade.

3.1.3. Topsoiling
Immediately prior to placing topsoil, the subgrade, where excessively compacted by traffic or other causes, shall be loosened by scarifying to a depth of at least 2 inches to permit bonding of the topsoil to the subgrade. Topsoil shall be uniformly spread by approved equipment in sufficient quantity to provide a compacted layer of 4 inches in thickness over the designated areas and in such manner that planting can proceed with little additional soil preparation or tillage. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to the proposed planting or to proper grading. Topsoil shall be graded to the lines indicated or as directed and any irregularities in the surface resulting from topsoiling or other operations shall be corrected to prevent formations of depressions where water will stand.

3.1.4. Tillage
After topsoiled areas required to be seeded have been brought to the grades shown on the plans and as specified, they shall be thoroughly tilled to a depth of 3 inches by approved methods, until the condition of the soil is acceptable to the ENGINEER. Any objectionable undulations or irregularities in the surface resulting from tillage or other operations shall be removed before planting operations are begun. The work shall be performed only during periods when satisfactory results are likely to be obtained. When conditions are such, by reason of drought, excessive moisture or other factors, that results are not likely to be satisfactory, the ENGINEER will stop the work and it shall be resumed only when, in his opinion, the desired results are likely to be obtained.

3.2. Limestone, Fertilizer and Seed

3.2.1. General
Seasonal limitations for seeding operations, the kinds and grades of fertilizers, the kinds of seed, and the rates of application of limestone, fertilizer, and seed shall be as shown in the seeding schedule.

3.2.2. Equipment to be used for the application, covering, or compaction of limestone, fertilizer, and seed shall have been approved by the ENGINEER before being used on the project. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.

3.2.3. Limestone, fertilizer, and seed shall be applied within 24 hours after completion of seedbed preparation unless otherwise permitted by the ENGINEER, but no limestone or fertilizer shall be

distributed and no seed shall be sown when the ENGINEER determines that weather and soil conditions are unfavorable for such operations.

3.2.4. During the application of fertilizer, adequate precautions shall be taken to prevent damage to structures or any other appurtenances. The CONTRACTOR shall either provide adequate covering or change methods of application as required to avoid such damage. When such damage occurs, the CONTRACTOR shall repair it, including any cleaning that may be necessary.

3.3. Limestone and Fertilizer

Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, limestone and fertilizer shall be distributed uniformly over the prepared seedbed at a specified rate of application and then harrowed, raked, or otherwise thoroughly worked or mixed into the seedbed.

3.3.1. If liquid fertilizer is used, storage containers for the liquid fertilizer shall be located on the project and shall be equipped for agitation of the liquid prior to its use. The storage containers shall be equipped with approved measuring or metering devices which will enable the ENGINEER to record at any time the amount of liquid that has been removed from the container. Application equipment for liquid fertilizer, other than a hydraulic seeder, shall be calibrated to insure that the required rate of fertilizer is applied uniformly.

3.4. Seeding

Seed shall be distributed uniformly over the seedbed at the rate indicated in the seeding schedule, and immediately harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil. The depth of covering shall be as directed by the ENGINEER. If two kinds of seed are to be used which require different depths of covering, they shall be sown separately.

3.4.1. When a combination seed and fertilizer drill is used, fertilizer may be drilled in with the seed after limestone has been applied and worked into the soil. If two kinds of seed are being used which require different depths of covering, the seed requiring the lighter covering may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.

3.4.2. When a hydraulic seeder is used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted by the ENGINEER.

3.4.3. Immediately after seed has been properly covered, the seedbed shall be compacted in the manner and degree approved by the ENGINEER.

3.5. Modifications

When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the ENGINEER may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

3.5.1. Such modifications may include but not be limited to the following.

3.5.1.1. The incorporation of limestone into the seedbed may be omitted on (a) cut slopes steeper than 2:1 (b) on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or (c) on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.

3.5.1.2. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.

3.5.1.3. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky

surfaces, or on other areas where soil conditions would make compaction undesirable.

3.6. Mulch

3.6.1. General
All seeded areas shall be mulched unless otherwise indicated on the plans or directed by the ENGINEER. Application rate of mulch shall be indicated in seeding schedule.

3.6.2. Mulching
Mulch shall be applied within 36 hours after the completion of seeding unless otherwise permitted by the ENGINEER. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations.

3.6.3. Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers that will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

3.6.4. Mulch Binding
Mulch shall be held in place using devices approved by the ENGINEER as per manufacturers recommendations. During application, the CONTRACTOR shall take adequate precautions to prevent damage to structures or appurtenances.

3.7. Maintenance

3.7.1. General
The CONTRACTOR shall be responsible for the proper care and maintenance of the seeded areas until the work under the entire contract has been completed and accepted by the ENGINEER. Maintenance shall consist of repair and replacement of eroded areas, watering, refertilizing, reliming, reseeding, and remulching as necessary to provide an even, fixed growth of grass. In addition, the CONTRACTOR shall provide protection against traffic and shall erect the necessary barricades and warning signs immediately after planting is completed.

3.7.2. Mowing
The seeded areas shall be mowed with approved mowing equipment as per seeding schedule. If weeds or other undesirable vegetation threaten to smother the planted species, such vegetation shall be removed at no cost to the OWNER.

3.8 Inspection and Testing

3.8.1 Fertilizer and Lime
The ENGINEER shall be furnished with duplicate copies of invoices for all fertilizer and lime used on the project. Invoices for fertilizer shall show the grade furnished. Invoices for lime shall show total minimum carbonates and minimum percentages of the material furnished that pass 100-mesh and 20-mesh sieve. Upon completion of the project, a final check of the total quantities of fertilizer and lime used will be made against the total area topsoiled and seeded, and if the minimum rates of application have not been met, the ENGINEER may require the distribution of additional quantities of these materials to make up the minimum application specified at no additional cost to the OWNER.

3.8.2 Seed
The ENGINEER shall be furnished duplicate signed copies of a statement from the Vendor, certifying that each container of seed delivered is fully labeled and in full accordance with the specifications in this section and the seeding schedule.

END OF SECTION

Material Specification Sheet

¾ Service:

Saddles: **Hinged** Bronze Saddle ¾ CC Threads (Mueller S-13000 Series) or equal, must be approved

Corporation Stop: ¾ CC x IPS Instatite (Mueller Part # H15005) no substitutes allowed.

Pipe: ENDOT EndoPure Polyethylene ¾ IPS 200 psi Part # PEP07541010004 no substitute allowed

Setter: ¾ w/ASSE Approved Dual Check & w/ ball valve (Mueller Part # B2404-2A7) or equal, must be approved

Setter Fittings:

Corporation Side of Setter: ¾ Multipurpose x IPS Instatite (Mueller #: H114229) no substitutes allowed.

Customer Side of Setter: ¾ Multipurpose x FIP Conn. (Mueller # H14222) or equal, must be approved

¾ Brass Male Adapter MIP x Rib (Ford # PTM-1) or equal, must be approved

Meter: Master Meter Multi jet Bottom load 5/8 x ¾ in Gallons, with Dialog 3G AMR no substitute allowed

Meter Box: Mid State #MSBCF1118-12XL no substitute allowed

Lid: 2MSHL DI FLSH CVR View RDR (Carson Industries) no substitute allowed

Repair:

¾ Ball Valve for Setter: Mueller # B-24265 or equal, must be approved

¾ Repair Bands: IPS: Stainless Steel Full Circle Smith Blair or equal, must be approved

3" long # 24400010503000 6" long # 24400010506000

CTS: Stainless Steel Full Circle Smith Blair or equal, must be approved

3" long # 24400008803000 6" long # 24400008806000

¾ Brass Inserts: Barb x Barb Ford # PTP-1 or equal, must be approved

¾ Instatite Coupling: IPS or CTS: Brass Mueller # H-15408 no substitute allowed

¾ IPS x CTS Compression Coupling: Brass Mueller Part # H 15409 or equal, must be approved

¾ Multipurpose x CTS Instatite (Mueller #: H 14230)

¾ CTS Pipe: ENDOT EndoPure Polyethylene ¾ CTS 200 psi no substitute allowed

1” Service:

Saddles: **Hinged** Bronze Saddle 1” CC Threads (Mueller S-13000 Series) or equal, must be approved

Corporation Stop: 1” CC x IPS Instatite (Mueller Part # H 15005) no substitutes allowed.

Pipe: ENDOT EndoPure Polyethylene 1” IPS 200 psi no substitute allowed

Setter: 1” w/ASSE Approved Dual Check & w/ ball valve (Mueller Part # B2404-2A12) or equal, must be approved

Setter Fittings:

Corporation Side of Setter: 1” Adapter MIP x IPS Instatite (Mueller #: H114229) no substitutes allowed.

Customer Side of Setter: 1” Multipurpose x FIP Conn. (Mueller # H 14222) or equal, must be approved

1” Brass Male Adapter MIP x Rib (Ford # PTM-2) or equal, must be approved

Meter: 1” Master Meter, with Dialog 3G AMR in Gallons

Meter Box: Mid State #MSBCF1324-12XL no substitute allowed

Lid: DI w/ reader (Carson Industries) no substitute allowed

Repair:

1” Repair Bands: Stainless Steel Full Circle Smith Blair or equal, must be approved

IPS 3” long # 24400013203000 IPS 6” long # 24400013206000

1” Ball Valve for Setter: Mueller # B-24265 or equal, must be approved

1” Brass Inserts: Barb x Barb Ford #PTP-2 or equal, must be approved

1” Instatite Coupling: IPS Brass Muller # H15408 no substitute allowed

1 ½" Service:

Up to setter shall be same as 2" service after the Harco adapter go to a 2" x 1 ½ "Brass bell reducer, 1 ½" brass nipple, 1 ½" brass union, 1 ½" brass nipple to setter

Setter: 1 ½", 18" tall w/ Dual Check & w/ ball valve (Mueller Part # B-2422-2 or equal, must be approved

Resetter: 1 ½" **w**/ Dual Check & w/ ball valve (Mueller Part # B-2424-2) or equal, must be approved

Setter Fittings:

Corporation Side of Setter: Brass all thread nipple to brass union to brass bell reducer to 2" DI Harco MIP x Slip PVC

Customer Side of Setter: FIP Thread to customer piping

Meter: 1 ½" Master Meter with Dialog 3G AMR in Gallons

Meter Box: Mid State # MSBCF1730-18XL no substitute allowed

Lid: DI w/ reader (Carson Industries) no substitute allowed

2" Service:

Saddles: Nylon Coated w/ Stainless Steel Double Strap IP Thread (Romac # 202NS) or equal, must be approved

Brass Nipple: 2" x 3" long

2"Ball Valve: FIP x FIP (AY McDonald 4139-183-0) or equal, must be approved

2" Harco DI Male Adapter MIP x Slip (# 80170) no substitute allowed

Pipe: SDR-21 no substitute allowed, Rod & Concrete @ each Harco Male Adapter

Setter: 2" 18" tall w/ Dual Check & w/ ball valve (Mueller Part # B-2422-2) (AY# 20B712WDFF775) or equal, must be approved

Resetter: 2" **w**/ Dual Check & w/ ball valve (Mueller Part # B-2424-2) or equal, must be approved

Valve Box: 18"x 24" screw type

Setter Fittings:

Corporation Side of Setter: Brass all thread nipple to brass union to DI Harco MIP x Slip

Customer Side of Setter: FIP Thread to customer piping

Meter: 2" Master Meter with Dialog 3G AMR in Gallons

Meter Box: Mid State # MSBCF1730-18XL no substitute allowed

Lid: DI w/ reader (Carson Industries) no substitute allowed

Repair:

2" Repair Bands: Stainless Steel Full Circle Smith Blair or equal, must be approved

SDR21- 6" long # SB24400023806000 12" long # SB22600023812000

2" PVC Class 200 Harco Slip Coupling Harco # 80140 no substitute allowed

2" Hymax Coupling # 2000-0303-260 no substitute allowed

2" Hymax Coupling flange adapter w/ oval meter flange Hymax # 2100-0303-175 no substitute allowed

All other necessary repair fitting needed must be approved by Iredell Water Corporation