

# **GENERAL CONSTRUCTION**

## **STANDARDS & SPECIFICATIONS MANUAL**



**MOORE COUNTY PUBLIC WORKS DEPARTMENT**

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## **PREFACE**

This Manual is for the Moore County Public Utilities and the East Moore Water District water and sewer systems, all of which are operated by the Moore County Public Works Department (MCPW).

These standards are for design and construction of general construction activities related to water mains, wastewater mains, pump stations, force mains, and flow metering stations, which will come under the jurisdiction of Moore County Public Works (MCPW). **These standards alone do not constitute a complete set of construction documents. The owner's or developer's Professional Engineer is responsible for providing plans that encompass all the needs of the project and comply with the standards within this manual.** These standards are set forth as the minimal requirements to achieve a suitable quality level for utilities which will become the property of MCPW.

The standards do not include a complete commentary on methods or installation and detailed information or quality of workmanship in place. The owner's or developer's Professional Engineer must include detailed information on methods of construction and should expand on the testing and any of the special requirements to the engineer's satisfaction, subject to the approval of MCPW.

From time to time, these standards will be amended and/or expanded at the pleasure of the MCPW Engineering Division. It will be the responsibility of the owner or developer to contact the MCPW to obtain updated standards.

There may be circumstances whereby the design engineer may wish to propose changes or modifications to these standards, when this occurs permission from the County Engineer shall be obtained prior to submission to NCDEQ.

## **Disclaimer**

To the best of their ability, the authors have insured that material presented in this manual is accurate and reliable. The design of engineered facilities, however, requires considerable judgment on the part of designer. It is the responsibility of the design professional to insure that techniques utilized are appropriate for a given situation. Therefore, neither Moore County Public Works, nor any author or other individual, group, etc., associated with production of this manual, accepts any responsibility for improper design, any loss, damage, or injury as a result of the use of this manual.

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## **STANDARD & SPECIFICATIONS MANUAL - GENERAL CONSTRUCTION**

### **1.0 ARCHAEOLOGICAL**

If the Contractor, during the prosecution of work, encounters an unidentified archaeological or other cultural resource within the work area, the Contractor shall immediately stop work and notify the Engineer.

### **2.0 CONSTRUCTION LIMITS**

All trash, forms of debris, and other foreign material shall be cleared from around all pipes and structures before backfilling.

Backfilling shall be kept up with the pipe laying to the satisfaction of the Engineer.

Backfilling around the pipe and to a depth of at least 12 inches above the top of pipe shall be hand compacted. Only select material containing no rocks or other objectionable material shall be used for this portion of the backfill. As soon as the material is placed, it shall be cut under the haunches of the pipe with a shovel and thoroughly compacted with mechanical tamps from 12 inches above pipe to ground level for the full width of the trench to provide support for the bottom and sides of the pipe. Back filling shall be carried up evenly on both sides.

Excess material shall be promptly removed from the site, and the pavement or road surface cleaned of objectionable material. The pavement and/or road surface shall be cleaned daily with a mechanical broom and/or washed, if required by the Engineer.

The Contractor shall be responsible for all final grades of all trenches and shall leave the same flush with the original ground after all settlement has taken place. Trenches must be protected against scour due to surface drainage. The Contractor shall correct any future settlement within the warranty period at his own expense.

### **3.0 DAMAGES AND COMPLAINTS**

The Contractor shall provide protection which, in the opinion of the Engineer, will prevent damage to the property, such as lawns, roads, fences, buildings, drains, bridges and utilities by his equipment, and shall assume sole responsibility for damages thereby incurred and shall notify the County Engineer immediately if and when damage occurs. The County Engineer shall be promptly notified of all utilities that are broken by the Contractor's operations and immediate arrangements made for repairs. Damage to property shall be repaired to a condition that is as good as, or better than original.

The Contractor shall promptly comply with all reasonable requests of the landowners and tenants relative to access to right-of-way and to general conduct of his work; however, he

shall not enter into any agreements with property owners or tenants on other matters such as the saving of logs or firewood or the disposal of brush without prior approval of the County Engineer. In cases of disagreement between any landowner or tenant and the Contractor, the Contractor shall notify the County Engineer immediately and shall not perform any further operations against the objections of the property owner or tenant without prior approval of the Engineer.

#### **4.0 DUST CONTROL**

The Contractor shall control dust throughout the life of the project within the project area and at all other areas affected by the construction of the project. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, or appearance of any property. The Contractor will provide dust control measures as directed by the Engineer.

#### **5.0 PRELIMINARY WORK**

- A. Work Area:** Adequate working space shall be cleared along the pipe and space shall be provided for control stakes and hubs. Trees and permanent structures not located within the right-of-way shall be removed only as directed by the Engineer.
- B. Vegetation and Ornamental Items:** The Contractor shall be fully responsible for protection of or removal and replacement of ornamental trees, shrubs and grasses, decorative items such as retaining walls and all other items with no additional payment or compensation.
- C. Clearing and Grubbing:** Clearing and grubbing shall be performed in areas indicated and where required for construction. It shall include the complete removal and disposal of all brush, weeds, timber, stumps, rubbish and all other obstructions. In clearing and grubbing areas where excavation is done, all timber, roots, or stumps removed that are exposed by said excavation shall be removed to a depth of 1 foot below the excavated surface.
- D. Disposal of Cleared and Grubbed Material:** All refuse from the clearing and grubbing operation shall be disposed of in compliance with Town, County and State regulations.

#### **6.0 TRAFFIC CONTROL AND WORK ZONE SAFETY**

##### **A. Controlling Agencies**

The Contractor shall maintain traffic control during construction and provide, install, and maintain all traffic control devices in accordance with the project guidelines, the Project Special Provisions, North Carolina Department of Transportation “Standard Specifications for Roads and Structures”, the current edition of the “Manual of Uniform Traffic Control Devices” (MUTCD) and any special local laws or ordinances.

**B. Traffic Control Methods**

The Contractor shall utilize complete and proper traffic controls and traffic control devices during all operations. All traffic control and traffic control devices required for any operation shall be functional and in place prior to the commencement of that operation. Signs for temporary operations shall be removed during periods of inactivity. The Contractor is required to leave the project in a manner that will be safe to the traveling public and which will not impede motorists.

**C. Lane Closures**

Traffic movement through lane closures on roads with two way traffic shall be controlled by flaggers stationed at each end of the work zone. In situations where sight distance is limited, the Contractor shall provide additional means of controlling traffic, including, but not limited to, two-way radios, pilot vehicles, or additional flaggers. Flaggers shall be competent personnel, adequately trained in flagging procedures.

**D. Dress Code**

All personnel when working in traffic areas or areas in close proximity to traffic shall wear an approved safety vest, or shirt or jacket and hat or helmet which meets the color requirements of the “Manual of Uniform Traffic Control Devices” (MUTCD).

**E. Regulations**

Contractor shall comply with all applicable laws and regulations relating to the safety of persons or property.

**F. Improper Control**

Failure to comply with any of the requirements for safety and traffic control of these standards and specifications shall result in suspension of work.

**7.0 UNLOADING & STORAGE OF MATERIALS**

The unloading and loading of all pipe, fittings, and other accessories shall be in accordance with manufacturer’s recommended practices and shall at all times be performed with care to avoid any damage to the material. All such material shall not be stored directly on the ground, but shall be on pallets or other suitable supports so as to prevent the entry of mud and debris in pipe or other materials.

Once on the job site, all materials shall be stored in accordance with the manufacturer’s recommended practices, and within the limits of the Project site.

**8.0 TRENCH EXCAVATION & PREPARATION**

**A. Trench Dimensions**

The pipe trench shall be excavated to the line and gradient shown on the approved drawings. The minimum width of the trench as measured at the top of the pipe shall

be the outside diameter of the pipe barrel, plus 6 inches on each side. The maximum trench width measured at the top of the pipe shall not exceed the outside diameter of the pipe barrel, plus 12 inches on each side. Where pavement is to be cut, it shall be cut in advance of trenching 12 inches wider than the specified width of the trench on each side. See STD. No. GC-1 & GC-2 for details.

The length of trench which may be open ahead of pipe laying operations shall be no more than 100 feet and no less than 20 feet unless warranted by special circumstances, and then only upon approval of the Engineer.

Depth of cover shall not be less than 3 feet for pipe up to 8 inches in diameter and 3 feet and 6 inches for pipe 10 inches and larger in diameter, measured to the top of pipe, unless shown differently on the profile plans or authorized by the Engineer.

**B. Poor Soil Conditions**

Where soil conditions prohibit vertical walls, the trench width shall be sloped per OSHA standards. Where soil conditions prevent ditch excavation without excessive widths, or where directed by the Engineer, hydraulic shoring or a suitable reinforced steel trench box shall be employed.

**C. Trench Bottoms**

Trench bottoms shall be hand graded to provide uniform and continuous bearing for the pipe along its entire length, with bell holes being dug for pipe bells. No ridges, sags, or undercutting will be allowed. Excess excavation below grade shall be backfilled with suitable material which shall be thoroughly tamped.

If approved by the Engineer and subject to suitable soil conditions, the trench may be excavated a few inches below the established subgrade and backfilled with select material (from the excavation, if available) well compacted and so shaped as to give the pipes uniform bearing throughout their lengths at the established grade. Bell holes shall be dug to relieve the bells of load and to provide for completion of the joints.

**D. Unstable Material**

Where the material at grade is unstable, soft, and incapable of supporting the pipe, the trench shall be excavated below grade, as directed by the Engineer, and refilled to grade with stone or gravel to form a firm foundation for the pipe. Stone shall be compacted and graded to provide a stable foundation and a uniform bearing for pipe. Bell holes shall be provided as in other types of foundations.

**E. Disposal of Material**

When authorized by the Engineer, the Contractor shall dispose of material excavated from the trench that is unsuitable for backfill material. The Contractor shall provide and place select borrow material to replace unsuitable material for backfilling the trench as directed.



## **F. Ground Water**

Should ground water be encountered in the bottom of the trench, causing the trench bottom to be unstable, the material, as directed by the Engineer, shall be excavated below grade sufficiently, 8 inches minimum, to allow a bed of crushed rock or gravel to be placed in which to bed the pipe. No. 57 stone shall be placed up to the spring line of the pipe. The work shall be done as for unstable foundations. The depth of cut below grade shall be only the minimum amount to accomplish the purpose, and shall be as directed by the Engineer.

The Contractor shall furnish all machinery for pumping, bailing, and/or well pointing and shall pump, bail, or otherwise remove any water which may be found or shall accumulate in the trenches. The disposal of water after removal shall be satisfactory to the Engineer.

## **G. Utilities**

All existing water, sewer, and gas mains, buried electrical and telephone cable, and other known utilities intersecting the pipe in construction shall be located by the Contractor at his expense. If requested by the Engineer, the utilities shall be uncovered by the Contractor at his expense and exposed to the Engineer at least 100 feet ahead of pipe laying operations to insure the correctness of grades.

The Contractor shall at all times take necessary precautions in preventing gutters, catch basins, ditches and other drainage facilities from being clogged that might cause flooding conditions and damage to public or private properties.

## **H. Rock Excavation**

In the event rock is encountered, the trench shall be excavated to a depth of not less than 6 inches beneath the bottom of the pipe and then refilled with No. 57 stone. For ductile iron pipe, the bedding may be other native granular soil as may be approved by the Engineer. The trench width in rock excavation shall be as previously specified. All rock excavation shall be disposed off-site and select fill shall be used in backfilling the trench.

## **I. Blasting Procedures**

Blasting for trench rock may be initiated only after the permitting requirements are met by the local governing body.

Blasting Procedures shall conform to all applicable local, State, and Federal laws and ordinances. The Contractor shall take all necessary precautions to protect life and property, including the use of an approved blasting mat where there exists the danger of throwing rock or overburden. The Contractor shall keep explosive materials which are needed on the job site in specially constructed boxes provided with locks. These boxes shall be painted red and plainly identified as to their contents. After working hours, the boxes containing explosive material shall be removed from the job site.

Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made. No blasting shall be allowed unless a

galvanometer is employed to check cap circuits. Where blasting takes place within 500 feet of a utility, structure, or property which could be damaged by vibration, concussion, or falling rock, the Contractor shall be required to keep a blasting log containing the following information for each and every shot:

1. Date of shot
2. Time of shot
3. Explosive Specialist's name
4. Number and depth of holes
5. Approximate depth of overburden
6. Amount and type of explosive used in each hole
7. Type of caps used (instant or delay)
8. The weather

This blasting log shall be made available to the Engineer upon request and shall be kept in an orderly manner. Compliance by the Contractor with these specifications does in no way relieve him of legal liabilities relative to blasting operations.

The Engineer reserves the right to require removal of rock by means other than blasting where any utility, residence, structure, etc. is either too close to, or so situated with respect to the blasting hazardous.

#### **J. Shoring**

Shoring will be provided by the Contractor when the excavation will endanger existing structures, utilities, pavements, banks, and workmen. The shoring shall be constructed of adequate size members and the arrangement of members shall be suitable to withstand the earth pressure expected. Shoring, sheeting, and bracing that are utilized above the invert of the pipe shall be removed carefully during the backfilling process in order to prevent caving that might displace the pipe from the correct line and grade. When and where directed by the Engineer, sheeting may be left in place in the backfill with adequate braces to provide lateral support. Shoring shall be in accordance with OSHA regulation.

### **9.0 ENCASEMENT INSTALLATION**

#### **A. Boring and Jacking**

Boring and Jacking is performed with dry bores slightly larger than the pipe bored progressively ahead of the leading edge of the advancing pipe as spoil is mucked by the auger back through the pipe. As the dry boring operation progresses, each new section of encasement pipe shall be butt-welded to the section previously jacked into place.

If voids are encountered or occur outside the encasement pipe, grout holes shall be installed in the top section of the encasement pipe on 10 foot centers and the voids filled with 1:3 Portland cement grout at sufficient pressure to prevent settlement within a traffic bearing area. In the event an obstruction is encountered during the

boring and jacking operation, the auger is to be withdrawn and the excess pipe is to be cut off, capped, and filled with 1:3 Portland cement grout as sufficient pressure to fill all voids before moving to another boring site. See Std. No. GC-3 for detail.

Upon insertion of the pipe through the casing pipe, the ends of the encasing pipe shall be sealed with brick and mortar; adjustable stainless steel band or rubber casing seal. All seals shall be such as to withstand hydrostatic pressure from ground water, backfill loads and provide means to prevent the pipe from flooding within the easement pipe. Grouting procedure will not be allowed.

**B. Driving:** A metal pipe, normally no larger than 8 inches in diameter with or without a pilot shoe can be driven through compressible soils by a steady thrust or hammering. The pipe, after penetration, is pulled out and a same size pipe or encasement pipe is installed.

**C. Pneumatic Drilling:** A pit is dug at the entrance where a support frame is installed to hold the encasement pipe and provide the proper slope. A Pneumatic Vibrator is then fastened to the outside end of the pipe and with a continuous thrusting action drives the pipe near flush with the pipe wall. The vibrator is then removed and a second encasement pipe is welded to the existing pipe. The vibrator is fastened to the outside end of the second pipe and vibration continues until this pipe is flush with the pit wall.

After all needed pipe has been installed, a rag is placed within the pipe opening and a flat piece of metal, that is larger than the pipe opening, and has a small hole in the middle is spot welded to the pipe end section. Air is then forced into the pipe through the small plate opening which blows the material within the pipe out the other end where it is contained within a small pit that was constructed earlier.

**D. Casing Pipe**

Size: See Below

<u>Carrier Pipe (inches)</u>	<u>Casing Pipe Minimum (inches)</u>
4	10
6	12
8	16
10	18
12	20
14	22
16	24
18	26
24	32
30	38

Thickness and Strength: Steel pipe for casings shall be manufactured from steel having minimum yield strength of 35,000 psi, per ASTM A36/A36M, with the minimum wall thickness as shown below:

<b>Pipe Sizes (inches)</b>	<b>Wall Thickness inches Roadway (inches)</b>	<b>Wall Thickness inches Railroad (inches)</b>
4-10	.188	.188
12-14	.188	.250
16	.250	.218
18	.250	.312
20	.250	.344
24	.250	.375
30	.312	.469
36	.375	.532
48	.500	.688

Casing under railroads: Railroad Crossing casing pipe to be 5 feet and 6 inches minimum from top of rail to top of Casing Pipe.

**E. Spider Support:** The carrier pipe shall be supported inside the casing pipe by metal Spiders. The Spiders shall be Epoxy Coated or Stainless Steel with polyethylene runners. There shall be a minimum of two Spiders per individual pipe length, one at each end of the pipe. The number can be increased as directed by the Engineer. See STD. No. GC-3 for detail.

## **10.0 DIRECTIONAL DRILLING**

- A. Scope:** This section includes the installation of a water main or wastewater main by guided boring. The Contractor will furnish all labor, components, materials, tools and appurtenances necessary or proper for the performance and completion of the contract.
- B. General Description of Method:** Guided boring is a method of trenchless construction using a surface launched steerable drilling tool controlled from a mobile drilling frame, and includes a field power unit, mud mixing system and mobile spoils extraction system. The drilling frame is sited and aligned to bore a pilot borehole that conforms to the planned installation of the main. The drilling frame is set back from an access pit that has been dug (typically at the location of the proposed main or other appurtenance) and a high-pressure fluid jet toolhead that uses a mixture of bentonite clay and water is launched. Pits are normally dug at the start point and endpoint of the proposed pipe installation and are used to align the toolhead, attach other equipment, and to collect and remove excess spoils. Using an electronic guidance system, the toolhead is guided through the soil to create a pilot borehole. Upon reaching the endpoint joint, the toolhead is removed and a reamer with the product pipe attached is joined to the drill string and pulled back through the borehole. In large diameter installations, pre-reaming of the borehole will usually be done prior to

attaching the product pipe for the final pullback. A vacuum spoils extraction system removes any excess spoils generated during the installation. The connections, manholes or other appurtenances are then completed at both the start point and endpoint locations and the surface restored to its original condition. See Std. No. GC-4 for detail.

**C. Site Conditions:**

1. Drilling operations must not interfere with, interrupt or endanger surface, and activity upon the surface.
2. Contractor must comply with all applicable jurisdictional codes and OSHA requirements.
3. The Contractor shall conduct pre-bid and pre-drill investigations of each individual site. When rock stratum, boulders, underground obstructions, or other soil conditions that impede the progress of drilling operations are encountered, the Contractor shall change from a conventional drilling bit to one suitable for drilling in rock formations. This change in equipment shall be at no additional cost to the owner.

**D. Drilling fluid:**

1. Drilling fluid will be a mixture of water and bentonite clay. The fluid will be inert. The fluid should remain in the tunnel to ensure the stability of the tunnel, reduce drag on the pulled pipe, and provide backfill with the annulus of the pipe and tunnel.
2. Disposal of excess drilling fluid and spoils will be the responsibility of the Contractor who must comply with all relevant regulations, right-of-way, work space and permit agreements. Excess drilling fluid and spoils will be disposed at an approved location.
3. The Contractor is responsible for transporting all excess fluid and spoils to the disposal site and paying any disposal costs. Excess drilling fluid and spoils will be transported in a manner that prevents accidental spillage onto roadways. Excess drilling fluid and spoils will not be discharged into sanitary or storm drain systems, ditches or waterways.
4. Fluid returns (caused by fracturing or formations) at locations other than the entry and exit points will be minimized. The Contractor will immediately clean up any drilling fluid that may surface through fracturing.
5. Mobil spoils removal equipment capable of quickly removing spoils from entry or exit pits and areas with returns caused by fracturing will be present during drilling operations to fulfill the requirements of 2 and 3 above.

6. The Contractor will be responsible for making provisions for a clean water supply for the mixing of drilling fluid.

**E. Dewatering:**

1. The Engineer shall be notified immediately if any obstruction is encountered that stops the forward progress of drilling operations.
2. Dewatering of pits and excavations must meet the general provisions and specifications for new water main construction as defined by MCPW. The type of dewatering method will be at the option of the Contractor. When water is encountered, the Contractor must provide a dewatering system of sufficient capacity to remove water, keeping any excavations free of water until the backfill operation is in progress. Dewatering shall be performed in a manner so that removal of soil particles is held to a minimum.

**F. Guided Boring Operations:**

1. Equipment:
  - a. The drilling equipment must be capable of placing the pipe within the limits indicated on the contract plans.
  - b. Guided boring equipment shall consist of a surface launched steerable drilling tool controlled from a mobile drilling frame, and include a field power unit, mud mixing system and mobile spoils extraction system.
  - c. The number of access pits shall be kept to a minimum and the equipment must be capable of boring the following lengths in a single bore. The guided boring system will have the capability of boring and installing a continuous run without intermediate pits of a minimum distance per the pipe manufacturer's guidelines and recommendations.
  - d. The guidance system shall have the capability of measuring vertical (depth) position, horizontal position and roll. The guidance system must meet the following specifications in soft homogenous soils:

Accuracy

Vertical position:	1 inch at	18-96 inches of depth
	2 inches at	97-144 inches of depth
	4 inches at	145-180 inches of depth
	6 inches at	181-300 inches of depth
	10 inches at	301-480 inches of depth
Horizontal position:	2 inches at	18-96 inches of depth
	4 inches at	97-180 inches of depth
	6 inches at	145-180 inches of depth
	12 inches at	181-300 inches of depth

24 inches at 301-480 inches of depth

- f. Required Safety Equipment:

During drilling operations all equipment shall be effectively grounded and incorporate a system that protects operating personnel from electrical hazards. The system shall be equipped with an audible alarm that can sense if contact is made with an energized electric cable. Proper operation of the alarm system will be confirmed prior to the drilling of each tunnel. All equipment will be connected to ground with a copper conductor capable of handling the maximum anticipated fault current. Crew members operating drilling equipment and handling rods will do so while standing on grounded wire mesh mats, ensuring that all equipment is grounded, and wearing hot boots, hot gloves, safety glasses and hard hats. Crew members operating handheld locating equipment will wear hot boots.
2. Pilot Hole Boring:
  - a. The entry angle of the pilot hole and the boring process will maintain a curvature that does not exceed the allowable bending radii of the drilling equipment and product pipe.
  - b. The Contractor shall follow the pipe alignment as shown on the Drawings and specifications. If adjustments are required, the Contractor shall notify the Engineer for approval prior to making the adjustments.
3. Installing Product Pipe:
  - a. Water mains crossing streams shall be of HDPE, DR-9, 250 psi or Fusible C-900 PVC pipe. The pipe shall be directional drilled at sufficient depth to provide a minimum of 5 foot of cover between the top of pipe and stream bed. There should be a minimum of 2 feet clearance between any utility crossing and a minimum of 3 feet of cover from any surface area.
  - b. Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 250 PSI. A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 25°, 4" - 8"; 20°, 10" - 12"; 15°, 14+" and 8-inches minimum expansion. The flexible expansion fitting shall not expand or exert an axial imparting thrust under internal water pressure. The flexible expansion fitting shall not increase or decrease the internal water volume as the unit expands or contracts. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The

coating shall meet ANSI/NSF-61. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16. Polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications. All flexible expansion joints shall be The Force Balanced FLEX-TEND as manufactured by EBAA Iron, Inc. or approved equal

- c. HDPE or PVC and Mechanical Joint Pull Assembly shall be as shown in Std. No. GC-4. HDPE and DIP Transition Assembly shall be as shown in Std. No. GC-5.
  - d. Reaming diameter will not exceed 1.5 times the diameter of the product pipe being installed.
  - e. The pipe being pulled into the tunnel will be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation.
  - f. Pullback forces will not exceed the allowable pulling forces for the product pipe.
  - g. The Contractor shall allow sufficient lengths of product pipe to extend past the termination point and sufficient time for bore pipe to relax to allow connections. The pulled pipe will be allowed 30 days of stabilization prior to making connections or the time can be reduced if calculations are provided that follow the Plastic Pipe Institute standards, refer to Handbook of PE Pipe (Chapter 12). The pull lengths and time required for pipe to relax shall also meet all manufacturers' recommendations. All calculations shall be submitted to Moore County for review sealed by a Professional Engineer before trench pipe is connected to the bored pipe.
  - h. Valves shall be provided at both ends of the ductile iron section of the bore so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding.
1. After installation:
    - a. A plan and profile shall be provided from entry to exit for each directional bore.
    - b. All bore sections shall be hydrostatically tested per specification standards upon completion of installation and prior to placing the pipe on-line.
    - c. This standard is also applicable to wetlands or any applications where directional bore is needed.



5. Clean-up:

The Contractor shall maintain the work site in a neat and orderly condition throughout the period of work and after completing the work at each site, remove debris, surplus material and temporary structures erected by the Contractor. The site shall be restored to a condition equal to the existing condition prior to being disturbed.

## **11.0 PAVEMENT REMOVAL AND REPLACEMENT**

### **A. Pavement Cut**

All pavements shall be neatly saw cut to a straight edge in advance of trenching. Pavement shall be cut 12 inches wider on each side than the excavated trench. Ragged or irregular edges will not be allowed, and work completed with barred edges shall be redone. Concrete pavement shall be sawed with suitable concrete saw cutting equipment. See Std. No. GC-1 and GC-2.

### **B. Sub-base**

Trench backfilling shall be done in lifts not over 6 inches thick and thoroughly compacted to within 12 inches of pavement surface course layer. Compaction shall be such as to prevent future settlement and shall be done by acceptable means. Rolling with rubber-tired vehicles or track-type equipment will not be allowed. Compaction shall be at least 95 percent of maximum dry density as determined by ASSHTO Method T-99.

### **C. Base**

The base shall be filled with 12 inches of ABC stone for the length of the pavement cut, plus 12 inches beyond the existing pavement on each side. This stone shall be thoroughly compacted and remain unpaved for a minimum of 30 days to allow any settling in the sub-base.

### **D. Surface**

1. Asphalt Replacement: The edges of the asphalt shall be trimmed to a new face and mopped with AC tack. The asphalt surface shall be placed and thoroughly rolled to a smooth, dense surface true to adjacent areas of the street. The asphalt surface course shall consist of a minimum of 2-inches Type SF-9.5B bituminous concrete surface course in accordance with NCDOT Specifications.
2. Concrete Replacement (Roadways): Concrete replacement shall be performed in accordance with NCDOT's "Standard Specifications for Roads and Structures."

### **E. Maintenance:**

Cut areas shall be maintained by the Contractor in a safe, passable condition until paved. Should the area create a dusty condition, the Contractor shall remedy this condition by using water. Special care shall be given to the areas cut in traffic lanes and intersections by placing crushed stone and maintaining in a smooth condition at the Contractor's expense until paved.

**12.0 SERVICES AND UTILITIES, REPAIRS TO DAMAGES**

Repairs to damaged services and utilities shall be promptly made at the Contractor's expense. The contractor shall use every effort to avoid damaging or breaking water, sewer, gas, power, telephone, or other utility service. Utility mains shall be properly supported across the pipe trench until backfilling is completed. Should damage occur, immediate action shall be initiated for satisfactory repairs. All repair work shall be satisfactory to the Owner of the damaged utility.

**13.0 SIDEWALK REMOVAL AND REPLACEMENT**

**A. Removal**

Where pipe is to be placed under existing concrete sidewalk, the concrete shall be removed in construction units unless their length is more than 10 feet, in which case the concrete shall be cut. The backfill shall be thoroughly compacted for the entire depth of the trench.

**B. Replacement**

The sidewalk shall be replaced with 3,000 psi concrete, 4 inches thick, except for driveways where it shall be 6 inches thick. The concrete shall be placed monolithic and dressed off with a wooden float, brush and edging tool. Where pipe is to be placed under concrete walk, the Contractor may, with the permission of the County Engineer, install the pipe by tunneling instead of removing and replacing the walk or driveways. If pipe is to be placed under curb and gutter, it shall be done by tunneling, unless other methods are approved by the County Engineer.

**C. Maintenance**

The Contractor shall be responsible for removing and replacing items such as mail boxes, fences, shrubbery, walls, steps, and any other private ornamental items that are in direct conflict with the construction.

**14.0 SEEDING/TURFING and EROSION CONTROL**

**A. Seeding:** Seed shall be furnished and sowed as follows, all mixtures and ratios are based on a per acre application rate:

**All Roadway Areas**

March 1 - August 31		September 1 - February 28	
50 lbs	Tall Fescue	50 lbs	Tall Fescue
10 lbs	Centipede	10 lbs	Centipede
25 lbs	Bermudagrass (hulled)	35 lbs	Bermudagrass (unhulled)
500 lbs	Fertilizer	500 lbs	Fertilizer
4,000 lbs	Limestone	4,000 lbs	Limestone

**Waste and Borrow Locations**

March 1 – August 31		September 1 - February 28	
75 lbs	Tall Fescue	75 lbs	Tall Fescue
25 lbs	Bermudagrass (hulled)	35 lbs	Bermudagrass (unhulled)
500 lbs	Fertilizer	500 lbs	Fertilizer
4,000 lbs	Limestone	4,000 lbs	Limestone

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

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

On cut and fill slope 2:1 or steeper, Centipede shall be applied at the rate of 5 lbs per acre and add 20 lbs of Serica Lespedeza from January 1 – December 1.

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

Quantities stated are in terms of total seed of the specified quantity.

The types of seed shall be mixed thoroughly prior to sowing.

All sowing of seed shall be completed within the time limit of the contract, or unless otherwise authorized by the Engineer. All seed shall be covered to an average depth of 1/4 inch.

**B. Lime:** The quantity of lime and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Lime Law and regulations adopted by the North Carolina Board of Agriculture.

During the handling and storing, the lime shall be cared for in such a manner that it will be protected against hardening and caking. Any hardened or caked lime shall be pulverized to its original condition before being used.

Lime shall be applied at the rate of 4,000 lbs. per acre and mixed thoroughly with the topsoil, as the seedbed is prepared unless a certified soils test is submitted that recommends a different rate.

**C. Fertilizer:** Applying Fertilizer – Fertilizer shall be distributed at the rate to provide 500 pounds per acre (Complete mix fertilizer – 10 parts nitrogen 20 parts phosphoric acid and 20 parts potash) unless a certified soils test is submitted that recommends a

different rate, after topsoil is returned to the area and thoroughly mixed with the topsoil immediately before planting.

**D. Establishing Turf:** The establishment period shall continue for 6 months from the date of seeding. The Contractor shall be responsible for maintenance, protection, repairing and resulting re-seeding and re-fertilization for 6 months after initial seeding. No direct payment will be made for this work.

**E. Mulching:** Where indicated on the plans or as described in encroachment agreements, mulch shall be applied as described herein.

1. Materials:

- a. Mulch Material: Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Low grade, musty, spoiled, partially rotted hay, straw, or other materials unfit for animal consumption will be acceptable. Mulch materials, which contain matured seed of species that would volunteer and be detrimental to the proposed overseeding or to surrounding farmland, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advance stage of decomposition as to smother or retard the planted grass, will not be acceptable.
- b. Straw: Straw shall be the threshed plant residue of oats, wheat, barley, rye, or rice from which grain has been removed as approved by the Engineer.
- c. Asphalt Binder: Asphalt binder material shall conform to the requirements of AASHTO M140. Type SS-1. or RS-1 as appropriate.

2. Mulching:

Before spreading mulch, all large clogs, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch shall be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled and evenly applied on the area shown on the plans or designated by the County Engineer. Straw shall be spread over the surface to a uniform thickness at the rate of 3 tons per acre to provide a sole depth of not less than 1-1/2 inches nor more than 3 inches. Mulch may be blown on the slopes and the use of cutters in the equipment for this purpose will be permitted to the extent that at least 95 percent of the mulch in place on the slope shall be 6 inches or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall be not less than 1 inch or more than 2 inches.

3. Securing Mulch:

The mulch shall be placed by asphalt binder on all slopes greater than 3 to 1 or as directed by the County Engineer. Where mulches have been secured by either of the asphalt binder methods, it will not be permissible to walk on the slopes after the binder has been applied.

4. Care and Repair:

- a. The Contractor shall care for the mulched area until final acceptance of the project.
- b. The Contractor shall be required to, at his expense, repair or replace any mulching that is defective or becomes damaged until the project is finally accepted.
- c. If the "Asphalt Spray" method is used, all mulched surfaces shall be sprayed with asphalt binder material so that the surface has a uniform appearance. Bituminous binder material may be sprayed on the mulched slope areas from either the top or the bottom of the slope.

**F. Manicured Areas (Sod)**

1. Scope: The goal of sodding, where specified, is to return disturbed manicured lawns to their original vegetative condition, and to return the area to an aesthetically pleasing environment.

Vegetative restoration (sodding or seeding) shall be done as the work progresses.

All existing ornamental grass stands (commercial or private lawns) may be carefully taken up, protected and replaced to their original condition or the Contractor may elect to install new sod or the same type. In most instances the areas requiring sod restoration should be readily determinable by the Contractor based on preconstruction conditions. Questionable areas shall be restored in the manner (sodded or seeded) determined by the Engineer to be appropriate.

Any area disturbed without Owner authorization will be restored by the Contractor at his own expense. In all cases the Contractor will guarantee a stand of grass over the entire area.

The work to be done to acquire the necessary vegetative cover shall include but is not specifically restricted to appropriate tilling of the area, the application of fertilizer and lime for area to be seeded, placement of sod, or sowing of seed and placing of straw mulch to hold the seed and soil in place until germination and growth occur.

After bringing the area to be sodded or seeded to proper grade, the entire area shall be tilled to a minimum depth of 4 inches by disking, harrowing or other approved means.

Following tilling, all large debris and stones shall be removed to the satisfaction of the Engineer and the surface leveled.

The Contractor shall provide general care for the restored areas as soon as the sod has been laid (or seeded and mulched), and such care shall continue until final inspection and acceptance of the work. All restored areas shall be protected against traffic or other use by warning signs or barricades approved by the Engineer.

2. Sodding: Sod furnished by the Contractor shall have good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials that might be detrimental to the development of the sod or to future maintenance. At least 70 percent of the plants in the cut sod shall be composed of the existing lawn species and any vegetation more than 6 inches in height shall be mowed to a height of 3 inches or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not more than 2 inches.

The sod shall be cut with approved sod cutters to such a thickness that after it has been transported and placed on the prepared bed, but before it has been compacted, it shall have a uniform thickness of not less than 2 inches. Sod sections or strips shall be cut in uniform widths, not less than 10 inches and in lengths of not less than 18 inches are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stored in an unrolled condition, irrigated, and protected from exposure to air drafts and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitchforks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, Commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and insure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen when replacing it shall work from ladders or treated planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sod sections. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil after compaction shall be set approximately 1 inch below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaces around the manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

On slopes steeper than 1 vertical to 2 1/2 horizontal and in v-shaped or flat-bottom ditches or gutters, the sod shall be pegged with wooden pegs not less than 12 inches in length and have a cross-sectional area of not less than 3/4 square inch. The pegs shall be driven flush with the surface of the sod.

Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. In all cases, watering shall be done in a manner that will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

**G. Permanent Erosion Control:**

1. All disturbed areas shall be dressed to typical sections and plowed to a depth of 5 inches. The top 2 inches shall be pulverized to provide a uniform seedbed. NOTE: Lime should be applied before plowing operations.
2. Lime, seed, and fertilizer shall be applied with necessary equipment to give uniform distribution of these materials.
3. Seeding area shall be cultipacked to firm seedbed and cover seed.
4. Grain straw shall be applied over seeded areas as a mulch base. Ground shall not be visible when riding by a mulched area if proper application is achieved. Thick clumps of straw are not permissible if a uniform coverage is expected.
5. Mulched area shall be tacked with asphalt when required to hold straw in place.

6. Ditch treatment shall be used in areas where steep grades could cause ditch erosion. Use of jute matting or excelsior matting is acceptable. Ditch treatment should be installed before mulching operation.
7. The use of temporary erosion control measures shall be included to prevent siltation of waterways and adjacent property. The use of silt basins, brush barriers, and temporary seeding, and mulching, as needed is recommended.

**H. Sedimentation and Erosion Control:** The Contractor is instructed to control sedimentation runoff during the course of construction of the project. The Contractor is reminded that all work shall meet all applicable requirements of the rules and regulations of erosion and sediment control as published by the Department of Environmental Quality and, North Carolina Sedimentation Control Commission including the “Erosion and Sediment Control Planning and Design Manual”. The payment for construction of all erosion control measures as shown on the plans shall not be paid directly but shall be included in the cost per linear foot for the installation of pipe as noted in the Schedule of Bid Items. The construction sequence for sedimentation and erosion control is as follows:

1. Begin pipe laying activity.
2. Disturbed areas shall be seeded and mulched as per the specifications within 15 working days of pipe installation on all portions of the project. Approval of final grade for disturbed areas must be received from the County Engineer prior to seeding and mulching.
3. Install erosion control device(s) as detailed in project plans and necessary to control erosion.
4. When construction is complete and all areas are stabilized, call for inspection by the County Engineer.
5. When the site is approved, remove temporary erosion control measures and perform permanent erosion control as specified herein, including seeding and mulching of disturbed areas.
6. Contractor is responsible for erosion and sedimentation control until vegetation is established

**I. Mowing:** No mowing will be required, unless directed by the Engineer.

## **15.0 FENCES AND GATES**

The Contractor shall not cut temporary openings or take down fences until he has contacted the property owner, tenant or occupant and arranged the ingress and egress to the right-of-way. All fences and gates removed for construction shall be replaced in like



kind by the Contractor. Payment for fence and gate removal and replacement shall be by the Contractor.

In each case where the fence is opened, braced posts shall be installed capable of holding the tension in the fence wires so that the adjacent fence spans will not become slack. Where temporary openings are immediately adjacent to the corner post, the fence shall be firmly attached to the brace post, and the fence wire shall be removed or cut at the corner post. At other locations the fence openings shall be made by cutting the wires near one of the brace fence posts. In both the above cases, a gate shall be installed by the Contractor.

The Contractor shall be held responsible for damages to crops, livestock, or other property caused by his failure to keep fences, gates, and gaps in proper condition. Damage claims resulting from the Contractor's negligence with respect to construction and maintenance and use of these gates, fences and gaps shall be the Contractor's full responsibility. The continuity of electric fences shall be maintained at all times.

## **16.0 CLEANUP**

All pipe work areas and other work areas shall be cleaned up, restored and left in satisfactory condition.

### **A. Roadway Cleanup:**

Cleanup of work along highways or roads shall be made immediately upon completion of the backfill operation. Ditching and pipe installation shall be stopped at any time that cleanup work lags and shall not be resumed until cleanup progress is satisfactory to the Engineer. Final cleanup and condition of the work area shall be subject to the approval of the N.C. Department of Transportation, and the County Engineer.

### **B. Cross-Country Cleanup:**

Cleanup of work for cross-country locations shall follow immediately upon the completion of any major part of the work or upon instructions of the County Engineer. Topsoil shall be replaced on all areas disturbed by the pipe work throughout the length of the pipe, and to the full satisfaction of the property owner. Topsoil may be removed from the line of work and stockpiled for future use. It shall be carefully removed, stockpiled, protected, spread, dressed up, and the entire right-of-way left in a condition acceptable to the County Engineer and property owner. If topsoil is not stockpiled and protected, suitable, approved material from other sources shall be provided. Where the pipe is located on pasture land, grassed areas, or roadway shoulders, grass shall be replaced