

WATER LINES: DETAILED SPECIFICATIONS FOR INSTALLATION

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1. General Provisions. The following Specifications cover work which is to be furnished and installed under the document containing water mains. Water main materials shall be certified to meet the NSF/ANSI 61.
2. Scope of Work. The work to be performed under this Contract includes the Water Mains shown on the Drawings complete with all appurtenant items, as shown on the accompanying Plans and as Described in these Specifications.
3. Clearing of Rights-of-Way. Where clearing and grubbing is required, the area to be cleared shall be grubbed of all stumps and shall be left free of all stumps, brush, roots and rubbish resulting from the clearing operation.
4. Excavation for Pipelines. All excavation shall be of one classification regardless of the material encountered, unless a rock clause is included in the supplemental conditions. All trenches shall be excavated in open cut from the surface, except as otherwise provided for herein, and in close conformity to the lines given by the engineer. The contractor shall be responsible for staking water line alignment in streets where curb and gutter will be installed to insure proper alignment and depth.

In order that there be sufficient room for properly laying and jointing the pipe, trench widths shall be a minimum of 24" plus the outside pipe diameter. In order to safeguard the pipe, however, the maximum trench width shall not exceed 36" plus the outside pipe diameter unless approval to the contrary is given by the Engineer. Trench widths will be measured between faces of the cut at the top of the pipe.

Where no special bedding is required, trench bottoms may be machine excavated to slightly above grade and cut down to pipe grade by hand in the fine-grading operation. Should the trench bottom be inadvertently cut below grade, it shall be filled to grade with #67 stone tamped.

Length of trench open ahead of pipe laying shall be no more than 300 feet, and no less than 20 feet unless approval is obtained from the Engineer. Contractor shall open no more trench than can be covered by end of working day.

Wet trenches or those of unstable subgrade shall be stabilized by the use of No. 67 stone.

The Contractor shall keep all trenches free from water during excavation for pipelines. The water shall be pumped out of the ditch or dams built to keep it out of the ditch in such a manner as not to cause injury to the public health, private property, or the work in progress.

Portable bridges shall be erected across trenches, wherever the Engineer deems them necessary to permit the passage of vehicular and/or pedestrian traffic.

The Local Fire Department and 911 shall be notified at least 24 hours before any street is blocked by the opening of a trench. The fire department and 911 shall also be notified when the street is once again open to traffic.

Sheeting or bracing shall be used wherever necessary to prevent caving of the trench banks. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the trench walls and the backfill. Sheeting shall be cut off and left in place where its removal will adversely affect the pipeline installation.

5. Rock Excavation in Trenches. Should rock be encountered in the trenches, the excavation shall be carried to a depth of 6" below the body of the pipe and the trench shall be brought back to grade with No. 67 stone properly compacted.

Should rock be encountered in the trenches and blasting is required for its removal, then all blasting operations shall be conducted in strict accordance with existing ordinances and accepted safe practices relative to the storage and use of explosives.

No rock excavated from trenches larger than 3" in diameter shall be used to backfill such trenches and no rock is allowed in the first 24" above the top of pipe. The Items named for the various sizes and classification of pipe to be installed shall include the removal and disposal of such excavated rock material. The Contractor shall secure, haul, and place in the trench sufficient suitable backfill material. Suitable backfill material is defined as stabilization stone, sand, or native material free from rocks and of optimum moisture content in order to compact to 95% of standard proctor. The use of native material shall be subject to the sole approval by the Engineer or his representative.

6. Pavement Cutting and Removal. Wherever it becomes necessary to cut pavement, the cuts shall be confined to a maximum width of the nominal pipe diameter plus 24". No pavement shall be cut wider than these Specifications without authorization from the Engineer. All pavement to be removed shall be marked for cutting by chalk line or other acceptable method. After marking, bituminous pavement shall be sawed to its full depth to a neat and true line along the mark. Concrete pavement shall be sawed to a minimum depth necessary for a smooth cut when broken out. All pavement cut shall be removed from the site of the work and shall not be used to backfill trenches.

7. Backfilling Trenches. Trenches shall be filled in layers six inches (6") deep and thoroughly compacted with mechanical compactors to attain 95% standard proctor. Dry material used in refilling shall be sufficiently moistened so that after compacting future settlement will be at a minimum. Flooring will not be permitted and excess water from any cause shall be removed from the ditch. Material left over from the trench shall be hauled away and no extra compensation will be allowed for such disposal. If native soils from the trench are unsuitable to attain a stable, unyielding trench; the contractor shall provide suitable backfill material as defined in paragraph 6. Compaction testing of the backfill shall be provided by a certified testing firm and paid by the contractor. See additional requirements as indicated under Section 10 and 27 of the Street and Site Improvements specifications.

The top twelve inches (12") of all trenches where pavement has been cut, and where directed by the City, shall be backfilled with crushed stone placed in layers six inches (6") deep and thoroughly compacted. This stone shall be Aggregate Base Course stone

meeting the requirements of the N. C. State Highway Commission's "Standard Specifications for Roads and Structures", January 1, 2018 (as amended). It shall be the Contractor's responsibility to maintain all pavement cuts until paved or accepted by the Owner.

Wherever pipelines are laid in the shoulders of paved roads, backfilling shall be accomplished in the same manner as hereinbefore described for trenches in paved roads or streets except that the trench shall be filled to its full depth with earth.

Rock excavated shall not be used to backfill such trenches.

8. Pipe Laying - General Provisions. The Contractor shall be responsible for all material which may become a part of the finished work until it is finally in place, tested and accepted by the City, except as otherwise provided for herein, and shall remove from the lines any cracked or defective pipe or fittings and shall replace them with new pipe or fittings without extra compensation. Great care must be exercised by the Contractor in handling lined pipe so as not to injure the linings. A damaged lining in a piece of pipe or a fitting will be deemed sufficient reason for its rejection by the City.

Should any pipe be cracked or defective, the City may allow the Contractor to cut off the cracked or defective portion and lay the remainder of the pipe if, in the City and the Contractor's opinion, the cutting off of the cracked or defective end will not injure the balance of the pipe. Permitting such cutting off of cracked or defective ends, however, will not absolve the Contractor from any of his responsibility toward the work. Cutting pipe will only be allowed at ends or with special permission of City staff.

All pipe shall be thoroughly cleaned of earth and rubbish before being placed in the trench, and so kept until final completion and acceptance of the work. Every open end of the pipe shall be securely plugged when pipe laying is not in progress.

All pipe shall be laid on lines and grades as directed by the Engineer and as shown on the Drawings. All pipe shall be placed on a firm foundation so as to prevent subsequent settlement, and the trenches shall be carefully excavated to the proper grade, except where rock excavation is encountered, so that it will be unnecessary to fill in under the pipe. Bell holes shall be provided for all pipe laying modes and special care shall be exercised in obtaining full barrel support.

9. Pipelines Crossing Gravel Drives. Wherever a water line crosses a gravel drive, it shall be backfilled as hereinbefore described in backfilling trenches for crossing paved roads, except the top six inches (6") shall be filled with thoroughly compacted aggregate base course (ABC).

10. Pipe Laying - Ductile Iron Water Main. The installation of ductile iron pipe for water main shall be performed in accordance with the appropriate sections and subsections of AWWA C600. Minimum cover for water mains 8" diameter and smaller shall be 3 feet. Minimum cover for water mains 10" and larger shall be 4 feet. Pipe shall be installed as shown on the Plans and as directed by the Engineer.

Handling of pipe and accessories shall at all times be done in such a manner as to prevent damage to lining of body. All pipe, fittings, valves and hydrants shall be lowered into the trench by approved methods. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

Pipe shall be swabbed clean before it is laid and any pipe which cannot be cleaned with a swab shall be removed and cleaned with suitable apparatus. Any pipe showing evidence of oil, tar or grease shall be permanently marked and removed from the job and shall not be returned until it has been cleaned to the satisfaction of the Engineer.

Laying of pipe shall be done in accordance with section 7 of AWWA C600, with care being taken to provide uniform bearing for the pipe. The laying of pipe on wood or other blocking will not be permitted. Bell ends shall face direction of laying unless otherwise directed by the Engineer. For lines on an appreciable slope, the Engineer may require that bell ends face upgrade. Bell and spigot of pipe shall be thoroughly cleaned and properly lubricated where a mechanical joint or a "push on" type of joint is employed.

Open ends of pipe shall be plugged with a standard plug or cap at all times when pipe laying is not in progress. Trench water shall not be permitted to enter the pipe.

Pipe cutting, where required, shall be done in a neat and workmanlike manner without damage to the pipe. Pipe cutting shall be done only with equipment especially designed and fabricated for that purpose. The use of chisels and cleavers will not be permitted.

Water mains shall be installed at the locations shown on the Plans or as directed by the Engineer. Separation distances to be field verified prior to backfill.

11. Setting Valves and Valve Boxes. Gate valves shall be set at locations shown on the Plans or as directed by the Engineer. The installation shall be made in accordance with Section 10 of AWWA C600. Each valve shall be equipped with a valve box accurately positioned over the wrench nut. Each valve box shall have a 6" thick x 24" diameter - Class A Concrete collar.

12. Setting Fire Hydrants. Fire Hydrants shall be set at locations shown on the Plans or as directed by the Engineer. In general, hydrants shall be located in a manner to provide complete accessibility and to minimize possibility of damage from vehicles or injury to pedestrians. The installation shall be made in accordance with Section 11 and 12 of AWWA C600 except as amended herein.

Drainage for hydrants shall be in accordance with subsections 11.4 and 11.5 of AWWA C600.

Each hydrant shall be set plumb and shall be restrained from the hydrant tee through the gate valve to the hydrant using mega-lug mechanical joint restraints. All valves installed on hydrant legs shall be securely anchored to the main line tee with mega-lugs.

Before a hydrant is set, it shall be carefully examined, and all dirt and other foreign matter shall be removed from it.

Fire Hydrants shall be on water mains less than 12" in size, main valve opening shall be 4-1/2" with 3-6" bury. For water mains 12" and greater in size fire hydrants shall have main valve opening of 5-1/4" with 4'-6" bury.

Fire hydrants shall be repainted after installation - using paint furnished by hydrant supplier, to the City Standard colors.

13. Setting Ductile Iron Fittings. Ductile iron fittings shall be set at locations shown in the Plans or as directed by the Engineer. The installation of fittings shall be made in accordance with Section 10 of AWWA C600. Special care shall be taken to properly bell-up the joints and to support the body of the fitting. All fittings shall be restrained using mega-lug mechanical joint restraints.

14. Joint Restraint. All cast iron or ductile iron fittings, hydrants, valves, fittings, and other water main components subject to hydrostatic thrust shall be securely restrained by use of mega-lug mechanical joint restraints and appropriately sized concrete reaction blocking. Reaction blocking shall be 3,000 PSI ready mixed concrete. Sakrete type concrete is not allowed. Refer to detail W-26 for restraint distances. All hardware to be stainless steel.

15. Blowoffs. All dead-end water mains, not provided with hydrants reasonably close to such dead ends, shall be equipped with blowoff facilities as provided for in Section 10 of AWWA C-600. Blowoffs shall be installed per details.

16. Testing Water Mains. All utilities (Water, Sanitary Sewer & Storm Sewer) need to be installed, in their entirety, prior to testing. All water mains (including services), before final acceptance shall be tested by filling the main with water, care being taken to expel all air. As a part of this operation, the main to be tested shall be flushed by opening the terminal valve hydrant or blowoff. A temporary tail ditch shall be provided to carry the flushing water to the nearest drain ditch. A pressure of 150 psi shall be applied to the main at the test pump and shall be maintained at that pressure for a minimum period of 2 consecutive hours. All defective material found shall be replaced by the Contractor. All leaking joints shall be made tight. The pipe installation will not be accepted unless and until the leakage, evaluated on the pressure test of 150 psi for a minimum of 2 hours, does not exceed 10.0 gallons per day per mile of pipe per inch of nominal diameter. Test pump drawings shall be approved by Engineer.

In general, the pressure test and the leakage test shall be performed in the manner set forth in Section 13 of AWWA Standard C600, except that the Contractor shall furnish his own pressure gauges. The pressure test and the leakage test shall be performed by the Contractor and witnessed by the City Engineer.

17. Chlorination of Water Mains. All additions to the water system shall be disinfected by chlorination in accordance with ANSI/AWWA C651. After disinfection the water supply shall not be placed into service until bacteriological test results of representative water samples are found to be satisfactory.

Such chlorination must be made under the observation of the Engineer. Chlorination of water mains and Dechlorination of water mains shall be carried out in the following manner:

a. Taps shall be made at the control valve at the upstream end of the line and at all extremities of the line. These taps shall be located in such a manner as to allow HTH solution to be fed into all parts of the main.

b. A solution of water containing high test hypochlorite (70% available chlorine) shall be introduced into the main by regulated pumping at the control valve tap. The solution shall be of such concentration that the water in the main will have at least 50 ppm total chlorine residual immediately after chlorination. The following chart shows the required quantity of 70% HTH compound to be contained in solution in each 1,000-foot section of pipe to produce the desired concentration of 50 ppm:

<u>Pipe Size</u>	<u>Pounds 70% HTH Per 1,000 Ft. of Pipe</u>
6"	0.88
8"	1.56
10"	2.42
12"	3.50

c. The HTH solution shall be circulated in the pipelines by opening the control valve and systematically manipulating hydrants and taps at the main extremities until a uniform concentration has been produced throughout the pipe.

d. The HTH solution shall remain in the main for not less than 24 hours. At the end of this time, the residual chlorine shall be at least 10 ppm. Should the chlorine residual be found to be less than 10 ppm, then the pipelines shall be rechlorinated.

e. Following satisfactory chlorination, the pipelines shall be flushed. Flushing shall continue until only a normal chlorine residual, as determined by the ortho-tolidine test, is present in the water.

f. The Contractor shall be responsible to dechlorinate or dechlorinate any water before it is released to the ground. The Contractor shall use an apparatus that injects or mixes EPA approved chemicals containing one of the following chemicals (ascorbic acid, sodium sulfite or sodium thiosulfate) with the discharged water to neutralize the chloramine or chlorine before it is released to the ground. Approved chemicals for use are: (Vita-D-Chlor Tablets, D-Chlor Tablets, No-Chlor Dechlorination Grade Calcium Thiosulfate Solution, or pre-approved equivalent). Approved dechlorination units are: (Pollard Water LPD250 Diffuser with tablet screen, Dechlorination System and Combo Kit, the H2O Neutralizer manufactured by Measurement Technologies, Inc., or pre-approved equivalent), or as directed by the Engineer. Total chlorine residual levels shall be reduced and maintained between a minimum of 1.0 parts per million (1.0mg/l) to a maximum of 4.0 parts per million (4.0mg/l). The Contractor shall test the discharge at 15 minute intervals to insure that acceptable levels of neutralization are maintained. Discharge shall be stopped if chlorine levels exceed 4.0 parts per million (4.0mg/l). The

Contractor under the supervision of the Engineer shall perform the dechloramination and/or dechlorination.

All procedures shall be in accordance with manufacturers recommendations and as approved by the Engineer.

Only in cases where this method is not practical for unique reasons will the City consider allowing the water to be released into the collections system. In those cases, the Contractor will need to make a request at least 48 hours in advance in order for the City to determine the acceptability of the downstream collection facilities.

g. Following the disinfection and flushing of the pipelines and after payment has been made at City Hall for sample fees, samples shall be taken at various points along the line designated by City for bacteriological analyses. City staff will collect samples for bacteriological testing at the State-approved Graham-Mebane Water Treatment Plant. If test results are satisfactory, the pipelines may be certified and then placed into service. If test results are not satisfactory, re-chlorination shall be undertaken at once.

All chlorination of the water system shall be witnessed by the City and performed by the Contractor at no cost to the Owner.

Coordinate all testing and sampling with the City. All water samples must be taken prior to 12 PM (noon) on Wednesday.

18. Connections to Existing Water Mains. Connections to existing water mains shall be made as detailed on the plans, using material hereinbefore specified or as shown on the Drawings. All water connections must be made while under pressure. No connection to existing water main without approval of the City shall be made.

19. Pipelines Under State Highway Pavement. Where shown on the Plans, or as directed by the Engineer, ductile iron water mains shall be installed under State Highway pavement by encasing in a larger pipe. The carrier pipe shall be of restrained joint ductile iron and the encasement pipe shall be steel.

The encasement pipe shall be installed true to line and grade and in conformance with the requirements of the N.C. State Highway Commission. The size of the encasement and carrier pipes will be as shown on the Drawings.

Following the installation of the carrier pipe, the ends of the encasement pipe shall be suitably protected against the entrance of foreign material but shall not be tightly sealed. In general, this may be accomplished by the use of the same stone specified for trench stabilization. The ductile iron carrier pipe shall extend approximately 5.0 feet beyond each end of the encasement pipe.

Pipelines installed under this section shall not be undertaken without the express approval of the appropriate N.C. State Highway Commission's Division Engineer.

20. Pavement Replacement. All pavement cut and removed from publicly maintained roads, streets, or highways as authorized by the Engineer, shall be replaced by the Contractor. Pavement cuts shall be maintained by the Contractor until such time as the pavement has been replaced, but such replacement shall be done as promptly as weather permits. Pavement shall be replaced within 48 hours of being cut. No pavement cuts are allowed on Friday.

21. Existing Pipes, Conduits, and Cables - Care of. Special care must be exercised by the Contractor, in the installation of the lines and improvements, in passing under or over existing storm sewers, sanitary sewers, water lines, gas lines, and telephone or power conduits or cables. All aforementioned lines, cables, conduits, or structures broken or ruptured by the Contractor must be immediately repaired or replaced by him.

22. Responsibility for Damages. The Contractor shall be held responsible for all damages claimed, as a result of the installation of this project, to all utility poles, driveways, yards, shrubbery and plantings, drain ditches, and pipes, pavement, sidewalks, water lines, gas lines, telephone or power conduits or cables, buildings, fences, etc., and will be required to make satisfactory adjustment of all claims arising from the installation of the work contemplated.

23. Signs and Barricades. The Contractor shall provide, erect, maintain, and illuminate, where necessary, all barricades, warning signs and local detour signs required. The contractor shall be held responsible for all damages to the project due to the failure of the signs and barricades to properly protect the work from traffic, pedestrians, animals, and from all other sources.

24. Cleanup. Upon installation of the specified improvements, the Contractor shall remove all excess materials, earth, debris, etc., along the line of his work and shall cleanup and leave, in its original or better condition, all affected property. The contractor shall clean up all work to the point of construction activity not less than weekly.

25. Erosion Control.

A. Reference to Other Documents. The General Conditions, Supplementary Conditions, Material Specifications, and Detailed Specifications for Installation contain requirements relevant to the work covered by this Section. Clearing and Grubbing, Site Grading, Clearing of rights of ways, excavating and backfilling, and Spoil Disposal will be subject to the applicable requirements of this Section.

B. General Requirements. Control of erosion and sedimentation resulting from land disturbing activities is subject to the requirements of the North Carolina Sedimentation Control Commission. Any authorized representative or agent of the commission shall be granted entry or access for purposes of inspection; he shall not be obstructed, hampered, or interfered with while he is in the process of carrying out his official duties. The requirements for erosion and sedimentation control apply to areas which are involved in borrow, waste disposal, and topsoil storage activities; and to areas which are directly involved with the construction of buildings, paving, curb, gutter, and to areas where storm

drainage, water, and sewer lines and structures are installed. No Construction shall take place until erosion control permit is in hand and erosion control devices are installed.

Land disturbing activities shall be planned and carried out to achieve the following objectives:

- 1) Expose minimum sized areas at any one time
- 2) Limit exposures of areas to the shortest possible time
- 3) Control surface water run-off to reduce erosion and sediment loss
- 4) Hold off-site erosion and sedimentation damage to a minimum

With reference to requirement No. 2, portions of the site on which land disturbing activities have been undertaken, but upon which no further active construction takes place for a period of 15 working days, shall be planted or otherwise provided with a ground cover sufficient to restrain erosion.

The Contractor shall be responsible for maintaining all temporary and permanent erosion and sedimentation measures and facilities until the project is accepted by the City, or until removal of facilities and cessation of control measures is authorized by the Engineer.

C. Work Included. This Section includes the labor, materials, equipment, and related services required for the installation of berms, drainage structures, storm water drains, straw barriers, vegetative covers, and other devices or methods for control of erosion and sedimentation shown on the Drawings or specified herein.

D. Facilities and Measures for Erosion and Sedimentation Control.

- 1) Phased Construction. The installation of improvements shall be done in phases as specified on the construction drawings.

This phasing of construction will help limit erosion caused during the installation of the improvements and will act as an erosion control measure.

- 2) Clearing and Grubbing. The Contractor is to clear the entire width of the permanent easement of trees, stumps, shrubs, and brush. The natural vegetative cover is to remain intact until the installation of the line begins, except that which has to be removed during the clearing and grubbing operation. Stumps, brush, and rubbish resulting from the clearing operation shall not be disposed of by placing on adjoining privately owned property unless the Contractor has a written instrument from the property owner. All other spoil is expected to be trucked off to the sanitary landfill for disposal.

- 3) Rip Rap. Rip Rap shall be installed at locations as shown on plans or as directed by the Engineer per the NC DENR erosion control manual.

- 4) Berms. Drainage berms and ditches shall be installed as shown on the Drawings per the NC DENR erosion control manual.

5) Silt Fence. Silt fences shall be installed as shown on the Drawings or when directed by the Engineer per the NC DENR erosion control manual.

6) Excelsior Matting. Matting shall be installed at location shown on the Drawings and shall be in compliance with "Standards and Specifications for Soil Erosion and Sediment Control" by the Land Quality Section of NCDENR per the NC DENR erosion control manual.

7) Utility Line Installation. Soil resulting from trench excavation to be used as backfill material shall be placed on the uphill side of the trench. This will prohibit runoff directly into the creek. No excavation shall be placed in the creek or on the bank at any time. Rock encountered during excavation shall be removed from the site and shall not be disposed of by placing on adjoining privately owned property.

8) Permanent Vegetative Cover. Prepare seedbed by ripping, chiseling, harrowing or plowing to depth of six inches so as to produce a loose, friable surface. Remove all stones, boulders, stumps or debris from the surface which would prohibit germination or plant growth per the NC DENR erosion control manual.

Incorporated into the soil 800 to 1,000 pounds of 10-10-10 fertilizer plus 500 pounds of twenty percent (20%) Superphosphate per acre and two tons of dolomitic lime per acre unless soil tests indicate that a lower rate can be used.

Mulch after seeding with 2.0 tons of grain straw per acre and either crimp straw into soil or tack with liquid asphalt at 400 gallons per acre or emulsified asphalt at 300 gallons per acre.

<u>PERMANENT SEEDINGS</u>		
<u>PLANTS & MIXTURE</u>	<u>PLANTING RATE/ACRE</u>	<u>PLANTING DATES</u>
TALL FESCUE (LOW MAINTENANCE)	100-150 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
TALL FESCUE WATERWAYS AND LAWNS (HIGH MAINTENANCE)	200-250 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
BLEND OF TWO TURF-TYPE TALL FESCUES (90%) AND TWO OR MORE IMPROVED KENTUCKY BLUEGRASS VARIETIES (10%) (HIGH MAINTENANCE)	200-250 LBS.	AUG. 15 - OCT. 15 FEB. 15 - MAY 1
TALL FESCUE AND KOBE OR KOREAN LESPEDEZA	100 LBS. & 20-25 LBS.	FEB. 15 - MAY 1 AUG. 15 - OCT. 15
TALL FESCUE AND SERICEA LESPEDEZA	50 LBS. 60 LBS./ACRE	NOV. 1 - FEB. 1 (UNSCARIFIED)

TALL FESCUE AND GERMAN MILLET OR SUNDANGRASS	70 LBS. AND 40 LBS.	JULY AND AUGUST
TALL FESCUE AND RYEGRAIN	70 LBS. AND 25 LBS.	NOV. 1 - JAN. 30
COMMON BERMUDAGRASS	8 LBS. (HULLED) 15-20 LBS. (UNHULLED)	APRIL 15 - JUNE 30 FEB. 1 - MARCH 30

Permanent Seeding Notes:

1. For spring seedlings, use scarified lespedeza seed. For late fall and winter seedings, use unscarified seed.
2. Annuals such as millet, sundangrass and ryegrain must be kept at 10-12" maximum height. The use of annual rye grass is not permitted.

The preceding permanent cover requirements pertain to all areas disturbed during the project construction including road shoulders, temporary access roads, spoil areas, building sites, rights-of-way, easements and line work.

26. Bonds and Permits Required by N.C. State Highway Commission. The Contractor, at his own expense, will secure from the N.C. State Highway Commission, the "Encroachment Agreement" required prior to the installation of that portion of this project that lies within the right-of way of the said Commission. Any or all other bonds and/or permits required by the said Commission in connection with this project shall be provided by the Contractor. This relates especially to the "Permit to Open Pavement" and the performance bond.

27. Guarantee. The Contractor shall guarantee that if any materials, equipment or workmanship covered by these Specifications and the accompanying Drawings proves defective within one year after final acceptance, such defects shall be made good by him. The Engineer shall provide a letter to the City indicating the start of the 12-month guarantee period. Provide State required certifications and "As Builts" with guarantee letter.

28. Testing Notice. Notice to the City, for any testing related to water line work, will be required of the Contractor 48-hours in advance of testing.

29. Damaged Piping. Should any piping be damaged prior to acceptance by the City, the whole joint will be replaced.