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**Project: 2813C**
**County: Buncombe**

## PROJECT SPECIAL PROVISIONS
**Utility Construction**

**Sewer Relocation and Construction along Long Shoals Road**

## I. DESCRIPTION:

The work covered by these provisions consists of constructing a sewer system as required by the plans and special provisions herein or as directed by the Engineer. The Contractor shall furnish any and all materials, labor, equipment, and incidentals necessary to complete the proposed sewer work.

Apply the applicable provisions of the Rules and Regulations of the North Carolina Department of Environment and Natural Resources, Division of Environmental Management to the construction of sanitary sewer lines except as otherwise provided.

## II. GENERAL CONSTRUCTION REQUIREMENTS

**Specifications:**

The proposed sanitary sewer construction shall meet the applicable requirements of the NC Department of Transportation's "Standard Specifications for Roads and Structures" dated January 2002, all applicable permits, and the MSD standard details as shown on the plans, as outlined in the following provisions, or as directed by the Engineer.

**Existing Utilities:**

The Contractor will be required to excavate to determine the precise location of utilities or underground obstructions, which are shown on the Construction Plans. Such location and excavation shall be 150 m ahead of construction.

All utility owners will be notified prior to excavation as required by the 1985 Underground Damage Protection Act. Owners who are members of NC One-Call may be notified in accordance with current procedures. The Contractor will be responsible for damage to any utilities if the owners have not been properly notified as required by Act.

Utility owners may have representatives present to supervise excavation in the vicinity of their utilities.

Conflicts with underground utilities may necessitate changes in alignment and/or grade of this construction. Changes will be approved by the Engineer before construction proceeds. When underground obstructions not shown on the Construction Plans are encountered, the Contractor shall promptly report the conflict to the Engineer and shall not proceed with construction until the conflict is resolved by the Engineer.

## III. EXCAVATION, BACKFILL AND TESTING FOR UTLITY PIPELINE CONSTRUCTION:

**Shoring and Shielding:**

The Contractor shall comply with OSHA trenching and excavation regulations as revised in "Subpart P" of Part 1926 in the Federal Register. Shoring and/or shielding shall be used as specified in "Subpart P" to prevent caving of trench banks and to provide a safe excavation.

**The Contractor will be responsible for excavation safety and shall designate his "competent person" for the determination of proper shielding/shoring systems.**

**Site Grading or General Excavation:**

Sites for pumping stations and access roads shall be graded by mechanical equipment within the areas and to the elevations shown on the plans. Grading operations shall be conducted so that material shall not be removed or loosened beyond the required limits. The finished surfaces shall be left in reasonably smooth and uniform planes such as are normally obtainable from the use of hand tools; but if the Contractor is not able to obtain the required degree of evenness by means of mechanical equipment, he will be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished to conform to the slope lines shown on the plans or as staked by the Engineer.

Topsoil from the surface of the ground to be excavated or occupied by fills, within the general area specified to be planted with grass, shall be "stripped" or removed before site grading or other excavation work is started. Topsoil so removed shall be stockpiled at a suitable location on the site of the work so that it can be reused later for planting grass as specified in these specifications. This "stripping" operation shall remove all leaves, loam, and loose topsoil which are unsuitable for foundations. The depth to which topsoil is removed shall be determined by the Engineer, but will be generally between the limits of 50 to 150 mm.

**Structural Excavation:**

Excavation for structures shall be sufficiently large for the proper placing of forms and concrete and for dewatering purposes, but shall not be excessively large in horizontal area. Banks may be sloped at a safe angle provided that such excavation does not endanger or damage existing or proposed structures, pipelines, etc. The bottom of the excavation shall be true to the required shape and elevations shown on the plans. No earth backfilling will be permitted under structures unless specifically shown on the plans. Should the Contractor excavate below the elevations shown or specified, he shall fill the void made with thoroughly compacted Class I pipe embedment materials or with Class B concrete at his own expense.

When muck, quicksand, soft clay, swampy or other material unsuitable for foundations are encountered which extend beyond the limits of the excavation, such materials shall be removed and replaced with thoroughly compacted foundation conditioning material, class VI, acceptable to the Engineer.

In all cases where materials are deposited along open excavation, they shall be placed so that in the event of rain, no damage will result to the work or adjacent property.

**Trench Excavation:**

Trench excavation or excavation for pipelines shall consist of excavation necessary for the construction of sewers, conduits and other pipelines and all appurtenant facilities thereof, including manholes, inlets, outlets, pipe embedment materials, and pipe protection as called for on the plans. It shall include site preparation, backfilling and tamping of pipe trenches and around structures and the disposal of waste materials, all of which shall conform to the applicable provisions of these specifications.

Trench excavation shall be made in open cut and true to the lines and grades shown on the plans or established by the Engineer, unless tunneling or boring is shown or specified. When practical the banks of the trenches shall be cut in vertical, parallel planes equidistant from the pipe center line. The horizontal distance between such planes, or the overall width of trench, shall vary with the size of the pipe to be installed. The overall width of trench shall be of the dimensions shown on the plans. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped provided that such excavation does not damage adjacent structures. When trench banks are sloped, such banks shall be cut to vertical planes as specified above for that part of the ditch below the level of 305 mm above the top of the pipeline. The bottom of the trench shall be level in cross section and shall be cut true to the required grade of the pipe except where concrete cradles or pipe embedment materials are shown on the plans, specified or authorized by the Engineer, in which case the excavation shall extend to the bottom of the cradle or pipe embedment materials.

Bell holes for bell and spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of joints in the pipe.

Excavation for manholes and other pipeline structures shall be as specified for structural excavation.

When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or subgrade are encountered which extend beyond the limits of the excavation, such material shall be removed and replaced with foundation conditioning material, class VI, as specified elsewhere in these specifications.

All work shall be performed so as to cause the least possible inconvenience to the public. Temporary bridges or crosswalks shall be constructed where necessary to maintain vehicular or pedestrian traffic. Crosswalks and bridges shall have handrails or other features necessary for safe use by the public.

In all cases where materials are deposited along open trenches, they shall be placed so that in the event of rain, no damage will result to the work or adjacent property.

**Pipe Laying:**

Before sewer pipe is placed in position in the trench the bottom and sides of the trench shall be carefully prepared and the necessary bracing and sheeting installed. Each pipe shall be accurately placed to the exact line and grade called for on the plans.

Each piece of pipe and special fitting shall be carefully inspected before it is placed and no defective pipe shall be laid in the trench. Pipe laying shall proceed upgrade, starting at the lower

end of the grade and with the bells upgrade. Pipe shall be straight when placed in the trench. Curved pipe shall not be laid. Trench bottoms found to be at incorrect grade after pipe laying operations have begun shall be corrected and brought to exact line and grade. Any fill required to bring the trench bottom to grade, shall be pipe foundation material or pipe embedment material as specified herein, as applicable.

Bell holes shall be of sufficient size to allow ample room for properly making the pipe joints. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length.

Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets or inequalities in the flow lines. The inside of all bells and the outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter. Joint lubricants shall be compatible with the pipe and gasket materials and shall be as recommended by the pipe manufacturer.

All jointing of pipe and fittings shall be in accordance with the pipe manufacturers recommendations.

Any leaks or defects discovered at any time after completion of the work shall be repaired immediately. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed. Any pipe which has been disturbed shall be taken up, the joint cleaned and remade and the pipe re-laid at Contractor's expense.

Water shall not be allowed to run or stand in the trench while pipe laying is in progress or before the joints are completed or before the trench has been backfilled. The Contractor shall not open up at any time more trench than his available pumping facilities are able to dewater.

As the work progresses the interior of all pipe in place shall be thoroughly cleaned. After each line of pipe has been laid it shall be carefully inspected and all dirt, trash, rags, and other foreign matter removed from the interior. When pipe laying is not in progress (for any period exceeding 4 hours), the contractor shall place a watertight plug in the last section of pipe which has been laid. The Contractor shall install temporary watertight plugs in the proposed sewer line at any manhole that is incomplete, at the open end of the pipeline prior to leaving the job site daily and elsewhere as dictated by good engineering and construction practices. All installed pipe shall be backfilled or otherwise securely tied down to prevent flotation in the event water enters or rises in the trench. The plugs as installed shall prevent infiltration or the introduction of any foreign material into either the existing or proposed systems. Upon completion of all construction, the Contractor will be responsible for the complete removal of all watertight plugs.

Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed.

**Deflection Tests:**

After backfilling trenches all sewer pipes shall be lamped and visually inspected for pipe alignment. Each run of pipe must present a full circle when viewed from one of the connected manholes. Any run of pipe which does not present a full circle will be removed and reinstalled.

After backfilling trenches all PVC sewer pipe shall be tested for initial diametric deflections by the use of a Go-No-Go type mandrel which is acceptable to the Engineer. The initial diametric

deflection shall not exceed five percent (5%) of the base inside diameter as defined in ASTM D-3034. Deflection test will be performed after trench is no longer subject to construction traffic loading and a minimum of thirty (30) days after completion trench backfill.

| Nominal Pipe Size | Pipe I.D. (SDR 35) | Required Mandrel O.D. |
|---|---|---|
| 200mm | 194.691mm | 184.912mm |
| 250mm | 242.900mm | 230.632mm |
| 300mm | 288.569mm | 274.066mm |
| 375mm | 353.009mm | 335.280mm |

The mandrel shall be pulled through each section of pipe from manhole to manhole. The mandrel must slide freely through the pipe with only a nominal hand force applied. No mechanical device shall be used in pulling the mandrel. Any pipe which refuses the mandrel shall be removed and replaced. Such sections shall be re-tested for deflection after completion of backfill.

Mandrel testing may be performed by MSD at any time prior to the expiration of the contract warranty period. Any pipe which refuses the mandrel shall be replaced by the contractor as described above.

**Leakage and Infiltration:**

All pipe and manhole joints shall be as near watertight as it is practicable to construct them with the material and methods specified herein. Any leaks into the sewer shall be repaired or corrected as authorized by the Engineer regardless of infiltration test results. **MSD reserves the right to TV any section of the sewer system to locate point sources of infiltration, either in the pipe or inside manholes.** When directed by the Engineer, any desired section shall be isolated and tested separately.

No sooner than 10 days following completion of backfill, the Contractor along with the Engineer, will be required to determine the level of the ground water table. If the ground water table is above the top of the pipe, the sewer line shall be tested for infiltration. If ground water table is less than 0.6 m above the top of the pipe, the sewer line shall be low pressure air tested. Each test shall be as performed as follows:

1. **Infiltration:**

   (a) The infiltration into each section of the sewer shall be measured in wet weather by the temporary installation of suitable metal or wooden weirs as authorized by the Engineer. These weirs shall be furnished, installed and removed by the Contractor. Infiltration tests limits shall be applied to single reaches of pipe, up to one mile in length, of the same diameter. For pipes 200 to 375mm in diameter, infiltration into the sewer system (including manholes) shall not exceed 190 liters per 1.609 kilometers of sewer per 25mm of inside diameter of the sewer per 24 hours, and in no case shall it exceed 11356 liters per 1.609 kilometers per 24 hours. For all pipe sizes larger than 375mm in diameter, infiltration into the sewer system (including manholes) shall not exceed 190 liters per 1.609 kilometers of sewer per 25mm of inside diameter of the sewer per 24 hours, and in no case shall it exceed 11356 liters per 1.609

kilometers per 24 hours.

2. **Air Testing of Gravity Sewers**:

The Contractor shall conduct low pressure air tests on all completed sections of gravity sewer. Air tests for PVC, DIP, and VCP lines will be performed in accordance with ASTM C828. Air tests for Concrete pipe 600mm in diameter and smaller shall be performed in accordance with ASTM C924. Air test results will be used to evaluate materials and construction methods on the sewer line sections, and successful air tests shall be mandatory for the acceptance of the sewers 600mm in diameter and smaller.

Air test will not be required on pipe with diameters exceeding 600mm. Acceptance of pipes exceeding 600mm will be based on infiltration tests and/or visual inspection of the joints.

The Contractor shall furnish an air compressor of the necessary capacity along with all necessary plugs, valves, pressure gages, air hoses, connections, and other equipment necessary to conduct the air tests. Plugs in sewers 450mm in size and larger shall be connected by steel cable for thrust reaction.

Compressor capacity shall be sufficient to pressurize the sewer main to 27.6 KPa within a time equal to or less than the required test time.

The sewer section shall be plugged at both ends and air pressure shall be applied until the pressure inside the pipe reaches 27.6KPa. When a stable condition has been reached, the pressure shall be bled back to 24.1 Kpa. At 24.1 KPa, the time and pressure shall be observed and recorded.

If the time for the air pressure to decrease from 24.1 KPa to 17.2 KPa is equal to or greater than that shown in the following table, the pipe shall be presumed to be free from defect. When these times are not attained, pipe breakage, joint leakage, or leaking plugs are indicated and the cause must be determined and corrected. After repairs have been made, the sewer sections shall be retested. This process shall be repeated until all sewer sections pass the air test.

## Minimum Test Times for Pipe

| Pipe-Size (mm) → | 100 | 150 | 200 | 250 | 300 | 375 | 450 | 525 | 600 |
|---|---|---|---|---|---|---|---|---|---|
| **7.6** | 0:04 | 0:10 | 0:17 | 0:22 | 0:26 | 0:31 | 0:36 | 0:44 | 0:53 |
| **15.2** | 0:09 | 0:20 | 0:35 | 0:44 | 0:53 | 1:02 | 1:12 | 1:29 | 1:47 |
| ↑ **22.9** | 0:13 | 0:30 | 0:53 | 1:06 | 1:20 | 1:34 | 1:48 | 2:14 | 2:40 |
| **30.5** | 0:17 | 0:40 | 1:11 | 1:29 | 1:47 | 2:05 | 2:24 | 2:58 | 3:33 |
| **L** | | | | | | | | | |
| **E** **38.1** | 0:22 | 0:50 | 1:29 | 1:51 | 2:13 | 2:36 | 3:00 | 3:43 | 4:27 |
| **N** **45.7** | 0:26 | 1:00 | 1:47 | 2:13 | 2:40 | 3:07 | 3:36 | 4:27 | 5:20 |
| **G** **53.3** | 0:31 | 1:10 | 2:04 | 2:35 | 3:07 | 3:39 | 4:12 | 5:12 | 6:14 |
| **T** **61.0** | 0:35 | 1:20 | 2:22 | 2:58 | 3:33 | 4:10 | 4:48 | 5:57 | 7:07 |
| **H** | | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **68.6** | 0:40 | 1:30 | 2:40 | 3:20 | 4:00 | 4:41 | 5:24 | 6:41 | 8:00 |
| **O** | **76.2** | 0:44 | 1:40 | 2:58 | 3:42 | 4:27 | 5:13 | 6:00 | 7:26 | 8:54 |
| **F** | **83.8** | 0:49 | 1:50 | 3:16 | 4:05 | 4:53 | 5:44 | 6:36 | 8:10 | 9:47 |
| | **91.4** | 0:53 | 2:00 | 3:33 | 4:27 | 5:20 | 6:15 | 7:12 | 8:55 | 10:41 |
| **P** | | | | | | | | | | |
| **I** | **99.1** | 0:58 | 2:10 | 3:51 | 4:49 | 5:47 | 6:47 | 7:48 | 9:40 | 11:34 |
| **P** | **106.7** | 1:02 | 2:20 | 4:09 | 4:11 | 6:14 | 7:18 | 8:25 | 10:24 | 12:28 |
| **E** | **114.3** | 1:06 | 2:30 | 4:27 | 5:34 | 6:40 | 7:49 | 9:01 | 11:09 | 13:21 |
| | **121.9** | 1:11 | 2:40 | 4:45 | 5:56 | 7:07 | 8:21 | 9:37 | 11:54 | 14:14 |
| **T** | | | | | | | | | | |
| **E** | **129.5** | 1:15 | 2:50 | 5:02 | 6:18 | 7:34 | 8:52 | 10:13 | 12:38 | 15:08 |
| **S** | **137.2** | 1:20 | 3:00 | 5:20 | 6:40 | 8:00 | 9:23 | 10:49 | 13:23 | 16:01 |
| **T** | **144.8** | 1:24 | 3:10 | 5:38 | 7:03 | 8:27 | 9:54 | 11:25 | 14:07 | 16:55 |
| **E** | **152.4** | 1:29 | 3:20 | 5:56 | 7:25 | 8:54 | 10:26 | 12:01 | 14:52 | 17:48 |
| **D** | | | | | | | | | | |
| **(M)** | **160.0** | 1:33 | 3:30 | 6:14 | 7:47 | 9:21 | 10:57 | 12:37 | 15:37 | 18:42 |
| **↓** | **167.6** | 1:38 | 3:40 | 6:31 | 8:09 | 9:47 | 11:28 | 13:13 | 16:21 | 19:35 |
| | **175.3** | 1:42 | 3:50 | 6:49 | 8:32 | 10:14 | 11:60 | 13:49 | 17:06 | 20:28 |
| | **182.9** | 1:47 | 4:00 | 7:07 | 8:54 | 10:41 | 12:31 | 14:25 | 17:51 | 21:22 |

For testing a sewer system with one or more installed service lateral pipes, an effective pipe length shall be added to the total sewer main pipe length. The equation used to calculate Effective Pipe Length is as follows:

$$L_e = \frac{d^2 \times l}{D^2}$$

Where: Le = Effective Pipe Length (added to Total Test Length)
d = Diameter of Service Lateral Pipe (millimeters)
l = Length of Sewer Lateral (meters)
D = Diameter of Sewer Main Pipe being tested (millimeters)

**Vacuum Testing of Manholes:**

Vacuum testing of manholes shall be required on no less than ten percent of the manholes installed. In addition, no less than five (5) manholes will be tested. The Engineer and MSD will select which manholes shall be tested after construction. Vacuum Testing each manhole prior to backfilling is recommended as most repairs must be made on the manhole exterior. Vacuum testing is not required on manholes with pipe connections in excess of 750mm diameter.

Vacuum test the assembled manhole after completing pipe connections and sealing. The vacuum test shall be as follows:

(1) Plug pipes with suitably sized and rated pneumatic or mechanical pipeline plugs. Place plugs a minimum of 150mm beyond the manhole wall and brace to prevent displacement of the plugs or pipes during testing.

(2) Position the vacuum tester head assembly to seal against the interior surface of the top of the cone section and inflate according to the manufacturer's recommendations.

(3) Draw a vacuum of 254 mm of mercury, close the valve on the vacuum line and shut off the vacuum pump.

(4) Measure the time for the vacuum to drop to 229 mm of mercury. The manhole shall pass when the time to drop to 229 mm of mercury meets or exceeds the following:

| Manhole I.D. (mm) | 1200 | 1500 | 1800 | 2100 | 2400 | 3000 |
|---|---|---|---|---|---|---|
| Time (seconds) | 60 | 75 | 90 | 105 | 120 | 150 |

(5) If the manhole fails the test, remove the head assembly and coat the manhole interior with a soap and water solution and repeat the vacuum test for approximately 30 seconds. Leaking areas will have soapy bubbles. Make the necessary repairs and repeat the test until the manhole passes.

**Dewatering Excavated Areas:**

The Contractor shall provide and maintain ample equipment with which to remove all water from every source which enters excavations for structures and pipelines. Dewatering operations shall ensure dry excavations and the preservation of the elevations of the bottoms of the excavations shown on the plans.

Surface drainage shall not be allowed to enter excavated areas.

Where the areas to be excavated are located under water surfaces or near the banks of flowing streams or other bodies of water, the Contractor may adopt and carry out any method of dewatering he may deem feasible for the performance of the excavation work and for protection of the work thereafter; provided that the method and equipment to be used results in completed work which complies with the specifications and is acceptable to the Engineer. In such cases, the excavation area shall be effectively protected from water damage during the excavation period and until all contemplated construction work therein has been completed.

Prior to beginning excavation for structures which are to be constructed at or below the groundwater table, groundwater levels shall be lowered and maintained at workable levels. For structures other than manholes this level must be at least 0.9 m below the bottom of such structures until construction and backfilling operations have been completed.

The Contractor shall be responsible for damage to structures caused by hydrostatic displacement during construction operations.

**Borrow Excavation:**

See NCDOT Standard Specification Section 230.

**Rock Excavation:**

The removal of sound, solid rock of whatever nature which occurs in its original position in ledges, bedded deposits or stratified and unstratified masses within the excavation limits shown on the plans, and which is of such hardness or texture that it cannot be loosened, or broken down and removed without resort to drilling and blasting methods, shall be classified as rock

excavation.

The removal of hardpan, chert, clay, soft or disintegrated shale, and of other rock materials and boulders, shall not be classified as rock excavation although the Contractor may elect to excavate same by drilling and blasting methods. The excavation and removal of all such materials shall be classified as common excavation.

The removal of existing pavements, sidewalks, driveways, manholes and similar structures called for on the plans shall be performed under these specifications and shall not be classified as rock excavation.

**Rock in Pipe Trenches:**

Rock encountered in trench excavation for sewers and other pipelines shall be removed for the overall width of trench which shall be as shown on the plans. It shall be removed to a minimum depth of 150 mm below the bottom of the pipe. Where pipelines are constructed on concrete cradles, rock shall be excavated to the bottom of the cradle as shown on the plans.

After the Engineer has examined the completed excavation, and has taken the necessary measurements for volume determination, the space below the ultimate pipe grade shall be filled with pipe embedment materials as required, compacted to proper grade and made ready for pipe laying.

**Drilling and Blasting:**

Prior to commencing any blasting operations the Contractor shall: notify the Engineer and MSD, notify the official from the list below (if applicable) and obtain blasting permits as required. The Contractor must furnish certification of insurance specifically covering any and all obligations assumed pursuant to the use of explosives.

**BLASTING PERMITS:**

| | |
|---|---|
| **City of Asheville** - | FIRE MARSHAL (259-5636) |
| **Biltmore Forest** - | PUBLIC WORKS DIRECTOR (274-3919) |
| **Black Mtn. & Montreat** - | FIRE DEPT. (669-8074) |
| **Weaverville** - | FIRE MARSHAL (645-3500) |

Drilling and blasting methods used in rock excavation shall be optional with the Contractor but shall be conducted with due regard to the safety of persons and property in the vicinity of the work and in strict conformity with all laws, ordinances or regulations governing blasting and the use of explosives. Rock excavation near existing structures of all types shall be conducted with the utmost care, and every precaution shall be taken to prevent damage to such structures. Any damage or injury of whatever nature to persons or property caused directly or indirectly by blasting operations shall be promptly repaired, replaced or compensated for by the Contractor at his own expense and to the entire satisfaction of the persons injured or the owners of the property damaged.

Where future units or pipe trenches are adjacent to structures requiring rock excavation, the rock shall be drilled and blasted (not excavated) for a distance of approximately 3 meters from the present construction, as shown on the plans or as authorized by the Engineer.

The Contractor shall not be allowed to blast within any rights-of-way maintained by any Public agency without specific approval of the controlling agency and only in accordance with their respective requirements.

**Pre-Blast Survey and Vibration Monitoring:**

Prior to conducting any blasting operations, the Contractor shall conduct a preblast survey of all structures within 90 meters of the proposed sewer line, along the entire route of the proposed sewer.

The pre-blast survey shall consist of 35 mm color photographs of all observable exterior and interior surfaces. The photographs shall be bound in a notebook, with a photo index describing the location of each photograph to facilitate easy comparison of a given structures condition. Existing defects in structures shall be photographed and appropriately documented. The Contractor shall furnish a copy of the survey results, including photographs, to the Engineer and MSD, prior to beginning blasting operations.

All blasting operations conducted within 90 meters of existing structures shall be monitored. In areas where several structures are located adjacent to blasting a sufficient number of seismic units shall be deployed to allow for comprehensive documentation of blasting operations. The resultant seismic data shall be provided to the blasters to allow for blast design changes based on the location of the next blast and the resultant vibration levels for the previous shot. A copy of all resultant seismic data shall be provided to the Engineer and MSD.

The pre-blast survey, vibration and over pressure monitoring shall be conducted by a professional seismic consultant.

All photographs and/or negatives shall be kept on file by the Seismic Consultant and shall be available to the Engineer and MSD upon request.

**Backfilling Trenches:**

The backfilling of pipeline trenches shall be started immediately after the pipe work has been installed. The initial backfill material (above pipe embedment materials), shall be placed to a height of 0.6 m above the top of the pipe.

Where the trench extends along or across streets, roadways, usable alleys, or sidewalks the trench shall be completely backfilled (above pipe embedment materials) with either compacted earth, class I pipe embedment material, Compacted Aggregate Base Course or Screenings. Unless otherwise specified in the Special Conditions or shown on the plans, such trenches shall be backfilled with compacted earth. Backfill materials shall be deposited in 150 mm layers (before compaction) and thoroughly compacted with power tools to 95% standard proctor.

Where excavation has been made within the limits of easements across private property, the top 0.3 m of backfill material shall consist of fine loose earth free from large clods, vegetable matter, debris, stones, and/or other objectionable materials. Backfill material shall be carefully placed and compacted to 85% standard proctor.

Any deficiency in the quantity of materials for backfilling the trenches, or for filling depressions caused by settlement, shall be supplied by the Contractor.

The Engineer may provide the services of a field technician of a recognized commercial testing laboratory during the compaction of the trench backfill to make density determinations. The field technician shall report the test results to the Contractor and Engineer on the project site as soon as these results are known. The results of all density tests shall be reported in writing and shall include the date of test, test location, depth below finished grade, wet density, moisture content, dry density, percent compaction of test sample, and maximum dry density used for comparison. Should any test fail, the cost of any subsequent test will be at the expense of the contractor.

Where pipe trenches are cut across or along pavement the Contractor shall construct a temporary surface over the cut which will not disintegrate under traffic and which shall be maintained in good condition under traffic until the permanent pavement has been constructed.

Backfilling around structures shall be done in the manner specified above for pipe trenches by power tamping for the full depth of cut from the bottom of the finished grade.

All backfilling shall be done in such a manner as will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be opened up and repaired and then re-backfilled as herein specified.

The Contractor shall replace all surface materials and shall restore paving, curbing, sidewalks, gutters, shrubbery, fences, sod, and other surfaces disturbed, to a condition equal to that before the work began, furnishing all labor and materials incidental thereto as provided elsewhere in these specifications.

**Disposal of Materials:**

All materials removed by excavation which are suitable for the purpose shall be used whenever practicable for fills, embankments, backfilling pipe trenches, and for such other purposes as may be shown on the plans or authorized by the Engineer and MSD. All materials not used for such purposes shall be considered as waste materials and disposed of by the Contractor.

Waste materials may be deposited in spoil banks on the site of the work if space is available. Such "on site" spoil bank locations shall be authorized by the Engineer and MSD. Waste materials shall not be left in unsightly piles but shall be spread in uniform layers and neatly leveled and shaped. Spoil banks shall be provided with adequate openings to permit surface drainage of adjacent lands. Where "on site" disposal is not practical, the Contractor shall be responsible for "off site" disposal.

On completion of any part of the work proper disposal shall be made of all surplus or unused materials within the construction limits of such work and the surface of the work left in a neat and workmanlike condition.

**Maintenance:**

All excavated areas, backfills, embankments, trenches, access roads, grading, and ditches shall be maintained by the Contractor in good condition at all times until final acceptance by the Engineer

and MSD. Where trench backfill has settled, trenches shall be re-excavated and compacted.

**Pipe Embedment Materials:**

Pipe embedment materials when required shall be Class I material. Where pipes are installed below groundwater levels or where the trench is subject to inundation, Class I material shall be placed to the top of the pipe. Class I materials shall be graded crushed limestone, or granite. Materials under 6 mm shall be limited to no more than 3% by weight. Grade 67 shall be used for PVC Construction and 57 for Ductile Iron.

Pipe embedment materials shall be placed to support the full length of the barrel of the pipe at exact line and grade.

Pipe embedment materials shall be placed in the pipe trench to the trench width and depth shown on the plans. Where rock has been removed from the pipe trench, it shall be placed to a minimum depth of 150 mm below the bottom of pipe.

Class I materials when placed in the pipe trench do not require compaction.

All other materials shall be mechanically tamped and compacted to the percent required herein, as noted in the special conditions, or as shown on the drawings.

**Backfill Material:**

Backfill material shall be of a relatively non-plastic nature and shall be sufficiently close to optimum moisture content to achieve specified compaction requirements. Backfill material shall exhibit no tendency to flow or behave in a plastic manner under blows of a mechanical tamp. Material which does not meet these requirements shall be removed from the site and replaced with suitable backfill materials.

Initial backfill material and Select material shall consist of fine loose earth, free of large clods, stones, vegetable matter, debris, and/or other objectionable material.

The remainder of the backfill shall be the same type material as the initial backfill except that a broken stone content of not more than fifty (50) percent by volume will be allowed provided that the stones are thoroughly mixed with earth. Maximum individual stone size shall be 0.02 cubic meters.

## IV COMPENSATION:

No direct payment will be made for utility construction work required by the proceeding provisions, which are general requirements applying to utility construction, and all of the requirements stated will be considered incidental work, paid for at the contract unit prices of the various utility items included in the contract.

## V GENERAL MATERIALS REQUIREMENTS:

All materials and products used on projects funded by M.S.D. and/or projects constructed with non-M.S.D. funds which are to be accepted for maintenance and operation by M.S.D. shall be **"Made in the U.S.A."**. This requirement shall include all raw materials, processing,

manufacture, and fabrication. To insure conformance to this requirement, the country of origin shall be legibly and permanently affixed by die stamping, molding or etching in a visible location on the final product. The country of origin marking shall appear on the top surface of all manhole covers, frames, or rings. If the name of any city or locality in the U.S. appears on the product, the name of the country of origin shall be preceded by "Made in" or "Product of" or words to that effect. This phrase must be of comparable size as the name of the city or locality and placed as close as reasonably possible thereto. Canadian products are not considered as meeting the **"Made in the U.S.A."** requirement. In addition, on any project funded in part or whole by Federal or State Funds, all materials and products used on that project shall comply with the provisions of the Federal Intermodal Surface Transportation Act of 1991 and regardless of any M.S.D. approvals of shop drawings and/or materials specifications, the contractor shall be fully and completely responsible for conformance to the provisions of this Act.

## Sanitary Sewer Installation:

The unit prices for sewer pipe and related appurtenances shall include the following work, and no separate payment for these items will be made:

a. Site Preparation (including clearing and grubbing)
b. Removal and Storage of Topsoil
c. By-Pass Pumping (Except for Project Coordination, Bypass Pumping
d. Common Excavation and Trench Backfilling and Compaction
e. Drilling, Blasting and Removing Rock
f. Sheeting, Shoring and Bracing
g. Dewatering Excavated Areas
h. Waste Material Disposal
i. Air, Mandrel and Vacuum Testing
j. Restoration of Surface (including structures, landscaping, etc.)
k. Plugging Abandoned Sewer Lines
l. Connection of Existing Sewer Main or Service to new Manhole
m. Pipe embedment material (PVC- to springline, DIP - per detail)
n. Connecting to an Existing Manhole
o. Renewing traffic light underpavement wiring
p. Removal of existing sewer line
q. Removal and disposal of pavement
r. Verification of size and location of existing underground utilities
s. Pre-blast and post blast survey and vibration monitoring.
t. Fittings
u. Wyes and Saddles
v. Testing of Sewers

## 1. PVC Pipe:

Poly-Vinyl Chloride (PVC) sewer pipe and fittings shall conform to the requirements of ASTM Specification D 3034. Wall thickness shall be SDR 35. Joints shall be integral bell and spigot type with compression type rubber gaskets. Joints shall conform to ASTM specifications D-3212. Couplings for PVC pipe to PVC pipe shall be PVC "Closure" or "Stop" couplings and shall meet ASTM D 3034. No more than one (1) material transition will be allowed in any one reach of pipe.

The quantity of PVC Sewer Pipe to be paid for will be the actual number of linear meters of PVC sewer line which has been properly incorporated into the completed and accepted work. Pipe

length shall be measured by horizontal linear meters in place measured along the pipe center line with no deduction for wyes or tees. **Horizontal measurements through manholes shall be excluded**.

The quantity of PVC Sewer pipe measured, as provided above, will be paid for at the contract unit price per linear meter of "***mm PVC Sewer Pipe, SDR 35". The prices and payments will be full compensation for furnishings and installing all materials, including pipe, accessories, fittings, compression couplings, anchoring, connections, pressure test, sterilization, backfilling, compaction and incidental necessary to complete the work as required.

## 2. Ductile Iron Pipe:

Ductile iron pipe shall conform to the requirements of ANSI Specification A21.51. The pipe class, bedding, and loading shall comply with MSD details. When loading conditions are beyond those shown, the Engineer will submit design computations to the MSD. The pipe class shall be as shown on the plans. Bedding shall be as shown on the trench details. Joints shall be "push-on" which conform to the requirements of ANSI Specification A21.11. Ductile iron fittings shall conform to the requirements of ANSI Specification A21.10, Class 350 in sizes 600mm and smaller and Class 250 in sizes larger than 600mm. All ductile iron pipe shall have a cement mortar lining of standard thickness conforming to the requirements of ANSI Specification A21.4.

All fittings for Ductile Iron Pipe, including but not limited to Wyes, Tees, Saddles, Bends, Crosses, Sleeves, Plugs, Caps, Reducers, and Glands, shall be or "Mechanical Joint" fittings conforming to the requirements of ANSI/AWWA C110/A21.10 [Standard fittings, 75 thru 1200mm] or ANSI/AWWA C153/A21.53 [Compact fittings, 75 thru 1200mm] with the joints meeting the requirements of ANSI/AWWA C111/A21.11 (Rubber-gasket joints) and shall be pressure rated at the same rating as the mainline sewer pipe but in no case less than 17.5 kg/sq. cm. Mechanical joint fittings shall meet or exceed the requirements as set forth in ANSI/AWWA C111/A21.11. All fittings shall be manufactured from ductile iron grade 70-50-05 (min. tensile strength – 4920 kg/sq. cm; min. yield strength – 3515 kg/sq. cm, min. elongation – 5%) as specified in AWWA C110 or C153 and ASTM A536. Compact fittings shall not be permitted unless specifically called for in the project specifications and/or project plans or approved in writing by the Project Engineer. Approval of compact fittings shall be limited to those locations where space and dimensional limits warrant the use of such fittings. All ductile iron pipe fittings and materials shall conform to paragraph 2.01 (d) of Item II, Section VI of MSD's Technical Specifications. All ductile iron pipe fittings shall have a cement mortar lining of standard thickness conforming to the requirements of ANSI Specification A21.4. Note: Couplings for ductile iron pipe to ductile iron pipe shall be ductile iron mechanical joint sleeves, only.

## Flow Interruptions and Bypass Pumping:

When the flow of an existing sewer must be interrupted and/or bypassed, the Contractor shall, before beginning any construction, submit a work schedule which will minimize the interruption and/or bypassing of wastewater flow during construction. This schedule must be approved by MSD, the Engineer, and (if appropriate) the owners of the private collection system and may require night, holiday, and/or weekend work.

If pumping is required, an identical standby pump shall be on site in the event of failure of the primary pump. If, at any time during construction, effluent from the existing sewer is not fully contained by the bypass system, gravity service will be restored by a temporary tie to the new

construction and work will be suspended until the problem is resolved to the satisfaction of the Engineer. The Contractor shall be responsible for any fines levied as a result of effluent reaching surface waters. The contractor will be required to verify his method of handling sewer flows during construction by pumping at peak flows for 1 hour as approved by the Engineer. This procedure shall be considered incidental to the cost of proposed Ductile Iron Sewer Pipe.

**3. Wyes and Saddles:**

Wyes and Saddles shall meet the requirements for sewer fittings as set forth in paragraph 2.05 (b) above and shall be of the same material and strength as the sewer mains on which they are installed. Saddle type fittings shall not be used on new construction or existing mains, unless specifically called for in the project plans and/or specifications or approved in writing by the Project Engineer. Saddle type fittings, if permitted, may be used only, for 100 or 150mm services on existing sanitary sewer mains of 300mm or less in diameter. Unless otherwise specified in the project plans and/or specifications, house services shall be constructed of 100mm diameter Schedule 40 PVC pipe or 25 kg/sq. cm Ductile Iron pipe. For taps and services on an existing MSD maintained PVC or VCP sewer main 150mm that are being repaired by trenchless construction methods, flexible saddles shall be required. Flexible Saddles shall be affixed to the main by bands or straps as provided by the manufacturers and by using a two part epoxy glue uniformly spread over the contact surface of the saddle.

Wye branches shall be placed in sanitary sewer lines at all points shown on the plans or specified herein. If such branches are not to be used immediately they shall be closed with clay, concrete, or plastic plugs with joints as specified for the sewer pipe.

Wyes shall be placed in sanitary sewers so as to properly serve each existing house and each vacant lot facing or butting on the street or alley in which the sewer is being laid, and at such other locations as may be designated by the Engineer.

The Contractor shall measure the distance to the tap or tee from the downstream manhole to obtain the information required for the "As-Built" records. As-built data shall be marked on the plans and turned over to the Owner at the end of the project.

The location of all wyes, cleanouts, and house sewers installed in the work shall be identified on the plans and in the field.

Wyes and Saddles shall be considered incidental to the cost of the proposed 24" Ductile Iron Sewer Pipe.

The quantity of Ductile Iron Sewer Pipe to be paid for will be the actual number of linear meters of Ductile Iron sewer line by pipe type which has been properly incorporated into the completed and accepted work. Pipe length shall be measured by horizontal linear meters in place measured along the pipe center line with no deduction for wyes or tees. **Horizontal measurements through manholes shall be excluded.**

The quantity of Ductile Iron Sewer Pipe measured, as provided above, will be paid for at the contract unit price per lineal meter of ****mm Ductile Iron Sewer pipe, Pressure Class ***mpa. The price and payments will be full compensation for furnishing and installing all materials, including pipe, accessories, fittings, compression couplings, anchoring, connections, pressure test, sterilization, backfilling, compaction and removal of existing sewer lines and manholes, incidental necessary to complete the work as required..

**3. Sanitary Sewer Clean-out :**

All sanitary sewer cleanout boxes and covers shall be manufactured from gray iron meeting the requirements of ASTM A48 or ductile iron grade meeting the requirements of AWWA C110 and ASTM A536. All sanitary sewer cleanout boxes shall conform to the dimensions and requirements as set forth in MSD's Standard Detail for Cleanout Boxes

The quantity of Clean-out Assemblies to be paid for will be the actual number of clean-out assemblies complete with all appurtenances, installed and accepted.

The quantity of Clean-out Assemblies measured, as provided above, will be paid for at the contract unit price per each for "Sanitary Sewer Clean-out". The prices and payment will be full compensation for each Clean-out installed, complete including any accessories.

**4. Manholes:**

General

(1) Manholes shall be constructed to the sizes, shapes and dimensions and at the locations shown on the plans. Unless otherwise shown on the plans, manholes shall be as follows:

**200 to 450mm pipe** .....1.2m diameter ..... 127mm thick walls
**525 to 900mm pipe** ..... 1.5m diameter ..... 127mm thick walls
**990 to 1350mm pipe** .....1.8m diameter ..... 150mm thick walls
**1350mm and larger pipe** ..... 2.4m diameter ..... 200mm thick walls

(2) The height or depth of each manhole will vary with the location, but it shall be such as will place the top at the finished grade of the pavement or ground surface or to the elevations shown on the plans and the invert at the elevation shown on the plans. The number of joints shall be minimized. No riser sections for manholes up to 1.8 meters tall and no more than 1 riser for each additional 1.2 meters in height. One additional section will be allowed for transition manholes.

Drop Manholes

Drop Manholes shall be similar in construction to the standard manhole except that a drop connection of pipe and fittings of the proper size and material shall be constructed outside the manhole and supported by Class B concrete as indicated on the plans.

Manhole Construction

(1) Manholes shall be composed of precast reinforced components with tongue and groove joints. Manholes shall conform to the requirements of ASTM Specification C478, except as modified herein.

(2) Concrete: Concrete shall conform to ASTM C478 and as follows:

Compressive strength: 34.5 MPa minimum at 28 days.

| | |
|---|---|
| Air Content: | 5 - 7 % |
| Alkalinity: | Adequate to provide a Life Factor, Az = Calcium Carbonate Equivalent times Cover over Reinforcement, no less than 0.35 for bases, risers and cones. |
| Cementitious Materials: | Minimum of 335 kilograms per cubic meter |
| Coarse Aggregates: | ASTM C33. Sound, Crushed, Angular Granitic Stone only. Smooth or rounded stone shall not be used. Free from organic impurities. |
| Chemical Admixtures: (if used) | ASTM C494. Calcium Chloride or admixtures containing calcium chloride shall not be used. |

Air Entraining Admixtures (if used): ASTM C260.

Absorption shall not exceed six (6) percent.

(3) Reinforcing: Reinforcing steel shall be ASTM A615 grade 60 deformed bar, ASTM A82 wire or ASTM A185 welded wire fabric.

(4) Lifting Loops: Lift loops shall be ASTM A416 steel strand. Lifting loops made from deformed bars shall not be allowed.

(5) Wall Thickness: The minimum wall thickness of the manhole riser sections shall be as shown in the table above. Cone sections shall have a minimum wall thickness of 200mm at their top. The minimum thickness of the bottom shall be 150mm for manholes 1.2 meters in diameter and 200mm for all sizes greater than 1.2 meters in diameter. Suitable openings for inlet and outlet sewer pipe shall be cast or cored into the base sections and into riser sections for drop connections. These openings shall be circular, accurately made, and located as required for each manhole.

Manhole Components

(1) Precast Manufacturing: Precast components shall be manufactured in conformance with ASTM C478. Wall and inside slab finishes resulting from casting against forms standard for the industry shall be acceptable. Exterior slab surfaces shall have a float finish. Small surface holes, normal color variations, normal form joint marks, and minor depressions, chips and spalls will be tolerated. Dimensional tolerances shall be those set forth in the appropriate references and specified below.

(2) Certification: Precast manufacturer shall manufacture all precast components with one or more of the following testing methods.

Plant shall be certified by the National Precast Concrete Association (NPCA) Plant certification program.

Plant shall be certified by the Prestressed Concrete Institutes (PCI) Plant certification program.

Manufacturing process of components delivered shall have been randomly tested by an MSD approved outside agency (such as a State Department of Transportation) no less than 5 weeks prior to manufacture. Test results covering no less than one

component in 100 and certification from cement manufacturer and aggregate supplier certifying chemical content will be furnished to MSD upon request. Minimum test shall cover concrete strength and absorption.

Components delivered shall be tested by a certified outside testing agency. Test results covering no less than one component in 25 and certification from cement manufacturer and aggregate supplier certifying chemical content will be furnished to MSD upon request. Minimum test shall cover concrete strength and absorption.

Joints: For joints utilizing O-Ring seals, the maximum slope of the vertical surface shall be 2 degrees. The maximum annular space at the base of the joint shall be 2.54mm. The manhole sections shall be joined as specified herein.

Lift Inserts and Holes: If used for handling Precast Components, lift holes and inserts shall be sized for a precision fit with the lift devices, and shall comply with OSHA Standard 1926.704.

Step Holes: Step holes shall be cast or drilled in the Bases, Risers and cones to provide a uniform step spacing of 300 or 400mm. Cast step holes shall be tapered to match the taper of the steps.

(3) Precast Base Sections: Base sections shall have the base slab cast monolithically with the walls, or have an approved galvanized or PVC waterstop cast in the cold joint between the base slab and the walls. Where extended base manholes are required, the width of the base extensions shall be no less than the base slab thickness. The bottom step in base section shall be a maximum of 500mm from the top of the invert Bench.

(4) Precast Riser Sections: The minimum Lay length of Precast Riser Sections shall be equal to the step spacing used by that manufacturer.

(5) Precast Concentric and Eccentric Cone Sections: Precast Cone Sections shall have an inside diameter at the top of no less than 600mm and no more than 650mm. The width of the top ledge shall be no less than 200mm and no less than the wall thickness required for the cone section. Concentric cones shall be used only for Shallow Manholes.

(6) Precast Transition Cone Sections: Transition Cone Sections shall provide an eccentric transition from 1.5 meter and larger manholes to 1.2 meters diameter risers, cones and flat slab top sections. The minimum slope angle for the cone wall shall be 45 degrees. A minimum of 1.8 meters height is required between the bench

(7) Precast Transition Top Sections: Transition Top Section shall provide an eccentric transition from 1.5 meter and larger manholes to 1.2 meters diameter risers, cones, and flat slab top sections. Transition Top sections shall be furnished with vents as shown on the manhole details. The maximum amount of fill over the transition top section shall be 6 meters. Transition tops shall not be used in areas subject to vehicle traffic.

(8) Precast Flat Slab Top Sections: Standard Flat Slab Top Sections shall have an access opening with an inside diameter at the top of no less than 600mm and no more than

650mm and shall be designed for HS-20 traffic loadings as defined in ASTM C890. Items to be cast into Special Flat Slab Tops shall be sized to fit within the manhole ID and the top and bottom surfaces.

(9) Precast Grade Rings and Brick: Precast Grade Rings or Brick shall be used to adjust ring and covers to finished grade. No more than 300mm of grade rings or brick will be allowed per manhole. Grade Rings shall conform to ASTM C478 and shall be no less than 100mm in height. All brick used shall be solid shall be made from Concrete, Clay, or Shale and shall be of standard building size.

(10) Steps: Provide steps in Bases, Risers, Cones, Transition Cones, and Transition Top sections aligned vertically on 300 or 400mm centers. Secure steps to the wall with a compression fit in tapered holes. Steps shall not be vibrated or driven into freshly cast concrete. Steps shall not be grouted in place. The steps shall be a Copolymer Polypropylene Plastic reinforced with a 12mm diameter grade 60 bar and have serrated tread and tall end lugs. Step pullout strength shall be a minimum of 900 kg when tested according to ASTM C497. The minimum width shall be 300mm only. Rubber or plastic covered steel steps shall be used. All manhole steps shall comply with the requirements of OSHA.

(11) Lifting Devices: Lifting devices complying with OSHA Standard 1926.704 for handling the Precast Components shall be provided by the Precast Manufacturer.

(12) Coatings: Where shown on the plans, the interior/exterior of the manhole walls shall be coated with 21 mils of Coal Tar Epoxy. The coating shall be spray applied according to the manufacturer's recommendations by an applicator with a minimum of 5 years experience. The joints between precast sections shall not be coated. Use butyl rubber rope as specified above to seal the interior horizontal joint surface.

(13) Joint Sealing Materials: Joints shall be sealed by **TWO** Seals. Each seal shall be as described in one of the following paragraphs:

(a) Internal Butyl Rubber Rope(s) - Internal Butyl Seal(s) shall consist of a plastic or paper-backed butyl rubber rope no less than 4.28 meters long and no less than 25mm (1") in diameter. When manholes are larger than 1.2 meters diameter or have a larger than normal space between the joints the length and or diameter of the rope shall be increased as required to achieve a seal. Butyl Rubber Material: Butyl rubber shall conform to Federal Specification SS-S210A, AASHTO M-198, Type B - Butyl Rubber and as follows: maximum of 1% volatile matter and suitable for application temperatures between –12 to 38 degrees C. Butyl Rubber shall be applied to clean, dry surfaces only. Use of two (2) independent wraps of Butyl Rubber qualifies for the requirement of two seals.

(b) Internal O-Ring Gasket - Internal O-Ring Gasket shall conform to ASTM C443, and be installed according to the Precast Manufacturer's recommendation.

(c) Internal Rubber Gasket - Internal Rubber Gasket shall conform to ASTM C361, and be installed according to the Precast Manufacturer's recommendation.

Manhole Sleeves and Entrance Joints

(1) Flexible manhole sleeves or flexible manhole entrance joints shall be installed on all pipe entering and leaving precast manholes. Manhole openings shall be accurately core drilled or cast in place. Sleeve and Joint material shall be of high quality synthetic rubber which complies with the requirements of ASTM Specification C 923. Sleeve hardware (clamps, bands, straps, draw bolts, nuts, etc.) shall be stainless steel and make a watertight union. Flexible manhole entrance joints shall be cast into the wall of the manhole base to form a tight waterstop. Joints shall be watertight under a 9 meter head of water. Flexible manhole sleeves and flexible manhole entrance joints shall be installed in accordance with instructions of their manufacturer. Installation on steep grades may require pipe openings cast or cored with a vertical angle. Alternative entrance joint connections must be approved by the Engineer and MSD prior to construction.

Placing Manhole Sections

The Contractor shall excavate to the required depth and remove materials that are unstable or unsuitable for a good foundation. Prepare a level, compacted foundation extending 150mm beyond the manhole base.

The base shall be set plumb and level, aligning manhole invert with pipe invert.

Thoroughly clean bells and spigots to remove dirt and other foreign materials that may prevent sealing. Unroll the Butyl Sealant rope directly against base of spigot. Leave protective wrapper attached until sealant is entirely unrolled against spigot. Do not stretch. Overlap from side to side - not top to bottom. For rubber gaskets follow manufacturer's recommendations for installation.

Risers and cones shall be set so that steps align, taking particular care to clean, prepare and seal joints.

Manhole Final Finishing

After placement of manhole frame and vacuum testing, perform the final finishing to the manhole interior by filling all chips or fractures greater than 12mm in length, width or depth 3mm with non-shrink grout. Grout the interior joints between the precast concrete sections with non-shrink grout. When manhole cone top opening is less than manhole frame base inside flange diameter, cone top shall be chamfered or grouted to prevent injury on sharp edges. Shaper edges or rough finishes shall be removed providing a smooth surface throughout the manhole. Clean the interior of the manhole, removing all dirt, spills, or other foreign matter.

Connection to Existing Manholes

(1) Any connection with 400mm and smaller pipe at an existing precast or cast-in place manhole will require the Contractor to core the necessary opening through the manhole wall and install a flexible manhole to pipe connector. Connector shall be as specified elsewhere. Connections to existing brick manholes do not required coring and an opening may be carefully hammered or sawed. Connections to existing manholes with 450mm and larger pipe may be cored or sawed as approved by the Engineer. When noted on the plans or directed in writing by MSD, a connection to an existing manhole may be made without using flexible pipe connectors.

Whenever a connection is made without a flexible pipe connector, it shall utilize non-shrink grout and a brick and mortar collar. The existing manhole bench and invert shall be repaired as specified under manhole materials and installation.

Manhole Inverts

(1) Manhole inverts shall be constructed of brick and cement grout or precast concrete and shall have a "U" shaped cross section of the same diameter as the invert of the sewers which they connect. "U" shaped inverts shall be constructed to a minimum depth of 150mm for 200mm sewers (unless full depth is required in Special Conditions) and to full pipe diameter depth of the outlet sewer main for larger mains. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer, whether horizontal or vertical, shall be made with true tangent curve(s) with as large a radius as the size of the manhole will permit. Manhole benches shall slope a minimum of 50mm to the lip of the "U" shaped invert. Provide a 12mm radius at the intersection of 2 or more channels. The minimum concrete thickness in the invert of the channel shall be 50mm, not including the manhole base thickness.

(2) When the fall between the inlet and the outlet holes is not available from precast company, the contractor shall construct the invert using 28 MPa concrete or non shrink grout. Non shrink grout [minimum 50mm thickness on invert channel and on bench] may be plastered over layered brick and mortar in lieu of solid non shrink grout invert.

(3) Inverts shall meet the following additional requirements:

Pipe Openings: Pipe openings shall provide clearance for pipe projecting a minimum of 50mm inside the manhole. The crown of small I.D. pipe shall be no lower than the crown of the outlet pipe.

Trough: The fall across the manhole invert shall be as noted on the plans.

Bench: Float finish benches to provide a uniform slope from the high point at the manhole wall to the low point at invert trough. Provide a radius 3 to 25mm at the edge of the bench and trough.

Gradual smooth sided depressions and high spots shall be allowed so long as diameter of invert channel ranges from 6mm less than or 12mm more than the nominal pipe diameter are maintained. Voids, chips, or fractures over 3mm in diameter or depth shall be filled with a non-shrink grout and finished to a texture reasonably consistent with the bench surface.

Manhole Frame and Cover Construction

(1) Manhole frames and covers shall be made of cast iron conforming to the minimum requirements of ASTM Specification A48, Class 35B. All castings shall be made accurately to the required dimensions and shall be sound, smooth, clean and free from blisters and other defects. Defective castings which have been plugged or

otherwise treated shall be rejected. The contact surfaces between the cover and its corresponding supporting ring in the frame shall be machined so that the cover will rest on the ring for the full perimeter of the contact surfaces.

(2) All frames and covers shall comply with AASHTO HS20 loading requirements. When a frame is designated as not for use in pavement applications (**"N"**) a reduced height traffic bearing frame may be used in lieu of the standard frame for the purpose of adjusting grade. All manhole frames shall be equipped to accept a cam-lock cover. However, only those frame & covers designated on the plans as watertight (**"W"**) or lock down (**"L"**) shall have covers equipped with cam-locks. When cam-locks are required, covers shall be furnished with two stainless steel, pentagon headed cam-locks. Frames and covers designated as watertight (**"W"**), shall have a cover equipped with a one piece gasket permanently attached in a groove in the manhole cover. An o-ring gasket may be placed in a dove tailed groove in the bottom of the cover if cam-lock feature provides sufficient pressure to prevent cover movement and subsequent wear of gasket. Otherwise gasket shall be double edged and placed in a groove in the side of the manhole cover.

(3) All covers shall have two 15mm diameter lifting bars set into the cover to allow for lifting by a chain hoist. There shall be no holes or perforations in covers. For models other than those listed as preapproved, the manufacturer's shop drawings shall be sent to the Engineer for review and acceptance by the Engineer and MSD prior to manufacturing and shipping of castings to the job site.

(6) Manhole Frame Placement

After the manhole has been set in its final position, set the manhole frames to the required elevation using no more than 300mm of precast concrete grade rings, or bricks (maximum three layers) sealing all joints between cone, adjusting rings, and manhole frame. When grade rings are used apply a 50mm X 6mm strip of butyl between the rings, the frame, and the cone. When bricks are used, grout with Cement mortar. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted so as to conform to the exact slope, crown and grade of the existing pavement adjacent thereto. Manhole Frames which are placed above final grade will have frames attached to manhole cone section by means of a minimum of three symmetrically placed 12mm diameter stainless steel anchors and stainless steel washers or shall have frames recast into the manhole cone or slab by an MSD approved process.

Manhole Submittal Data

(1) Drawings and descriptive data on manholes, (including wall thicknesses, vertical dimensions, and deflection angles), concrete used in manufacture of manholes and precast inverts, rubber gaskets, joint sealant, flexible manhole sleeves and joints, frames and covers, inverts, and manhole steps shall be submitted to the Engineer for review prior to their manufacture.

Manhole Delivery, Storage, and Handling

(1) The Contractor shall coordinate delivery with the manufacturer, handle and store the Manhole Components in accordance with the ASTM C891 and the

manufacturer's recommendations using methods that will prevent damage to the components and their joint surfaces.

Grouts

(1) All grouts used on manhole interiors shall be "non-shrink" grouts, and Grout used on manhole exteriors shall be either "non-shrink" or standard cement mortar grouts, as specified in Item II, Concrete, of the specifications.

Sanitary sewer manholes will be measured on the "per each" basis and on the "lineal meter" basis for that portion exceeding 1.8 m in height.

Measurements will be made for the appropriate diameter of manhole on the actual number constructed as required and accepted. The height of the manhole will be measured to the nearest tenth of a meter from the manhole invert to the top of the manhole ring.

Sanitary sewer manholes measured as provided above and accepted will be paid for at the contract unit price per each of "*** mm Diameter Precast Concrete Sewer Manhole, 1.8 Meters Depth", and at the contract unit price per lineal meter for "Precast Concrete Manhole Wall., ****mm Diameter, Over 1.8 Meters Height". Such prices and payments will be compensation in full for all materials, labor, equipment, excavation, backfill, and incidents necessary to complete the work as required.

Outside drop assemblies will be paid for at the contract unit price per lineal meter of "Sewer Manhole Outside Drop Assembly".

**5. Project Coordination Bypass Pumping:**

The begin manhole, MH # 1B, will be constructed by others. It is anticipated that this manhole will be completed prior to the beginning of the sewer line construction for this project.

In the event that MH # 1B is not completed, the contractor will be required to begin at PMH #2B and by-pass pump to the existing system from PMH # 2B to existing MSD MH # 28755. The final 23.365 m of 500 mm DIP pipe shall be constructed after MH # 1B has been completed. The Contractor will be paid for this item of work for each hour by-pass pumping is required. The total quantity for bidding purposes is 2160 hours The bypass pump used for this purpose should be able to handle flows of 5 MGD.

The quantity of Project Coordination, Bypass Pumping will be measured and paid for at the contract unit price per each hour for "Project Coordination Bypass Pumping". The prices and payment will be full compensation for furnishing and installing all materials and incidents necessary to complete the work as required.

# Metropolitan Sewerage District of Buncombe County, NC
# Sanitary Sewer Pre-Approved Materials List

**Pre-Approved Products** Date of Listing : November 3, 2003

| Equipment / Material | Manufacturer | Model Number | Comments and Applicable Stds.** |
|---|---|---|---|
| **MANHOLES** | | | |
| STD. MH Ring & Cover w/ Cam-lock or Bi-lock covers | U.S. Foundry<br>East Jordon Iron Works | USF 577 w/ Bi-Loc covers<br>1045ZI-1040AGS w Cam-Lock covers | AASHTO HS20, ASTM A 48, Cl. 35B |
| Reduced Height MH Ring & Cover w/ Cam-lock or Bi-lock covers | U.S. Foundry<br>East Jordan Iron Works | USF 574 w/ Bi-Loc covers<br>1046ZI w/ Cam-Lock covers | AASHTO HS20, ASTM A 48, Cl. 35B |
| Pre-Cast Manholes | Tindall Concrete Products<br>MST<br>Southern Concrete<br>Old Castle<br>Metromont | S-SK-1, S-SK-2, S-SK-3 | ASTM C 478, C 620, C 33, C 494, C 82, C 416 NCPA, PCI, & NCDOT Certified Plants, with precast inverts & benches; Note: Flat Top or Slab Top MH Sections are NOT permitted without special written permission of MSD Project Engineer or unless specifically called for in project plans |
| **PRE-CAST MH JOINTS** | | | |
| Internal Butyl Rubber | | | Fed. Spec SS-S210A, AASHTO M-198 type B |
| Internal O-Ring Gasket<br>Internal Rubber Gasket | *These items not permitted* | | ASTM C 443<br>ASTM C 361 |
| Manhole Sleeve | National Pollution Control Systems Inc. | Kor-N-Seal I , Kor-N-Seal II or Contour Seal | ASTM C 923 |
| Flexible Connectors | EPCO<br>Lock Joint (Griffin-Hill-American, Inc.)<br>Press Seal Gasket Corp.<br>A-LOC Products Corp.<br>Press Seal Gasket Corp. | 72, 73, 74, 107, 117, 126, 127, 128, 1610, 1612<br>Sleeves<br>A-LOC Flexible MH Entrance Joints<br>Press Wedge II | |

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# PIPE & FITTINGS

## VC PIPE

| | | | |
|---|---|---|---|
| Vitrified Clay Pipe | | | ASTM C 700 & C 425, Extra Strength |
| VCP Couplings | Fernco<br>Pipe Conx | | Couplings for Clay Pipe to Clay Pipe, Clay Pipe to Ductile Iron Pipe and Clay Pipe to PVC Pipe |

## CONCRETE PIPE

| | | | |
|---|---|---|---|
| Concrete Sewer Pipe | | | ASTM C76, C 150, C175, C 205, C 33 |

## DUCTILE IRON PIPE

| | | | |
|---|---|---|---|
| Ductile Iron Pipe (Cement Lined) | Griffin Pipe Products<br>American Pipe<br>US Ductile<br>McWane | | ANSI/AWWA C 104/A21.4, ANSI A 21.51 Class 350 |
| M.J. type joint Pipe | Griffin Pipe Products<br>American Pipe<br>US Ductile<br>McWane | Fastite | Thickness - ANSI/AWWA C 150/ A21.50 Impact - ANSI/AWWA C 151/A21.51 |
| Pushon type Joint Pipe | American Pipe<br>US Ductile<br>McWane | | ANSI A 21.11 |
| Flanged Joint type Pipe | American Pipe<br>US Ductile<br>McWane | | |

## DUCTILE IRON FITTINGS

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| | | | |
|---|---|---|---|
| Saddles (DIP)* | Romac | "CB" Tapping Saddles<br><br>DEW / HPI | " CB" Saddles<br><br>4" Flexible Saddles |
| Wyes (CIP/DIP) | Tyler-Union<br>American Pipe Mfg.<br>US Pipe & Foundry | | ANSI/AWWA C 104/A21.4, Class 350 , ANSI/AWWA C 153/A21.53, ANSI/AWWA C 111/A21.11 NSF Approved , NSF 61 |
| Tees (CIP/DIP) | Tyler-Union<br>American Pipe Mfg.<br>US Pipe & Foundry<br>Inserta Fittings Company | Inserta Tees for trenchless const. - only | ANSI/AWWA C 104/A21.4, Class 350 , ANSI/AWWA C 153/A21.53, ANSI/AWWA C 111/A21.11 NSF Approved , NSF 61 |
| Cleanout Boxes | U.S. Foundry<br>East Jordan Iron Works | 7610<br>1566Z | ANSI/AWWA C 104/A21.4, Class 350 , ANSI/AWWA C 153/A21.53, ANSI/AWWA C 111/A21.11 NSF Approved , NSF 61 |
| other Fittings (CIP/DIP) | Tyler-Union<br>American Pipe Mfg.<br>US Pipe & Foundry | | ANSI A 21.10, Cl. 350 or Cl. 250, ANSI A 21.4 |
| **PVC PIPE** | | | |
| PVC Pipe (Services) | Charlotte Pipe & Foundry Co. | Sch 40 | ASTM D 1784, ASTM D 1785, ASTM D 2665 |
| PVC Pipe (Mains) | Charlotte Pipe & Foundry Co. | | ASTM D 3034, D 3212 SDR 35 , ASTM D 3212, ASTM F 477 |
| **PVC FITTINGS** | | | |
| PVC Fittings (Services) | Charlotte Pipe & Foundry Co. | Sch 40 | ASTM D 1784, ASTM D 2466, NSF Std 14 &16 |
| PVC Fittings (Mains) | | | |
| **FIBERGLASS PIPE** | | | |
| Centrifugally Cast Fiberglass Pipe | | | ASTM D 3262, D3662, D 3681, D 4161 |

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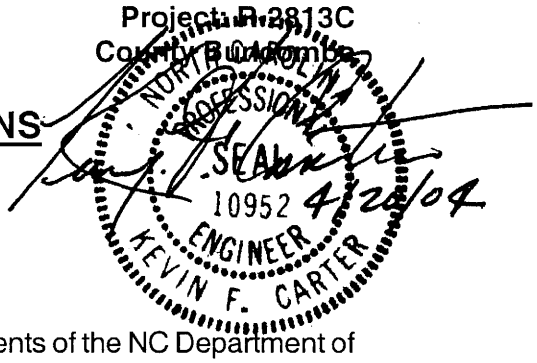
| | | | |
|---|---|---|---|
| | | | |
| **MISC. MATERIALS** | | | |
| Pipe Foundation Material<br>Rip-Rap<br>Crushed Stone<br>CABC | NCDOT Approved Plant<br>NCDOT Approved Plant<br>NCDOT Approved Plant<br>NCDOT Approved Plant | | Crushed limestone or granite<br>NCDOT Type I or II<br>NCDOT Specs<br>NCDOT STD. # 57, #67 or #78 |
| I-2 Asphalt<br>HB Binder Asphalt | NCDOT Approved Plant<br>NCDOT Approved Plant | | NCDOT Specs<br>NCDOT Specs |
| Tunnel linings | | | AASHTO M 111-94, M-190, ASTM A 569 |
| Bore Casings | | | Steel pipe, ASTM Q 139, welded or seemless, Grade B |
| Steel Straps and Anchors | | | ASTM A 36 steel, 36,000 psi (min.), ASTM A307 |
| Concrete | | | ASTM C 150, C33, C78, ACI 305,309, 309 |
| Spiders | | MSD Std. No. 21 | |
| Vent Pipes & Fittings | | MSD Std. No. 3A & 3B Revised10-30-02 | Stainless Steel |
| Rubber or Plastic covered steel MH steps | Delta Pipe Products Company<br>M.A. Industries, Inc. | | |
| Molder Rubber Water Stops | A.C. Horn<br>W.R. Meadows, Inc.<br>Rubber & Plastics Compound Co. | | |
| Molded PVC Water Stops for const. joints | A.C. Horn | | 6" length x 3/8" thich w/ 3/4" bulb at each end |
| Flat Type Water Stops | Vulcan Metal Products, Inc. | | 6" length x 3/8" thich w/ end & intermed. Ribs |
| Molderd PVC Water Stops for expansion & const. joints - Flat type | A. C. Horn<br>Vulcan Metal Products, Inc.<br>A-H Products<br>Viveflex Corporation | | 9" length x 3/8" thick w 1" bulb at each end & 1 .5" hollow bulb in center |
| 9" Flat Type Water Stop | Vulcan Metal Products, Inc.<br>A-H Products<br>Viveflex Corporation | | 9" length x 3/8" thick w/ intermediate rib & center hollow bulb |

| | | | |
|---|---|---|---|
| Pre-molded Joint Filler & Cold Applied Sealing Compound | A.C. Horn<br>W.A. Meadows, inc.<br>Rubber & Plastics Compound Co. | | |
| Pitch & Felt | Barrett Div. Allied Chemicals Corp.<br>Flintkote Company<br>Johns-Manville | | |
| Cold Applied Cement, Nerva-Plast and Synthetic sheeting | Rubber & Plastics Compound Co.<br>Carlisle Tire & Rubber Div. of Carlisle Corp<br>Building Products Div. American Cyanamid co. | Nervastrol Seal-Purf H-D | |
| Pre-mixed Nonmetalic Grout | Cormix Construction Chemicals | Gilco | |
| Dry Packed Grout | A.W. Cook Cement Products, Inc. | | |
| Geotextile Fabric | Hocchst Celanese | Trevia Spunbond Type 1125 | |
| | A.D.S. | #8800 | |
| | Contech | C-80NW | |
| Submersible Sewerage Pumps | Clow Corporation<br>ABS Pumps Inc.<br>Hydro O Matic Pump division | | |
| Automatic dialers | Odessa Engineering, Inc. | Dialog Ultra | |
| Gate Valves & Check Valves | Mueller Company<br>M & H Valve & Fitting Co.<br>American-Darling Valve & Mfg. Co. | | |
| Air/Vacuum Valve | G.A. Industries, Inc. | Duo-Matic | |
| Submersible Grinder Sewage Pumps | Aurora/Hydromatic Pumps , Inc. | Model G2FX | |
| Rust Inhibiting Enamel paint | Koppers<br>Southern Coatings | Glamortex No. 501 Enamel (black)<br>Rustaloy No. 0537 Enamel (black) | |
| Liquid Membrane Curing Compound w/ Fugitive Red Paint | Sonneborn Contech<br><br>Lambert Corporation | <br><br>No. 64 WB Compound | |

* Saddle type fittings not acceptable on new construction.
All DIP and CIP products shall be USA manufactured and made of USA steel.
** For more detailed Standards requirements - see MSD Technical Specifications.
"Approved Equals" are accepted for all materials listed above, contractor shall submit sufficient information to MSD for review and determination that requested materials are equal to or exceeds the standards of those products listed.

Project: R-2813C
County: Buncombe




# PROJECT SPECIAL PROVISIONS
## Waterline Construction

I. GENERAL CONSTRUCTION REQUIREMENTS

The proposed utility construction shall meet the applicable requirements of the NC Department of Transportation's "Standard Specifications for Roads and Structures" dated January 2002, and the following provisions:

The Contractor is herein forewarned as to the possibility of having to vary the depth of the pipeline installation to achieve minimum clearance of existing or proposed utilities or storm drainage while maintaining minimum cover specified (whether existing or proposed pipelines, conduits, cables, mains, storm drainage are shown on the plans or not).

All ductile iron pipe shall be pressure class 2.41 MPa complying with the requirements of Subsection 1036-5 of the NCDOT Standard Specifications for Roads and Structures, unless otherwise indicated herein. Polyethylene encasement shown on the Plans shall conform to ANSI/AWWA C105/A21.5 and ASTM A674. Polyethylene encasement shall be installed where indicated on the plans as recommended by the pipe manufacturer and shall be considered incidental to the cost of the proposed pipeline.

Double strap tapping saddles shall be installed for all new/relocated water service lines 50mm and smaller in diameter.

Ball valves conforming to AWWA C800 and rated at 2.07 MPa, shall be installed on all new/affected/relocated 50mm water main service lines.

Due to the above average operating pressures of the system, all piping, valves and bends shall be properly restrained regardless of the type and soil bearing capacity. PRECAST CONCRETE THRUST BLOCKING WILL NOT BE ALLOWED.

No rodding shall be used to restrain mechanical joint fittings, mechanical joint valves, fire hydrants or fire hydrant piping, unless specifically indicated on the plans. Mechanical joint retainer glands shall be used on all mechanical joint pipe and mechanical joint connections, and shall be considered incidental to the cost of the proposed pipeline. Restrained joint fittings shall be provided within designated restrained joint pipe segments indicated on the plans, all other fittings shall be mechanical joint, unless otherwise indicated on the plans.

The Contractor shall submit his proposed method of anchoring to the Engineer for review and approval of restraining all pipe, pipe bends, valves and other related appurtenances. Anchoring will be the responsibility of the Contractor. Connecting to existing water mains may alter such lines to the extent that these pipelines with existing pipe bends, valves and other related appurtenances may also require restrained retainer glands, or reaction blocking; this is also the responsibility of the Contractor.

All valve box covers and sanitary sewer manhole covers shall be cast to indicate "WATER" or "SEWER", as the case may be with the appropriate utility owner's special cover verbiage cast into the cover.

The location, size and type of material of the existing utilities shown on the plans are from the best available information. The Contractor shall be responsible for determining the exact location, elevation, dimensions, orientation, and type of material of the existing facilities prior to ordering materials. Materials and labor required to connect the proposed pipeline to the existing pipeline shall be considered incidental to the cost of the proposed pipeline.

All structures and pipes shall be backfilled with the type of materials shown on the plans and as specified herein. **UNLESS OTHERWISE INDICATED TYPE "A" PIPE BEDDING SHALL BE USED FOR ALL WATER PIPELINE WORK.** Typical trench cross-sections are shown on the plans.

All piping shall be installed by skilled workmen and in accordance with the best standards for piping installation. Proper tools and appliances for the safe and convenient handling and installation of the pipe and fitting shall be used. Great care shall be taken to prevent any pipe coating from being damaged on the inside or outside of the pipe and fittings. All pieces shall be carefully examined for defects, and no piece shall be installed which is known to be defective. If any defective pieces should be discovered after having been installed, it shall be removed and replaced with a sound one in a satisfactory manner by the Contractor at his own expense. Pipe and fittings shall be thoroughly cleaned before they are accepted in the complete work.

All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give the appearance of good workmanship.

All piping shall be installed to the correct line and grade, with no abrupt changes in line or grade and as shown on the plans. **JOINT DEFLECTION SHALL NOT EXCEED 75 PERCENT OF THE MANUFACTURER'S RECOMMENDED DEFLECTION.** Maximum trench widths shall conform to the Trench Width Excavation Limits shown on the plans.

Following proper preparation of the trench subgrade, pipe and fittings shall be carefully lowered into the trench so as to prevent dirt and other foreign substances from gaining entrance into the pipe and fittings. Proper facilities shall be provided for lowering sections of pipe into trenches. UNDER NO CIRCUMSTANCES SHALL ANY OF THE PIPE MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH.

The full length of each section of pipe shall rest solidly upon the bed of the trench, with recesses excavated to accommodate bells, couplings, joints, and fittings.

Pipe that has the grade or joint disturbed after laying shall be taken up and relaid by the Contractor at his own expense. Pipe shall not be laid in water or when trench conditions are unsuitable for work. Water shall be kept out of the trench until jointing and backfilling are completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no water, earth, or other substance will enter the pipes, fittings, or valves. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored as required. All piping shall be installed in such a manner that it will be free to expand and/or contract without injury to itself or to structures to which it is connected. During the laying of pipe, each pipe manufacturer shall provide his own supervisor to instruct the Contractor's pipe laying personnel in the correct procedure to be followed.

Before joints are made, each pipe shall be well bedded on a solid foundation; and no pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place.

Proper and suitable tools and appliances for the safe convenient handling and laying of pipe shall be used and shall in general agree with manufacturer's recommendations. At the time of laying, if the pipe is discovered to be defective after being laid, it shall be removed and replaced with sound pipe by the Contractor at his expense.

Ordinarily only full lengths of pipe (as furnished by the pipe manufacturer) shall be used. Exceptions: (closure pieces at manholes and areas where extra joint deflection is required). The pipe manufacturer, through the Contractor, shall submit a detailed laying schedule for all pipe as part of the Shop Drawing submittals.

**AT THE CLOSE OF WORK EACH DAY THE END OF THE PIPE SHALL BE TIGHTLY SEALED WITH A CAP OR PLUG SO THAT NO WATER, DIRT, OR OTHER FOREIGN SUBSTANCE ENTERS THE PIPE, AND THIS PLUG SHALL BE KEPT IN PLACE UNTIL PIPE LAYING IS RESUMED.**

Valves shall be in the quantity, quality, types and size indicated on the Plans and specified herein. All valves shall be constructed of first-quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual valves are designated. All valve body castings shall be clean, sound, and without defects of any kind. No plugging, welding, or repairing of defects will be allowed.

Valves shall have flanged ends for exposed service and mechanical joint ends for buried service, unless otherwise shown on the Plans. Flanged ends shall be flat-faced conforming to ANSI B16.1, Class 1.73 MPa. All bolt heads and nuts shall be hexagonal of American Standard size. Non-ferrous alloys of various types shall be used for parts of valves as specified. All valves of one type shall be the product of one manufacturer.

All valves shall be lubricated, manually opened and closed at least three times before installation to check their operation; and the interior of the valve shall be thoroughly cleaned. Valves shall be placed in the positions shown on the Plans. Joints shall be made as directed under the piping specifications. The valves shall be so located that they are easily accessible for operating purposes and shall bear no stresses due to loads from the adjacent pipe. The Contractor shall be responsible for coordinating connecting piping.

Owner and Owner's Requirements:

The existing utilities belong to the City of Asheville and the Metropolitan Sewerage District of Buncombe County (MSD). The Contractor shall provide access for the Owner's representatives to all phases of construction. Notify the Owner's two weeks before commencement of any work and one week before service interruption. Interruption of water service on main lines shall be limited to a maximum of four (4) hours. Individual service connection interruptions shall be scheduled between regular working hours. Water services shall be restored within the same working day.

Working Drawings:

Before fabrication of any materials, the Contractor shall submit Shop Drawings to the Engineer. The Contractor shall be responsible for securing all of the information, details, dimensions, drawings, etc., necessary to prepare the shop drawings. The Contractor shall field verify all dimensions and elevations required for completeness and accuracy of the drawings. **THE CONTRACTOR SHALL SUBMIT A DETAILED PIPE LAYING SCHEDULE PROVIDED BY THE PIPE SUPPLIER/MANUFACTURER TO THE ENGINEER PRIOR TO ORDERING MATERIALS. THE LAYING SCHEDULE SHALL CLEARLY INDICATE HOW EVERY PIECE OF PIPE AND**

**THE MAKE-UP OF ASSEMBLIES REQUIRED FOR THIS PROJECT WILL BE LOCATED.**

Shop Drawings shall be submitted for the following:

(a) Pipes and joints (all sizes and materials)
(b) All reinforced concrete structures and manholes (including frames and covers)
(c) Miscellaneous metals
(d) All valves, hydrants, etc.

SHOP DRAWINGS ON ITEMS REQUIRING PERFORMANCE AFFIDAVITS WILL NOT BE APPROVED UNTIL ACCEPTABLE PERFORMANCE AFFIDAVITS ARE RECEIVED. ALL SUBMITTALS SHALL BE THOROUGHLY CHECKED BY THE CONTRACTOR FOR ACCURACY AND CONFORMANCE TO THE INTENT OF THE CONTRACT DOCUMENTS BEFORE BEING SUBMITTED TO THE ENGINEER AND SHALL BEAR THE CONTRACTOR'S STAMP OF APPROVAL CERTIFYING THAT THEY HAVE BEEN SO CHECKED. SUBMITTALS WITHOUT THE CONTRACTOR'S STAMP OF APPROVAL WILL NOT BE REVIEWED BY THE ENGINEER AND WILL BE RETURNED TO THE CONTRACTOR.

The Engineer's review of the Contractor's submittals shall in no way relieve the Contractor of any responsibility under the Contract. An acceptance of a submittal shall be interpreted to mean that the Engineer has no specific objections to the submitted material subject to conformance with the Drawings and Specifications.

The Engineer's review will be confined to general arrangement and compliance with the Drawings and Specifications only, and will not be for the purpose of checking dimensions, weights, clearances, fitting, tolerances, interference's, coordination of trades, etc.

Performance Affidavits:

When required in the appropriate equipment specifications, the Contractor shall submit manufacturer's Performance Affidavits for equipment or materials to be furnished. By these affidavits, each manufacturer must certify to the Contractor and the Engineer, jointly, that he has examined the Contract Documents and that the equipment, apparatus or material he offers to furnish will meet in every way the performance requirements set forth or implied in the Contract Documents. The Contractor shall transmit to the Engineer three (3) copies of the affidavit given him by the manufacturer or supplier along with the initial Shop Drawing submittals. The Performance Affidavit shall be signed by an officer of the basic corporation, partnership or company manufacturing the equipment and witnessed by a notary public. Shop Drawings, if required, will not be approved prior to receipt of an acceptable Performance Affidavit, which shall have the following format:

Addressed to: (Contractor), and NCDOT

Reference: NCDOT R-2813C BUNCOMBE COUNTY

Text: (Manufacturer's Name) has examined the Contract Documents and hereby state that the (Product) meets in every way the performance requirements set forth or implied in Section _____ of the Contract Documents.

(For pipe only): The piping, fittings and piping materials fully conform to the following standards:_____

Signature: Corporate Officers shall be Vice President or higher. (Unless statement authorizing signature is attached).

## II. WATER MAIN CONSTRUCTION

General: All materials used shall have a preliminary inspection by the Engineer and City Inspector before they will be allowed to be installed. Materials rejected shall be marked as such and shall be immediately removed from the job site. The Contractor shall furnish all materials, labor and equipment to perform all testing and inspections to the satisfaction of the City Inspector. The City of Asheville will provide water for testing purposes on all water mains. Water for the initial hydrostatic test and initial disinfection will be provided free of charge; however, water for subsequent repeat testing due to testing failure by the Contractor may result in charges under the City's residential water rate for additional water use.

Hydrostatic Testing: A section of line, which is to be hydrostatically tested, shall be slowly filled with water at a rate, which will allow complete evacuation of air from the line. Hand pumps shall not be used for the pressure testing of water mains. The hydrostatic test shall be witnessed by the City of Asheville Engineering Department for the full two-hour duration.

The line shall be tested to a minimum of pressure of 1.38 MPa with a maximum of 1.73 MPa at the lowest elevation for a duration of 2 hours. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 0.07 MPa, or less. Pressure shall be maintained at a minimum of 1.38 MPa at the highest point of the test section, throughout the duration of the test by pumping additional water into the test section through a water meter furnished by the City of Asheville. Water shall be added as often as necessary to maintain the indicated test pressure. At the end of the test period, the total leakage shall be calculated and approved by the City before the section will be accepted.

The line to be tested shall utilize a backflow prevention assembly as shown on Standard Detail 6.21. The installation and removal of the backflow prevention assembly shall be considered incidental to the cost of the proposed pipeline. All water for testing shall be drawn through the double check backflow preventer valve assembly. Prior to connecting to the existing water line, the new line shall be pressure tested, disinfected, and a clear water sample obtained and approved by the City. The allowable leakage shall be no more than 2.12 liters per 25mm diameter per kilometer of pipe per 24 hours. All visible leaks shall be repaired regardless of the amount of leakage.

Disinfection: All additions or replacements to the City of Asheville water system shall be chlorinated, tested and approved before being into service. Such disinfection shall take place under the continuous supervision of the Engineer and the City of Asheville Engineering Department. The maximum total length of water main which may be disinfected at the same time is 914 linear meters.

Disinfection of a completed line shall be carried out in the following manner:

a) Taps with extended copper tubing shall be made at the control valve at the upstream end of the line and at all extremities of the line including valves. These additional taps may not be necessary where a suitable permanent tap is already available as approved by the City.

b) Prior to introducing the chlorine solution into the pipe, all blow-offs shall be checked to confirm that all air has been expelled from the pipe and the pipe is completely filled with water. During the introduction of chlorinated solution into the pipe, the operation of blow-offs shall be carefully controlled to make sure that solution enters all main lines, branch lines, and service lines thoroughly and that no air is introduced.

c) All pressure gauges and residual chlorine field test equipment shall be properly calibrated. All equipment used in the disinfection process shall be cleaned and disinfected suitable for potable water application.

d) A solution of water containing a high concentration of sodium hypochlorite (70% available chlorine) shall be introduced into the line by regulated pumping at the control valve tap. The solution shall be of such concentration that the line shall have a uniform concentration of 50 ppm total chlorine immediately after disinfection. The chart below shows the required quantity of 70% HTH compound to be contained in solution in each 304.8m section of line to produce the desired concentration of 50 ppm.

| Pipe Size (mm) | Kilograms Hypochlorite (70%) per 304.8m of line |
|---|---|
| 150 | 0.40 |
| 200 | 0.71 |
| 250 | 1.10 |
| 300 | 1.59 |
| 350 | 2.16 |
| 400 | 2.82 |
| 500 | 4.43 |
| 600 | 6.35 |

e) Once the new main is uniformly chlorinated at the required concentrations as confirmed by the Engineer and the City Engineering Department Inspector, entrances and blow-offs shall be properly secured and the solution shall be retained in the system for a minimum of 24 hours, during which time all intermediate valves and hydrants shall be operated several times to insure that the pipe is still full of solution without trapping air and the solution at each point checked has retained a chlorine residual of not less than 10 mg/L.

f) Following the 24-hour period, with the approval of the Engineer and the City Inspector, the chlorine solution shall be thoroughly flushed from the new main. Flushing shall not be completed until the residual chlorine measured by the Engineer and City Inspector at

the end points of the new main has a measured chlorine residual within +/- 0.5 mg/L of the water supplied for flushing from the active water main.

g) Disposal of the chlorinated solution during flushing shall comply with all federal, state and local regulations. Where a sanitary sewer is located nearby, with the approval of MSD, the chlorinated solution may be discharged to the sanitary sewer system with a positive air gap to prevent a backsiphon. Disposal directly to surface waters without removal of chlorine is strictly prohibited.

h) After flushing is completed as described above, the new water mains shall be isolated without introducing air by closing all entrances and blow-off points and allowing the new mains to sit for another 24-hour period. At the end of this 24-hour period, an authorized employee of the City of Asheville Water Production Division shall collect samples from randomly selected end points of the new water mains and perform bacteriological analysis of the samples in a certified laboratory. Results of the testing shall be documented and certified by signature of the laboratory technician and Water Production Supervisor or Superintendent. Test results shall be provided to the Contractor, Resident Engineer, and City Engineering Department. The disinfection process is not completed until the results of all testing are certified as negative for bacteriological contamination.

i) If the bacteriological tests fail to produce satisfactory results, the new water mains shall be reflushed by repeating steps f) through h) above. If bacteriological tests fail the second time, the entire disinfection process shall be repeated.

j) The Contractor shall give the City of Asheville one week advanced notice prior to doing any of the above mentioned procedures.

## III. COMPENSATION

No direct payment shall be made for utility construction work required by the preceding provisions, which are general requirements applying to utility construction, and all of the requirements stated will be considered incidental work, paid for at the Contract unit prices of the various utility items included in the Contract.

### 1. BEDDING MATERIAL:

Bedding material for utility lines shall be installed in accordance with the applicable utility provisions herein, as shown on the utility construction plans, and/or as directed by the Engineer.

Bedding material shall meet the requirements of Article 1016-3 of the Standard Specifications. Bedding material shall be installed in accordance with Articles 300-6 and 300-7 of the Standard Specifications.

Bedding material installed in accordance with the plans and provisions herein and accepted, will be measured and paid for at the contract unit price per metric ton for "Bedding Material, Utilities Class VI ". Such prices and payments shall be full compensation for all materials, labor, equipment, compaction and shaping the bedding material in accordance with Article 300-4 of the Standard Specifications, and incidentals necessary to complete the work as required.

2.. BUTTERFLY VALVE ASSEMBLY:

Butterfly valves shall be of the rubber-seated, tight-closing type, conforming to the latest revision of AWWA C504 Specifications. The manufacturer shall have a minimum of 5 years experience in manufacturing butterfly valves of the sizes required in accordance with AWWA C504 Specifications. All butterfly valves shall be the product of one manufacturer. Each valve shall be performance and leak tested as specified in AWWA C504 revised as follows: In addition to the testing requirements of AWWA C504, each butterfly valve shall be thoroughly cleaned and opened and closed at least three (3) times prior to testing. Certified copies of the test results shall be submitted to the Engineer for approval prior to shipment of the valve.

Butterfly valves shall be Class 250B of short body design with mechanical joint ends as shown on the Plans. Butterfly valves shall be designed for a minimum working pressure of 1.73 MPa and a test pressure of 3.46 MPa. The valve body shall have cast thereon "250B" to denote the valve as of the working pressure defined by these specifications.

Valve bodies shall be epoxy coated cast iron conforming to ASTM A-126, Grade B, ASTM A-48, Class 40 or Ductile Iron ASTM A536, Grade 65-45-12. Where required to meet design operating conditions, valve bodies shall be manufactured of higher strength materials. Valve bodies shall have integral hubs for housing shaft bearings and seals. The valve body thicknesses shall exceed the AWWA C504 Class 150B thickness by 20% for valves 300mm through 600mm and by 50% on valves 750mm and larger.

Butterfly valves shall be of the concentric or eccentric shaft types. Valve discs shall be constructed of epoxy coated ductile iron, ASTM A536, Grade 65-45-12. Disks shall be of the "offset" design to provide a full 360 degree seating surface with no external ribs transverse to flow, and shall comply with the latest revision of AWWA C504 Specifications. The valve manufacturer shall furnish Shop Drawings, which include end clearance dimensions when the disc is in the full open position.

The resilient valve seat shall be synthetic rubber designed to seat against a pressure differential of 1.73 MPa on either side of the valve. The resilient seat shall be mechanically attached to the valve disc or valve body. Any required seat attachment hardware shall be stainless steel. The resilient seat shall be capable of being adjusted or replaced in the field without moving the valve disc along the shaft axis, or removing the valve from the line. The mating seat surface shall be stainless steel or monel. The seats shall be factory tested as per AWWA C504 at a test pressure of 1.73 MPa, and post adjusted for differential pressures indicated herein.

Valve shafts shall be one-piece or two-piece units of stainless steel construction meeting ASTM A564, Type 630 condition H1110, non-rising, suitably sized to transmit the torques required to operate the valve under a differential pressure of 1.73 MPa with appropriate safety factor. Shafts shall be securely attached to valve disc by means of conservatively sized corrosion-resistant taper pins, threaded at one end and secured with lockwashers and nuts (i.e.: mechanically attached). Provide O-ring seal on taper pin if required to prevent leakage. Shaft key shall be constructed of corrosion-resistant material.

Shaft bearings shall be contained in the integral hubs of the valve body and shall be the permanently self-lubricated, corrosion resistant, sleeve type of teflon or heavy-duty bronze. The valve assembly shall be furnished with a factory set two-way thrust bearing designed to center the valve disc in the valve seat at all times. End cover bolts shall be of stainless steel construction.

A shaft seal shall be provided of the type utilizing "O" ring seals. Stuffing boxes shall be specifically designed for the operating pressures to be encountered. Stuffing box bolts, studs and nuts shall be stainless steel.

The "O" ring type shaft seal shall be contained in a removable bronze cartridge. The bronze cartridge shall be manufactured from ASTM B505 copper alloy UNS #C93200 and shall meet the requirements of AWWA C504 for bronze, Grade E. The "O" ring material shall be nitrile, BUNA-N rubber, as intended for use with potable water and per ASTM D-2000 with a hardness of 70 Shore A Durometer.

Manual operators for butterfly valves shall be the traveling nut type conforming to AWWA C504. Operators shall be equipped with adjustable AWWA limit stops and shall open counterclockwise. The capacity of the manual operator shall be adequate to drive the valve under the differential pressure of 1.72 MPa and maximum flow rate of 0.580 $m^3$/sec. Actuators shall provide stop limiting devices for the open and closed positions. Actuators shall be not less than 90% grease packed and totally sealed by gaskets, O-rings, or similar means for buried services. The manufacturer shall certify that the butterfly valves are capable of operating in continuous duty service under these pressures and flow conditions.

Each valve shall be hydrostatically tested and tested for bubble tightness after the operator has been mounted and adjusted. Copies of the hydrostatic and leakage test certification and certification of conformance shall be submitted to the Engineer prior to shipment.

All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (0.25 mm DFT) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

All valve boxes shall be of the sliding type, placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve boxes rest shall be thoroughly compacted to prevent settlement. The boxes shall be fitted together securely and set so that the cover is flush with the finished grade of the adjacent surface. A concrete pad as detailed on the plans shall be provided around the valve box, sloped outwards. All valve boxes shall be 2-piece cast iron, sliding type, 130 mm shaft, with heavy duty traffic weight collar and the lid marked with the appropriate carrier product (i.e.: WATER).

Concrete thrust collars shall be in accordance with the detail shown on the plans. Class A concrete and Grade 60 reinforcing steel shall be used. The excavation at such location(s) shall receive special attention with such undisturbed materials within as short a distance as possible from the pipe. The concrete thrust collar (ring) shall be provided on the pipe by the pipe manufacturer. No after manufacture rings will be allowed. Thrust collar rings shall be designed for a dead end thrust load of at least 1.72 MPa internal pressure and shall be fabricated from steel or annealed ductile iron.

Butterfly valve assemblies, installed in accordance with the plans and provisions herein and accepted, will be paid for at the contract unit price per each for "___"MM ButterflY Valve Assembly. Such prices and payments will be full compensation for all materials, excavation, equipment, labor, installation, grouting, backfilling, butterfly valve, flanged piping, fittings, thrust collars (if required), threaded rods, rod tabs, manhole, ring and cover, valve box and pad, valve wrench guide, compacted stone, and incidentals necessary to complete the work required.

3. AIR RELEASE VALVE ASSEMBLY

The pressure air release valve shall be constructed of cast iron with stainless steel trim and stainless steel float, and all working parts shall be bronze, brass, stainless steel, or other corrosion resistant material. All connecting parts (nipples, bends, etc) shall be brass. The valves shall be designed for a minimum working pressure of 1.034 MPa and a test pressure of 2.069 MPa. All valves shall be provided with seating material to provide drip-tight closure at pressures greater than 1.03 MPa. **All valves shall be provided with a vacuum check.**

All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (0.25 mm DFT) of the manufacturer's premium (NSF approved) epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

PRESSURE AIR RELEASE VALVE

| Location | Size | Orifice | PRV Discharge Capacity @ 0.345 MPa | Model # | Connection |
|---|---|---|---|---|---|
| All | 50mm | 7.813mm | 59 SCFM | PL20/V5 | Screwed |

The Air Release Valve Assembly, installed in accordance with the plans and provisions herein and accepted, will be paid for at the contract unit price per each for "Air Release Valve Assembly". Such prices and payments will be full compensation for all materials, excavation, equipment, labor, installation, backfilling, pressure air release valve, copper tubing, fittings, tapping sleeve/service saddle, corporation cocks, copper tube adapter, ball valve, meter box and cover, support bricks, compacted washed stone, and incidentals necessary to complete the work required.

4.. 900 mm STEEL ENCASEMENT PIPE:

Steel encasement pipe shall be installed in accordance with the applicable utility provisions herein, as shown on the utility plans, and/or as directed by the Engineer. Steel encasement pipe may be of the following types: - spiral welded steel pipe in accordance with ASTM A211; circular black or galvanized steel pipe in accordance with ASTM A53 or A589; high strength smooth wall steel casing in accordance with API-5L, Grade B, or other grades; or other steel pipe of acceptable quality and meeting the approval of the Engineer.

Steel encasement pipe shall be installed with leak proof joints. The joints shall be butt-welded by a certified welder using approved techniques and materials.

Steel encasement pipe installed under roadway pavement by methods other than opening the pavement shall be by simultaneous boring and jacking. Larger pipe may be installed by pushing the casing pipe through a bored hole provided all voids around the casing are grouted with mortar at 0.345 MPa under the supervision of the Engineer.

Simultaneous boring and jacking of casing under pavement shall be as follows: The pipe shall be installed by a special rig designed to bore and push or jack the casing on a controlled grade and line under the pavement in a continuous operation. As the dry boring operation progresses, each new section of casing shall be butt-welded to the section previously jacked into place. The

boring auger shall not be of a greater diameter than the outside diameter of the casing.

The carrier pipe shall be installed inside the encasement pipe by use of skids or spiders appropriately spaced to support the carrier pipe from deflection. Skids or spiders shall be sized to raise the carrier pipe bells above the encasement pipe and to restrict excessive radial movement. Skids or spiders shall be securely attached to the carrier pipe and shall be approved by the Engineer.

After the carrier pipe is installed and tested, the ends of the encasement pipe shall be plugged or capped with concrete, brick or other approved materials. The plug or cap shall have a 25mm diameter weep hole at the bottom to facilitate drainage of the encasement pipe.

Steel encasement pipe, installed in accordance with the plans and provisions herein and accepted, will be measured along the pipe from end to end and paid for at the contract unit price per linear meter for "_900 mm Steel Encasement Pipe, 12.5 mm Thick, by Boring and Jacking". Such prices and payments will be full compensation for all materials, excavation, equipment, labor, installation, grouting, backfilling, and incidentals necessary to complete the work as required.

5. GATE VALVE AND VALVE BOX:

Gate valves 100 mm through 400 mm shall be of the non-rising stem design, shall fully comply with the requirements of AWWA C509 for resilient-seated gate valves. Gate valves shall be designed for a minimum working pressure of 1.38 MPa and a test pressure of 2.76 MPa.

Gate valve body and bonnet shall be ductile iron with resilient seat gate and O-ring seals. The gate shall be cast iron with a vulcanized rubber coating with no metal to metal contact when in the fully closed position and a smooth unobstructed waterway when in the fully opened position.

Gate valves shall be mechanical joint as shown on the Plans in Detail 207, and 50 mm square standard AWWA operating nuts unless otherwise shown on the Plans or specified herein.

All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (0.25 mm DFT) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

All valve boxes shall be of the sliding type, placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve boxes rest shall be thoroughly compacted to prevent settlement. The boxes shall be fitted together securely and set so that the cover is flush with the finished grade of the adjacent surface. A concrete pad as detailed on the plans shall be provided around the valve box, sloped outwards. All valve boxes shall be 2-piece cast iron, sliding type, 130 mm shaft, with heavy duty traffic weight collar and the lid marked with the appropriate carrier product (i.e.: WATER).

Mechanical joint retainer glands shall be manufactured of ductile iron conforming to ASTM A 536 such that the device can be used with standardized mechanical joint pipe and conform to ANSI/ AWWA A 21.531 C153.

Concrete thrust collars shall be in accordance with the detail shown on the plans. The excavation at such location(s) shall receive special attention with such undisturbed materials within as short a distance as possible from the pipe. Class A concrete and Grade 60 reinforcing

steel shall be used. The concrete thrust collar (ring) shall be provided on the pipe by the pipe manufacturer. No after manufacture rings will be allowed. Thrust collar rings shall be designed for a dead end thrust load of at least 1.73 MPa internal pressure and shall be fabricated from steel or annealed ductile iron.

The gate valve and valve box, installed in accordance with the plans and provisions herein and accepted, will be paid for at the contract unit price per each for " ___MM Gate Valve and Valve Box". Such prices and payments will be full compensation for all materials, excavation, equipment, labor, installation, backfilling, mechanical joint gate valve, piping, fittings, mechanical joint retainer glands, thrust collars (if required), valve box and pad, and incidentals necessary to complete the work required.

6.. FIRE HYDRANT:

Fire hydrants shall be installed in accordance with the applicable utility provisions herein, as shown on the utility plans, and/or as directed by the Engineer.

Fire hydrants shall be iron body, fully bronze mounted, dry barrel type conforming to AWWA C502, and ASTM B61, 62, or B96. Hydrants shall be suitable for a working pressure Hydrants shall be suitable for a working pressure of 1.38 MPa and be tested to 2.76 MPa. The rated working pressure shall be cast on the hydrant barrel. Hydrants shall be constructed to permit withdrawal of internal working parts without disturbing the barrel or casing. Valves, when shut, shall be reasonably tight when the upper portion of the barrel is broken off. All hydrants shall have a breakable safety flange located at the connection of the barrel of the hydrant. Hydrants shall have 150mm shoe with mechanical joint. All fire hydrants connected to water mains 150mm through 250mm in size shall have a 150mm barrel with double 63.5mm hose connections and a single 114.3mm steamer connection. All steamer connections shall include caps attached to the body with a 2/0 minimum twist link, non-kinking, heavy-duty machine chain. All caps shall be greased with the manufacturer's specified lubricant and only be hand-tight. Caps shall include threaded connections conforming to National Standard Threads. Working parts shall be bronze. Hydrants shall be connected to the main with 150mm diameter pipes. Design, materials, and workmanship shall be similar and equal to the latest stock pattern ordinarily produced by the manufacturer. Hydrants shall include a 38.1mm pentagon operating nut, painted bronze to bronze seating, and a drain in the boot to drain barrel when hydrant seat valve closed. The hydrant bonnet shall be designed with a sealed oil and grease reservoir with o-ring seals and a teflon thrust bearing. Operating nut shall open counterclockwise and be so marked. Barrel shall be of sufficient length to stand approximately 750mm above the ground and maintain a cover of 1M unless otherwise specified.

Hydrants shall be factory coated as follows: (1) barrel and pipe shall have one coat of primer gray oil – base and two coats of safety yellow epoxy enamel; (2) caps shall have one coat of primer gray oil – base and two coats of red epoxy enamel; and (3) bonnets an caps shall have one coat of primer gray oil – base paint only.

Fire hydrants shall be located and installed as shown on the utility plans. Hydrants shall be set plumb with the pumper nozzle facing the roadway and with the breakaway safety flange between 25mm and 100mm above the finished grade. Except where approved otherwise, the backfill around the hydrant shall be thoroughly compacted to the finished grade line immediately after installation to obtain beneficial use of the hydrant as soon as possible. Not less than 0.2 cubic meters of crushed stone shall be placed around the base of the hydrant to insure proper drainage of the hydrant barrel.

Fire hydrants, installed in accordance with the plans and provisions herein and accepted, will be paid for at the contract unit price per each for " Fire Hydrant 1.38 MPa WP". Such prices and payments will be full compensation for all materials, excavation, equipment, labor, installation, rods, reaction blocking, backfilling, piping, fittings, compacted stone, and incidentals necessary to complete the work required.

7. Remove Existing Fire Hydrant:

Existing fire hydrants to be removed as part of the utility construction shall be eliminated at the locations shown on the plans. Hydrants shall be removed and stockpiled onsite for recovery by City personnel. A storage location and pick up schedule shall be arranged prior to removal of any existing fire hydrants.

Existing fire hydrants, removed in accordance with the plans and provisions herein and accepted, will be paid for at the contract unit price per each for "Remove Existing Fire Hydrant". Such prices and payments will be full compensation for all materials, excavation, equipment, labor, storage, and incidentals necessary to complete the work required.

8. WATER METER ASSEMBLY:

Water meter assemblies are to installed at the locations shown on the plans and/or as directed by the Engineer. Water meter assemblies shall consist of angle valves, expansion connector, yoke bar, backflow preventer, and meter box. The meter will be provided by the City of Asheville.

Meter yoke shall include a soft seating meter stop ball valve with a padlock wing. The valves internal components shall be removable from the top of the valve body. An in-line dual check valve (backflow preventer) with independent acting checks shall be used downstream of the water meter. The check valve shall have a meter coupling inlet and shall be contained inside the box. The internal parts of the check valve shall be removable without disconnecting the check valve or outlet piping. All brass materials used in contact with the water shall have a minimum copper content of 80% and a maximum zinc content of 10%. The yoke shall include a threaded expansion wheel on the inlet side to the water meter and a smooth machined brass surface on the outlet side to compress a meter washer into the dual check inlet rated for 1.72 MPa; tightening lugs shall extend from the wheel to allow easy access.

Meter box shall be round style and made of polyvinyl chloride plastic with a minimum wall thickness of 0.952mm. The box shall be sized to accept a 16mm meter and shall have a minimum inside diameter of 457mm with a 762mm depth. The box shall have a non-locking cast iron lid. The meter box shall be placed with the top of the meter box flush with finished grade of the project.

The Water Meter Assembly, installed in accordance with the plans and provisions herein and accepted, will be paid for at the contract unit price per each for " Water Meter Assembly". Such prices and payments will be full compensation for all materials, excavation, equipment, labor, installation, backfilling, angle valves, expansion connector, yoke bar, backflow preventer, and meter box and cover, piping, fittings, compacted stone, and incidentals necessary to complete the work required.

9. DI RESTRAINED JOINT WATER PIPE FITTINGS:

Restrained joint fittings shall be provided as specified herein and shown on the plans. Restrained fittings shall consist of either bolted retainer rings and welded retainer bars or the boltless type which includes ductile iron locking segments and rubber or neoprene retainers.

Restrained fittings utilizing tie-rod segments are not to be used. Restrained joint fittings shall be manufactured in accordance with ANSI/AWWA C151/A21.51, ANSI/AWWA C110/A21.10, ANSI/AWWA C111/A21.11 and ANSI/AWWA C153/A2153. Bolts and gaskets for restrained joint fittings shall be as recommended by the pipe manufacturer.

The quantity of restrained joint fittings, installed in accordance with the plans and provisions herein accepted, will be measured and paid for at the contract unit price per kg for "DI Restrained Joint Water Pipe Fittings. "Such prices and payment will be full compensation for all materials, excavation, equipment, labor, installation, backfilling, and incidental necessary to complete the work required.

**PROJECT: R – 2813C**
**COUNTY: Buncombe**

## PROJECT SPECIAL PROVISIONS
**Utility Conflicts**

**UTILITY CONFLICTS:**

General:

The following utility companies have facilities that will be in conflict with the construction of this project:

**A. Progress Energy – Power (Distribution)**

**B. Charter Communication**

**C. BellSouth – Telephone**

**D. PSNC Energy (Gas)**

The conflicting facilities of these concerns will be adjusted prior to the date of availability, unless otherwise noted and are therefore listed in these special provisions for the benefit of the Contractor. All utility work listed herein will be done by the utility owners. All utilities are shown on the plans from the best available information.

The Contractor's attention is directed to Article 105.8 of the Standard Specifications.

All existing facilities will remain in place and be abandoned after the new facilities are installed and in service, within each phase as described below.

Utilities Requiring Adjustment:

**A. Progress Energy – Power (Distribution)**

1) **Phase 1-** Sta. 35+00 to Sta. 57+82 Line -L- (Miami Rd.)
They will start their power pole line relocations at the beginning of the project and continue left of Line –L- to (Sta. 57+82) (Miami Road.) This phase will take 6 months, and was started on October 15, 2004.

2) **Phase 2-** Sta, 57+82 Line – L- (Miami Rd.) to Sta. 64+71 (End of Proj.)

This power pole line relocation phase can begin after the proposed culvert left of Line –L- at Sta. 59+00, proposed retaining walls, and proposed rough grading left of Line – L- are completed. This phase will take 2 months.

**B. Charter Communication**

1) . **Phase 1 -** After Progress Energy poles are installed and available, (April 15, 2005), Charter will attach their aerial cable , starting at the beginning of the Project and continuing until Sta. 57+82 (Miami Road.). This phase will take 3 ½ months.( August 1, 2005)

**2) Phase 2** - After Progress Energy poles are installed and available, Charter will attach their aerial cable , starting at Sta. 57+82 (Miami Road.) and continuing until Sta. 64+71 (End of Project). This phase will take 45 days.

**C. BellSouth**

1) **Phase 1 -** After Progress Energy poles are installed and available,(April 15, 2005) BellSouth will attach their aerial copper lines starting at the beginning of the Project and continuing to Sta. 47+49 (Plott Place.). This phase will take 9 months.(January 1, 2006)

2) **Phase 2 -** After Progress Energy poles and Charter lines are installed and available, and phase 1 is complete,(January 1, 2006) BellSouth will attach their aerial copper lines starting at Sta. 47+49 (Plott Place) and continuing to Sta. 57+82 (Miami Road). This phase will take 6 months.(July 1, 2006)

3) **Phase 3** - After Progress Energy poles and Charter lines are installed and available, and phase 2 is complete,(July 1, 2006) BellSouth will attach their aerial copper lines starting at Sta.57+82 (Miami Road) and continuing to Sta. 64+71 (End of Project). This phase will take 6 months.(January 1, 2007)

4) **Phase 4** – The existing telephone terminal located left of Line –L- at Sta.44+60, will be abandoned and removed after a new terminal is installed outside of the R/W. This procedure will take place after phase 1 is complete. This phase will begin on January 1, 2006 take 6 months to complete.(July 1, 2006)

**D. PSNC Energy (Gas)**

1) After rough grading left of line – L- throughout the project limits, PSNC will begin their installations and be complete in 4 months.