TECHNICAL SPECIFICATIONS

FOR

CITY OF COOKEVILLE

SEWER FORCE MAINS

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Department of Water Quality Control

City of Cookeville, Tennessee
1860 South Jefferson Avenue
Cookeville, Tennessee 38506

Revised: March 15, 2023

CONSTRUCTION SPECIFICATIONS INDEX

1. SEWER FORCE MAIN AND APPURTENANCES

1. SEWER FORCE MAIN AND APPURTENANCES

1-01 Section I: Scope

1. This item shall consist of furnishing all material and performing all work necessary for or incidental to completing and making ready for operation sewer force main and appurtenances including testing, clean-up and all other operations necessary to complete the work in accordance with the Contract Drawings and these Specifications.

2. The Contract drawings indicate the extent and general arrangement of Water Systems. If any departure from the Contract Drawings are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted as soon as practicable for approval. No such departures shall be made without written approval.

3. The Drawings and these Specifications shall be considered as supplementary, one to the other, so that materials and labor indicated, called for, or implied by the one and not the other, shall be supplied and installed as though specifically called for on both. Should any discrepancy appear or any misunderstanding arise, the Engineer/Owner shall decide the true intent and his decision shall be binding.

4. A pre-construction conference is required for all projects

5. On contracts made with the City, the "Owner" is the City. On such contracts the references to pay items apply.

6. On contracts between a private developer and a contractor, the "Owner" is generally the developer. The two parties are to reach their own agreement regarding pay items and what constitutes extra cost items. The City shall not be responsible for payment of any items on such contracts with developers.

7. A video shall be submitted for all contracts with the City. Before beginning the job, the Contractor shall make a video recording showing the status before any construction has begun. The video(s) shall be made, submitted and approved prior to the beginning of work. The video shall be submitted on a DVD.

8. As-builts shall be submitted to the owner upon completion of the project. As-builts must show accurate location, of all fittings, valves, air release valves, and other appurtenances as specified by the Engineer before project will be accepted by the city.

9. Caution shall be taken around existing utilities. The contractor is responsible for all costs incurred when utilities are disturbed during construction. All material, labor, and vehicle costs will be charged to the contractor from all departments within the city. It is the contractor's responsibility to contact utilities outside of the city when disturbed. Water services damaged during subdivision development will be replaced from the meter setter to the main where connected, not repaired.

10. Any structures or utilities that need to be moved or held during construction shall be the responsibility of the contractor. It is the responsibility of the contractor to contact the City of Cookeville Electric Department or UCEMC to maintain, hold, or move guy wires or utility poles. Any costs incurred are considered part of the project cost and are the responsibility of the contractor.

11. In Subdivision Development, property pins must be installed before water and sewer line installation can begin.

12. Contractor must install temporary fencing on a project site as needed when existing fencing is disturbed for farm animals or household pets. Property owners shall be contacted to ensure optimal placement of fencing.

1-02 Section II: Quality Assurance and Warranty:

Installation and materials shall conform to the construction standards of the local governing authority and to the Tennessee Department of Environment and Conservation.

The Contractor and/or Developer shall provide a one-year maintenance warranty on all water lines and related appurtenances.

1-03 Section III: Applicable Documents and Specification Reference

The acronyms and names of various organizations are used throughout this document. Publications by these organizations referenced in these specifications form a part of this specification and where referred to by basic designation only, are applicable to the extent indicated. The latest editions of the publications referenced shall apply to the work.

1. AASHTO: American Association of State Highway and Transportation Officials)

2. ASTM: American Society for Testing and Materials (ASTM)

3. The terms "State Specifications," as used herein, refer to the State of Tennessee Division of Highways, "Standard Specifications for Road and Bridge Construction" current at the date of this Specification. Reference to State Specifications is solely for the purpose of specifying quality of materials and/or methods of construction as therein set forth.

4. The term A.S.A. as used herein refers to the American Standards Association.

1-04 Section IV: Material Handling

1. Deliver materials to the job site and store in a safe, dry place with all labels intact and legible at time of installation.

2. All materials furnished by the Contractor shall be delivered and distributed at the site by the Contractor. Materials furnished by the Owner shall be picked up by the contractor at points designated and hauled to and distributed at the site.

3. Protection of materials for the project before, during, and after installation, and protection of installed work, and materials of all other trades shall be the responsibility of the contractor. In the event of damage, the contractor shall make all repairs and replacements necessary to the approval of the owner at no additional cost to the owner. If requesting stored materials, the City shall be able, at any time, to inspect materials for quantities and to ensure correct storage procedures, as defined by the manufacturer, are being followed.

4. Ductile iron pipe, fittings, valves, hydrants and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. In distribution of the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench.

1-05 Section V: Materials

1. GENERAL:

A. Materials, pipe and accessories shall be new and unused materials of the size and type shown on the Drawings and conforming to the requirements of the applicable article of this Section of the Specifications.

B. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign matter before lowered into the trench, and shall be kept clean during laying operations. The pipe shall not be laid in water or when trench or weather conditions are unsuitable for work. When the work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other foreign substance can enter the line.

C. Any section of pipe, or fitting, or accessory found to be defective, either before or after laying, shall be replaced with new material at no additional expense to the Owner.

D. The nominal pipe size, type of plastic, ASTM designation, SDR, and name of manufacturer shall be clearly marked on each length of pipe.

2. Polyvinyl Chloride (PVC) Water Pipe:

A. PVC pipe shall be Class 200 (SDR 21- green) unless SDR-17 is required on the plans. pressure rated valve, manufactured in accordance with the latest revisions of the following specifications:

ASTM-D2241
Department of Commerce PS 22-70 (SDR-PR)
National Sanitation Foundation Laboratories (NSF)

B. Materials used to produce the pipe couplings and fittings shall conform to ASTM D 1784, Type 1, Grade 1, 2000 psi design stress. The pipe shall be designed to pass without failure of pressure of 600 psi for 90 seconds when tested in accordance with PS 22-70 as referenced to ASTM D1599. In addition, the pipe shall pass without failure for 1000 hours a pressure of not less than 340 psi when tested in accordance with ASTM 1598. Rubber gaskets shall conform to ASTM D1869. All necessary fittings and adapters shall be provided as necessary to connect to water system facilities.

C. The PVC pipe must meet the requirements of Policy Statement from the Tennessee Department of Public Health dated July 6, 1971, and all subsequent statements relating to PVC pipe by the Tennessee Department of Environment and Conservation - Division of Water Supply.

3. Ductile Iron Pipe:

A. All ductile iron pipe for sewer shall have 401 protecto interior coating. Ductile iron pipe shall be Pressure Class 350 unless noted otherwise on the plans. The ductile iron pipe shall be designed in accordance with AWWA C151 method of design based on 21,000 psi bursting tensile strength and 45,000 psi modules of rupture for a minimum of 150 psi water working pressure, laying conditions "Type 2" flat bottom trench, without blocks, tamped backfill, and under 3 feet of cover.

B. Ductile Iron Fittings shall conform to AWWA Standard, C-153 for compact fittings, latest revision. Joints shall be mechanical joint or flanged as required, Protecto 401 coating. 3" and larger mains shall use DI MJ fittings with Protecto 401.

4. Polyethylene Pipe (HDPE):

Polyethylene pipe (HDPE) shall have a co-extruded green cover or stripes designating use for potable water. Pipe shall be HDPE 4710, manufactured

by an approved manufacturer. HDPE 4710 may also be used for casing pipe where designated. Pipe with extruded green stripes shall have a minimum of three equally spaced stripes. Pipe shall have a heat indented print line containing the information required in ASTM D 3035. Sizes larger than 2 inch shall be Ductile Iron Pipe Size (DIPS) in compliance with *AWWA C906* and *ASTM F 714*. Sizes smaller than 2 inch shall be Iron Pipe Size (IPS) in compliance with *AWWA C901* and *ASTM D 3035*. Pipe smaller than 2 inch shall be SDR 9. Pipe 2 inches and larger shall be SDR 11. All pipe shall be in compliance with *NSF 61*. Color print lines are not an acceptable method for color marking of pipe. The transition of HDPE to PVC on new lines shall be with a Poly-Cam fittings or approved equal. If SDR-21 is specified and HDPE is allowed to be used as an alternate, the HDPE shall be sized one nominal size larger.

5. Gate Valves:

Gate valves shall be of the resilient seat type, flanged valve, conforming to AWWA Standards, tested to 300 pounds hydraulic pressure, suitable for 150 pounds working pressure. Valve shall have mechanical joint ends (some applications for a 2" valve require threaded valves), and inside screw, and shall be equipped with an operating wheel – open left. All in-line gate valves are to have Protecto 401 coating. Valves 3" and larger shall have MJ x MJ end. Mechanical restraints shall be used on valves less than 3".

6. Air Release Valves

A. Air release valves for normal use in the system shall be A.R.I or APCO brand valves and be combination valves. ARI D-025 is the acceptable ARI valve.

B. Air release valves shall be installed in valve basins as shown on the plans.

7. Valve Basins:

Precast concrete manholes shall conform to Designation C478, latest revision and the Standard Detail Drawings. Standard manholes shall be circular in shape and shall be constructed of precast concrete manhole sections in general conformity with the Standard Detail Drawings. Any

manhole materials that have been damaged or are otherwise unsuitable for use in the work shall be rejected and removed from the site and shall be replaced at the Contractor's own expense.

A. Sidewalls shall be precast concrete manhole section.
B. Gravel base made of No. 57 stone, minimum 6" deep, manhole cone/barrel extension to be plumb with gravel base.
C. Valve basin frame and covers shall be of the type and weight shown on the plans or as specified by the Engineer. The standard frame and cover shall be traffic type of gray cast iron ASTM Designation A48, latest revision, with a 24-inch minimum diameter opening, traffic rated. JBS 1150, JBS 1150D, and Vulcan V-1380 are acceptable. Submittal required.
D. Valve basin steps shall be of cast iron to the design and section shown on the plans.
E. Contractor shall furnish and install a rubber adjustment riser as needed or directed by the engineer in streets to make casting flush with existing pavement surface or meet ground incline conditions. Adjustment risers shall be Flex-O Ring Series BE 864 (inclined), Infra-RISER 32800 Series, or as approved by engineer.

8. Service Connections:

A. On 2" & 3" Ductile Iron or PVC mains, service tees shall be a Harco restrained (pipe size-in.) x 1.25". On low pressure mains 4" and larger, a DI tee with Proteco 401 shall be utilized.
B. On 2" HDPE mains, a ___ shall be used for in lieu of a service tee. On mains larger than 2", a GFPS Electrofusion high volume tapping tee (DR-11) shall be used.
C. Service line material shall be either 1.25" Schedule 40 PVC (for DI/PVC mains) or DR-11 HDPE (IPS) for HDPE mains.
D. E-one stainless steel lateral kit shall be utilized inside of the service box. The lateral kit installed shall be accessible (depth) as determined by the City.
E. Service box shall be a Highline Jumbo Utility Box with a drop-in green lid designated in words "sewer", or approved equal.
F. Sewer service boxes shall not be stacked on top of each other unless approved by the City. A single box shall be utilized.

8. Concrete:

A. Class "A" concrete shall have the following characteristics and/or proportions of materials.

(1) Minimum Cement Content:
6.0 bags (564 pounds) per cu. yd.

(2) Minimum 28-day Compressive Strength:
3500 psi avg. any three cylinders.

(3) Anticipated 28-day Compressive Strength:
3700 psi or greater.

B. Class "C" concrete shall have the following characteristics and/or proportions of materials.

(1) Minimum Cement Content:
5.0 bags (470 pounds) per cu. yd.

(2) Minimum 28-day Compressive Strength:
2500 psi avg. any three cylinders.

Compressive strength of concrete shall be determined by use of standard 6-inch diameter by 12-inch test cylinders in accordance with ASTM Designations C 39-80 and C 31-69 (1980), as amended to date.

Materials not mentioned in this section shall follow the standard detail sheet provided by the City. Any deviations from the language in this section or on the standard detail sheet will need to be submitted and approved by the City. All materials to be used shall be submitted to the City (Environmental Engineer and/or Civil Engineer) for approval prior to ordering.

1-06 Section VI: Responsibility for Material Furnished by the Contractor

1. The Contractor shall be responsible for all material furnished by him and shall replace at his own expense, all such materials found defective in manufacturer or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labor required for the

replacement of installed material discovered defective prior to the final acceptance of the work.

2. The Contractor shall be responsible for the safe storage of material furnished by or to him, and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all pipes, fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

3. Any material furnished by the Owner that becomes damaged after acceptance by the Contractor shall be replaced by the Contractor at his own expense.

1-07 Section VII: Alignment and Grade

1. The force main shall be laid and maintained to the required lines and grades established by the Engineer, with fittings, valves, and hydrants at the required locations; spigots centered in bells; and all valves and hydrant stems plumb.

2. Whenever obstructions not shown on the Plans are encountered during the progress of the work and interfere to such an extent that an alteration in the Plan is required, the Engineer shall have the authority to change the Plans or order a deviation from the established line and grade or arrange with the Owners of the structures for the removal, relocation, or reconstruction of the obstructions. If the change in plans result in a change in the amount of work by the Contractor, such altered work shall be done on the basis of payment to the Contractor for extra work authorized and credit to the Owner for eliminated work.

5. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures both known and unknown may be determined, and he shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on his part.

6. Whenever, in the opinion of the Engineer, it is necessary to explore and excavate to determine the location of existing underground structures, the Contractor shall make explorations and excavations for such purposes. If

the Contractor is required to perform additional work in making the explorations and excavations, extra compensation will be allowed for such additional work, as approved by the Engineer.

1-08 Section VIII: Excavation

1. The excavations shall include the removal of quicksand, hard pan, boulders, drain tile, clay and roots, within the depth and width of trench necessary to the proper installation of the work.

2. The excavation shall be of sufficient width and carried to the depth required for the construction of the improvement. Bell holes of sufficient depth shall be provided across the bottom of the trench to accommodate the bell of the pipe, to provide sufficient room for joint making, and to insure uniform bearing for the pipe.

3. Where a firm foundation is not encountered at the bottom of the trench due to soft, spongy, or other unsuitable material, it shall be removed and replaced with sand, gravel, or crushed rock firmly compacted into place.

4. Where rock is encountered in the prosecution of the work, it shall be excavated to a depth of six (6) inches below the established grade of the bottom of the trench. The cut below grade shall be refilled with gravel, firmly compacted. Rock is defined herein as any natural boulder exceeding twelve (12) cubic feet in volume, or natural ledge rock or stone which cannot be broken and removed by a power shovel of one-half (1/2) cubic yard capacity.

5. Any excavation made below that necessary for the proper installation of the improvement shall be refilled with sand or fine gravel and thoroughly compacted.

6. Sheeting and bracing shall be placed in the ditch, as may be necessary to protect workmen, adjacent structures, adjacent utilities, pavements, roadways, curbs, sidewalks, and for the safety and proper execution of the work. It is the contractor's sole responsibility to determine if it is required.

7. Sufficient pumping and/or well pointing equipment shall be provided to remove all water from the trenches and appurtenant excavation. No pipe shall be installed in or under water without the Engineer's approval.

8. The trench shall be dug so that the pipe can be laid to the alignment and depth required, and it shall be excavated only so far in advance of pipe laying as permitted by the Engineer. The trench shall be braced and drained so that the workmen may work therein safely and efficiently. It is essential that the discharge of the trench dewatering pumps be conducted to natural drainage channels, drains, or sewers.

9. The width of the trench shall be ample to permit the pipe to be laid and jointed properly, and the backfill to be placed and compacted as specified. Trenches shall be of such extra width, when required, as will permit the convenience for placing of timber supports, sheeting and bracing, and handling of specials.

10. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural watercourses shall not be obstructed.

11. Hand methods for excavation shall be employed in locations shown on the drawings. In other locations, the Contractor may use trench-digging machinery or employ hand methods.

12. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for traffic to use the highway. All material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. The rules and regulations of the local authorities respecting safety provisions shall be observed.

13. The Contractor shall carry on the work in a manner which will cause the least interruption to traffic, and may close to through travel not more than two (2) consecutive blocks, including the cross street intersected. When traffic must cross open trenches, the Contractor shall provide suitable bridge at street intersections and driveways.

14. The Contractor shall post suitable signs necessary for proper maintenance of traffic. The Engineer may require additional signs if he deems they are necessary.

15. Temporary support, adequate protection, and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his expense and under the direction of the Contractor at his expense and may have been disturbed shall be restored upon completion of the work.

16. Trench shall be excavated to a depth sufficient to allow minimum cover of thirty-six (36) inches above the crown of the pipe. Also, the top of the main shall be at least thirty inches below the finished grade of the existing or proposed road.

17. Trees, shrubbery, fences, poles and all other property and surface structures shall be protected unless their removal is shown on the drawings or authorized by the Engineer. When it is necessary to cut root and tree branches, such cutting shall be done under the supervision and direction of the Engineer.

18. All excavated material not needed for backfilling purposes shall be disposed of in a manner satisfactory to the Owner.

19. In all areas along highways or roadways where the pipeline is being laid in the pavement or in the right-of-way of the road, excavation during each day shall be limited to the footage of pipe that can be laid and the trench to be backfilled so that minimal ditch is left open overnight in such areas. The rules and regulations of the Tennessee Department of Transportation and the City of Cookeville shall apply.

20. All excavation shall be accomplished in accordance with applicable safety laws and regulations; the Owner does not assume responsibility of any degree or sort for acts of the Contractor.

21. EXCAVATION NEAR WATER LINES

    A. The Contractor shall protect existing water lines that have proposed

sewer lines crossing by providing 18-inch minimum separation between the bottom of the water line and the top of the sewer line.

B. When sewer lines are being laid parallel to existing water lines, there should be a minimum of 10 feet horizontal separation or a minimum of 18 inches vertical separation as specified above and laid in separate trenches.

C. When the above conditions cannot be obtained, both the water and sewer lines shall be constructed of water pipe and be pressure tested to assure water tightness.

1-09 Section IX: Pipe Bedding

1. In general, the trench shall be opened below the bottom of the pipe and refilled with bedding material to a depth sufficient to provide a firm bed for the lower quadrant of the pipe at the proper line and grade.

2. Clear dry excavated earth, sand, or crushed stone may be used as bedding material.

3. Where rock is encountered, the trench shall be excavated to a depth of at least six (6") inches below the bottom of the pipe and refilled with suitable bedding material.

1-10 Section X: Force Main Installation

1. Adequate provision shall be made for safely storing and protecting all water pipe and fittings prior to actual installation in the trench. Care shall be taken to prevent damage to the pipe castings, both inside and out. Provisions shall be made to keep the inside of the pipe clean throughout its storage period and to keep mud and/or other debris from being deposited therein. All Pipe shall be thoroughly cleaned on the inside before laying. Proper equipment shall be used for the safe handling, conveying and laying of the pipe. Each pipe or fitting shall be firmly supported throughout its entire length. The bottom of the trench shall be shaped to assist in providing the even bearing for the pipe. Bell holes of sufficient size and depth shall be provided at each joint to permit proper jointing.

2. Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient

prosecution of the work. All pipe fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of a derrick, ropes or other suitable tools or equipment, in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

3. The pipe and fittings shall be inspected for defects and, while suspended above grade, be rung with a light hammer to detect cracks. All lumps, blisters, and excess coal tar coating shall be removed from the ends of each pipe, and the inside of the bell or the face of the joint shall be wire-brushed and wiped clean and dry and free from oil and grease before the pipe is laid.

4. Joining of Push-On Joint Pipe:

   A. Shall conform in general to AWWA Standard procedures.

   B. The inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the bell socket.

   C. A thin film of gasket lubricant shall be applied to either the inside surface of the gasket or the spigot end of the pipe or both. Gasket lubricant shall be as supplied by the pipe manufacturer and approved by the Engineer.

   D. The spigot end of the pipe shall be entered into the socket with care used to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the bottom of the socket with a forked tool or jack-type tool or other device approved by the Engineer.

   E. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint. Field cut pipe lengths shall be filed or ground to resemble the spigot end of such pipe as manufactured. Manufacturer's assembly instructions shall be followed.

5. Joining of Mechanical-Joint Pipe shall in general conform to AWWA Standard procedures. The last 8 inches outside of the spigot and inside of the bell mechanical joint pipe shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter from the joint, and then painted with a soap solution made by dissolving one-half cup of granulated soap in 1 gallon of water. The cast-iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket, or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland. The entire section of the pipe shall be pushed forward to seat the spigot end in the bell. The gasket shall then be pressed into place within the bell; care shall be taken to locate the gasket evenly around the entire joint. The cast-iron gland shall be moved along the pipe into position for bolting, all of the bolts inserted, and the nuts screwed up tightly with the fingers. All nuts shall be tightened with a suitable (preferably torque-limiting) wrench. Nuts spaced 180" apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland.
6. The Contractor shall furnish all labor and materials, including all necessary tools and equipment, and all other incidentals necessary for making connections between the new work and the existing main at the point indicated on the Plans or where directed by the Engineer.

7 During the construction and until jointing operations are complete, the open ends of all pipe shall be at all times protected and sealed with temporary watertight plugs.

8. Anchorage:

   A. All plugs, caps, tees and bends deflecting 22½° or more shall, unless otherwise indicated, be anchored to prevent movement by providing concrete thrust blocks.

   B. Concrete reaction backing shall be of a mix not leaner than one (1) cement, two and one-half (2 1/2) sand, five (5) stone, and having a compressive strength of not less than 3,000 psi at twenty-eight (28) days. Backing shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground in each instance shall be that shown or directed by the Engineer. The backing shall, unless otherwise shown or directed, be so placed

that the pipe and fittings joints will be accessible for repair.

1-11 Section XI: Backfilling of Sewer Force Mains & Appurtenances

1. After the pipe has been embedded in accordance with the manufacturer's recommendation and inspected by the Engineer, backfilling shall be carefully placed for a depth of one (1) foot above the pipe. Material for this purpose shall be free from stones and shall contain no frozen materials. The remainder of the back fill shall be further compacted by hand or machine. No backfill material will be used that exceeds 6 inches in its greatest dimension in the first 4 feet above the pipe. No material shall exceed 12 inches in its greatest dimension in the remainder of the backfill. It shall be mounded and left at a height, over the trench, eight (8) inches higher than the original elevation of the ground in dirt backfill areas. A minimum cover of thirty-six (36) inches above the crown of pipe is required. Also the crown of the pipe shall be at least thirty (30) inches below the finished road grade.

2. When the type of backfill material is not indicated on the drawings or specified, the Contractor may backfill with the excavated material, provided that such material consists of loam clay, sand, gravel or other materials which, in the opinion of the Engineer, are suitable for backfilling. Where excavated material is indicated on the drawings or specified for backfill and there is a deficiency due to a rejection of part thereof, the Contractor shall furnish the required amount of sand, gravel or other approved material as an extra.

3. Backfilling shall not be done in freezing weather except by permission of the Engineer, and it shall not be made with frozen material. No fill shall be made where the material already in the trench is frozen.

4. All sand used for backfill shall be a natural bank sand, graded from fine to coarse, not lumpy or frozen, and free from slag, cinders, ashes, rubbish or other material which, in the opinion of the Engineer, is objectionable or deleterious. It shall not contain a total of more than ten (10) percent by weight of loam and clay, and all material must be capable of being passed through a three-quarter (3/4) inch sieve. Not more than five (5) percent shall remain on a No. 4 sieve.

5. Gravel used for backfill shall consist of natural bank gravel having durable particles graded from fine to coarse in a reasonably uniform combination with no boulders or stones larger than two (2) inches in size. It shall be free from slag, cinders, ashes, refuse or other deleterious or objectionable materials. It shall not contain excessive amounts of loam and clay, and shall not be lumpy or frozen. No more than fifteen (15) percent shall be finer than No. 200 sieve.

6. Screenings shall consist of the product obtained from crushing sound limestone or dolomite ledge rock and shall be free from shale, dust, excessive amounts of clay and other undesirable materials. All materials shall pass a one-half (1/2) inch sieve and no more than twenty-five (25) percent shall be finer than a No. 100 sieve.

7. Where sand or gravel backfill is not indicated on the drawings or specified herein, and in the opinion of the Engineer should be used in any part of the work, the Contractor shall furnish and backfill with sand or gravel as directed, as an extra.

8. Where the excavation is made through permanent pavements, curbs, driveways, or sidewalks, or where such structures are undercut by the excavation, the entire backfill to the subgrade of the structures shall be made with sand or gravel. Walks and driveways consisting of broken stone, gravel, slag or cinders shall not be considered as being of a permanent construction.

9. Gravel backfill shall be used around each service tap and under the first four feet of tubing from the corporation stop.

1-12 Section XII: Magnetic Detection Tape and Wire

1. Magnetic detection tape shall be placed approximately eighteen inches (18") above all sewer force mains in excavated trenches. The tape shall be 2" wide and such that it can be located with a standard pipe locator and shall have stamped clearly upon it, "Sewer Force Main Buried Below."

2. The Contractor shall bury a #12 AWG solid copper tracer wire with 45-mil polyethylene coating in the ditch with the sewer line including with the pipe in any bore hole. Green coating shall be used for sewer. Contractor shall use King Wire Nut connectors with silicone to fit #8 gauge through

#22 gauge wire (Direct Bury King 6 Blue).

1-13 Section XIII: Removal, Restoration and Maintenance of Property

1. The contractor shall limit his work area to that provided by temporary and permanent easements and lands owned by the Owner unless he obtains written permission of the property owner (s) on which the Contractor desires to encroach. The contractor shall supply a copy of said permission to the Owner for its records.

2. Where any trees, shrubbery, fences, poles or other property and surface structures have been damaged, removed or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the Contract Documents, State Laws, Municipal Ordinances or the specific direction of the Engineer, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced or repaired at the expense of the Contractor. The Contractor shall (unless otherwise stipulated) replace or repair and restore said structures to a condition equal to that before the work began, furnishing all labor and materials incidental thereto.

2. The Contractor shall restore (unless otherwise stipulated) all sidewalks, curbing, gutters, shrubbery, fences, poles, sod or other property and surface structures removed or disturbed as part of the work to a condition equal to that before the work began, furnishing all labor and materials incidental thereto. No permanent pavement shall be restored unless and until, in the opinion of the Engineer, the condition of the backfill is such as to properly support the pavement.

3. All disturbed areas other than lawns (which shall be reseeded in approximately their pre-construction condition) shall be left smooth and thickly sown with a mixture of Blue Grass, Kentucky Fescue #31 and/or such other grasses as are specified by the Owner. When the final grading has been completed, the entire area to be seeded shall be fertilized with an approved commercial fertilizer at the rate of 10 lbs. per 1000 square feet. After the fertilizer has been distributed, the Contractor shall disc or harrow the ground to thoroughly work the fertilizer into the soil. The seed shall then be sowed in two operations, broadcast either by hand or by approved sowing equipment. The applications shall be 30 pounds per acre for each operation. If the owner determines to use "hulled" or

"unhulled" Bermuda, the application rate shall be 7 lbs. per acre. After the seed has been distributed, the Contractor shall then lightly cover the seed by use of a drag or other approved device. All seed shall be certified not more than three percent weed. The seeded area shall then be covered with straw at the rate of 1 1/2 tons per acre.

5. Any necessary reseeding or repairing shall be accomplished by the Contractor prior to final acceptance. If the construction work is brought to completion when, in the opinion of the Owner, the season is not favorable for the seeding of the grounds, then the Contractor shall delay this item of work until the proper season for such seeding as directed by the Owner.

6. All planting and seeding shall be watered thoroughly as soon as completed and shall be watered daily or more often, if necessary, until all growth is thoroughly established.

7. Seeding and landscaping is <u>not</u> a separate pay item. Replacement of sod disturbed by the Contractor's operation is <u>not</u> a pay item.

8. Mailboxes shall be placed back in their original location. For any reason the mailbox cannot be placed back into its original location, the inspector shall be notified. The inspector will determine the location of the mailbox. Mailboxes shall be installed 40" from the ground in which the post office vehicle will sit to the bottom of the mailbox. If the shoulder where the post office vehicle sits is disturbed during construction causing the post office to be unable to drive up to the mailbox, the contractor will be responsible for spreading gravel 4" thick to provide a large enough radius for the post office vehicle to drive to and from the mailbox.

9. Driveways shall be resealed by the contractor when damaged has occurred during construction. Contractor shall not use private driveways or property to park vehicles or store materials without written permission from the property owner(s).

10. Water line services disturbed by the contractor during construction of this project shall be replaced from the point of conflict to the meter box, not repaired.

11. The contractor is responsible for property pins disturbed during construction. Any pins removed during construction must be replaced at

the contractor's expense including any survey of the property needed to install the pins in the proper location.

1-14 Section XIV: Street and Driveway Replacement

1. REPLACING STREETS AND ROADWAYS:

A. General

The Contractor shall replace all streets, alleys and roadways, which may be removed, disturbed, or damaged in connection with his operation under the Contract. The Contractor shall reconstruct same to the original lines and grades and in such a manner as to leave all such surfaces in as good or better condition as that which existed prior to his operations. The reuse of materials removed in making excavations will be permitted in the manner described, provided said materials are capable of being compacted without settlement.

Gravel, crushed limestone, bituminous materials, or other materials used in the resurfacing of streets shall meet the current requirements of the Standard Specifications of the Tennessee Department of Transportation.

The Contractor shall patch the roadway within 15 days of backfilling the trench. Since asphalt plants regularly shut down during the winter months, the Contractor shall patch roadways with 4 INCHES of Grade B Modified Binder as specified herein during the time of year which asphalt plants are open. During the time period that the asphalt plants are closed, the Contractor shall replace the roadway with Temporary Pavement Replacement as specified herein. The Contractor shall have 15 days from the date the asphalt plant re-opens to replace all temporary patches placed during times of plant shutdown with Grade B Modified Binder patches as specified herein. Temporary patches shall be replaced by digging out the temporary patch and replacing with 4 INCHES of binder as specified herein.

The Contractor shall submit the name and credentials of his paving subcontractor to the Engineer. No pavement shall be placed without prior approval of the paving subcontractor by the Engineer.

B. Temporary Pavement Replacement

If asphalt plants are closed for the season, the Contractor shall replace pavement with a temporary patch comprised of 2 inches of Bituminous Plant Mix Surface Course (Cold Mix) as specified in Section 410 of the TDOT Standard Specifications for Road and Bridge Construction. Temporary patches shall be placed a maximum of fifteen days from the time of initial construction. The Contractor shall maintain the ditch in the interim as specified in subparagraph 2 of this section.

C. Traffic-Bound Base Course

Replacement of streets after trenching shall be handled in the following manner:

After the backfill has been compacted to within about 3 inches of finished grade as specified hereinbefore, the Contractor shall place approximately 4 inches of crushed stone, Tennessee Department of Transportation Class "A", Grade "D", as a Traffic-Bound Base Course, at the proper elevation to allow for settlement, but not in such a way as to prevent traffic from using the street.

Where the entire ditch is to be backfilled with crushed stone, compacted Tennessee Department Size No. 67 may be used up to a point approximately 12 inches below finished grade and then capped with Class "A", Grade "D" Traffic-Bound Base Course placed in 4-inch lifts compacted to 95 percent of its Standard Proctor Density.

Crushed stone added to ditches for maintenance or as needed or directed by the City after initial backfill will not be cause for additional payment. Crushed stone shall be capped between 1" and 2" above road grade when initial crushed stone is placed to allow for potential settling.

The Contractor may leave replaced roadways in the condition described in this paragraph for a maximum of 15 days before final patch (if asphalt plant is open) or temporary patch (if asphalt plant

is closed) is placed.

D. Subgrade for Final Resurfacing

The traffic-bound course described above will comprise of the base course of all types of resurfacing.

When, in the opinion of the Engineer, the trench has reached a condition of settlement satisfactory for final resurfacing the Contractor shall first strip the base course or add backfill with crushed stone the size specified above to obtain the proper subgrade elevation. The subgrade shall then be rolled with an approved type roller or tamped until thoroughly compacted and 8 inches thick. Any depression shall be filled with crushed stone or gravel—as specified above-and the process of rolling or tamping continued until the subgrade has a smooth and uniform surface.

E. Binder Course

Where required Grade "B" modified (B-M) binder as specified in the Tennessee Department of Transportation Specifications Section 307 shall be used as a base prior to application of the asphaltic concrete surface. Placement of binder shall be in 4-inch lifts well compacted with a heavy roller.

Prior to placement of the Binder, the subgrade or base shall be thoroughly cleaned and broomed and a prime coat of Grade RT-2 tar meeting the requirements of TDOT Specifications Subsection 904.04 or Grade AE-P emulsified asphalt meeting the requirements of TDOT Specification Subsection 904.03 shall be uniformly applied at the rate of 0.20 to 0.25 gallons per square yard.

Where the Binder will be left at the finished grade, the existing pavement will be neatly saw cut back approximately 1 foot outside the trench and the new pavement tied to the existing pavement.

F. Asphaltic Concrete Pavement (Hot Mix)

Where asphaltic concrete pavement is to be replaced, the subgrade shall be prepared as above specified, and this subgrade shall

comprise the base course upon which the bituminous pavement shall be laid.

The existing pavement shall be neatly saw cut back approximately one (1) foot outside the trench and the new pavement tied into the existing. The subgrade or base shall be thoroughly cleaned and broomed, and a prime coat of medium tar shall be uniformly applied at the rate of 0.20 to 0.25 gallon per square yard. Where Portland Cement concrete subslab is required, the prime coat shall be applied to the concrete at a rate of 0.05 gallon per square yard. The prime coat shall be applied by a pressure distributor or other approved pressure spray method. When the prime coat has become tacky but not dry and hard, a bituminous surfacing consisting of asphaltic concrete shall be placed, spread, finished and compacted in accordance with the current standard Specifications of the Tennessee Department of Transportation, Section 104. Compacted thickness of asphaltic concrete pavement replacement shall be as directed or shown on the plans.

G. Untreated Surface

Where the existing surface is untreated crushed stone, the Contractor shall replace the surfacing that is disturbed or removed with crushed stone as above specified to at least the thickness of the existing surface.

2. BITUMINOUS SURFACING (Tar and Chip)

A. Where bituminous surfacing is required, as shown on the Plans, or as directed by the Owner, the traffic-bound base shall comprise the subgrade upon which the bituminous surfacing shall be placed.

B. After the subgrade or base has been prepared, thoroughly cleaned and broomed, a prime coat of Grade RT-2 tar shall be applied at the rate of 0.30 to 0.35 gallons per square yard.

C. Where the prime coat has become tacky but not hard, cutback asphalt RC-800 shall be applied in two applications at the rate of 0.35 to 0.45 gallons per square yard for each application. The Contractor shall apply approximately 50 lbs. per square yard of crushed stone chips between the two applications of bituminous

material and 35 to 40 lbs. of chips after the final application of bituminous material.

3. REMOVING AND REPLACING CONCRETE DRIVEWAYS, SIDEWALKS AND PAVED DITCHES

A. Whenever driveways are removed or disturbed in connection with the construction work, they shall be replaced to the original condition and grades in fully as good or better condition than which existed prior to the Contractor's operation.

B. After the sub-base has been brought to a satisfactory grade, a 3-inch layer of cinders or crushed stone shall be spread over it and thoroughly tamped. Immediately prior to pouring the concrete, the cinders or stone shall be thoroughly wetted, or the concrete shall be poured on a layer of heavy building paper.

C. The driveways shall consist of 6 inches of Class "A" concrete, struck off to accurately placed screeds and worked with a float until the mortar appears on top. After the surface has been thoroughly floated, it shall be brushed to leave marking of a uniform type similar to the existing driveway. All joints and edges shall be finished with an edging tool.

D. Other types of driveways, such as brick, stone asphaltic concrete, etc., shall be replaced with materials removed during the progress of the work, in equally as good condition as that found before the work began.

1-15 Section XV: Highway Crossings

1. Where shown on the Plans or required for the successful completion of this project, highway crossings for the water lines are to be installed by boring and jacking or directional boring. The following Tennessee Department of Transportation requirements apply: "Where open cutting is allowed, the following conditions shall be met: (a) all backfill material shall be compacted crushed stone, (b) one-half of the traveled portion of the paving must be open at all times." Crossings of City roads will be open cut with permission of the City of Cookeville Public Works Department unless shown on the plans by no-dig methods. The Contractor shall be fully

responsible for the successful operation without interruption of traffic and shall be held responsible for any settlement that occurs as a result of his work.

2. Casing pipe under highway roadways shall be installed to the limits shown on the approved Permit Drawings. Boring and jacking operations, when used, shall be performed in accordance with State Highway Specifications, exercising extreme caution to maintain a straight line through the roadbed. When drilled holes are not to grade and required clearance, holes shall be redrilled at no extra cost to the Owner.

3. Upon completion of installation of casings, the carrier pipe shall be installed in the casings in such a manner as to avoid any undue stress or damage to the pipe or its coating. The carrier pipe shall not be in a state of tension at any point within the casing.

4. PVC and Ductile Iron carrier pipe shall be supported within the casing by utilizing Advance Products & Systems Model SI epoxy coated casing spacers, or approved equal. Casing spacers shall be spaced at not more than 8' apart. The annulus space between the casing and carrier pipe shall be sealed at each end by installing Advanced Products & Systems end seals, or approved equal, in accordance with the instructions of the manufacturer of the seals.

5. For those sections of the "crossing where open trench construction is permitted, the backfill shall be placed in uniform loose layers not exceeding 6 inches in depth under and around the casing and not exceeding 8 inches over the casing. The successive layers of soil shall be placed and thoroughly compacted by mechanical tampers until the trench is filled and brought to the required elevation. All backfill shall be compacted to a density of 95% of the maximum density as determined by AASHTO Method T-99.

1-16 Section XVI: Stream Crossings

1. Water lines entering or crossing streams shall be constructed of ductile iron pipe with mechanical joints, concrete encased, or shall be so otherwise constructed as shown by the Engineer on the plans. The crossing shall be such that it will remain watertight and free from changes in alignment and grade.

2. The contractor shall not unnecessarily disturb or uproot trees and vegetation along the stream bank and in the vicinity of the stream, or dump soil and debris into streams and/or along the banks of streams. Contractor is required to comply with the requirements of the ARAP permit for utility line crossings as discussed in section 1-17 of these specifications.

3. Stream banks shall be sodded if due to erosion Contractor is unable to otherwise establish grass.

4. Where tree canopy has been removed, replacement trees shall be planted of natural species.

1-17 Section XVII: Erosion Control

1. The City of Cookeville is very concerned that the contractor use proper erosion control procedures. The contractor shall explicitly follow any direction from the owner or engineer as well as state regulations as to the placement of erosion control structures. The owner has the authority to stop construction if the proper erosion control procedures are not utilized.

2. Cleanup, grading, seeding, planting, and restoration of the work area shall be carried out as early as practical as the construction proceeds. ALL AREAS DISTURBED DURING CONSTRUCTION SHALL BE SEEDED TO RE-ESTABLISH VEGETATION WITHIN 20 DAYS OF DISTURBANCE. THE OWNER HAS THE AUTHORITY TO STOP WORK IF THIS PROTOCOL IS NOT FOLLOWED. NO PAYMENT WILL BE MADE FOR LINE WORK IN GRASSED AREAS THAT HAS NOT BEEN SEEDED AND MULCHED.

3. Temporary pollution control provisions and permanent erosion control features such as berms, slope drains, sediment basins, silt fences, and seeding and mulching shall be used as necessary to assure economical, effective, and continuous erosion control.

4. All temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.

5. All permanent erosion control features shall be incorporated into the project at the earliest practicable time. Temporary pollution control measures shall be used to correct conditions that develop during construction that require attention prior to installation of permanent pollution control features, or that are needed temporarily to control erosion that develops during normal construction practices.

6. Provisions shall be made to retard the rate of runoff from the construction site and control disposal of runoff, including pump discharges resulting from dewatering operations.

7. THE CONTRACTOR SHALL BE SOLELY AND STRICTLY LIABLE FOR ANY VIOLATIONS OF STATE OR FEDERAL WATER POLLUTION LAWS, REGULATIONS, OR STANDARDS CAUSED DURING CONSTRUCTION BY THE CONTRACTOR'S FORCES OR SUBCONTRACTORS AND ANY PENALTIES LEVIED BY ANY PARTY DUE TO SAID VIOLATIONS.

8. On projects that it is anticipated that 1 acre or more will be disturbed, the Engineer will submit on behalf of the Owner, a "Notice of Intent for General NPDES Permit to Discharge Storm Water Associated with Construction Activity" in accordance with Tennessee Department of Environment and Conservation Rule Chapter 1200-4-10. This submittal is required at least thirty (30) days prior to the date on which construction is scheduled to begin. The Contractor is required to sign the Notice of Intent provided by the Engineer prior to commencing construction activities stating that he understands the conditions of the General Permit and accepts responsibility for compliance for his portion of the work.

   As part of this permit, the Contractor is also required to develop a "Stormwater Control Plan" in accordance with the provisions of the Tennessee Department of Environment & Conservation Rule 1200-4-10-05 unless such plan is already prepared by the engineer and included in the construction plans.

9. Work under this contract may also be covered by the rules of the Department of the Army 404 nationwide permit #12 effective March 12, 2007. The Contractor shall be solely responsible for compliance with the requirements of this nationwide permit.

10. Work under this contract may also be covered by the rules of the

Tennessee Department of Environment and Conservation, Water Quality Control Board, Division of Water Pollution Control, Chapter 1200-4-7 Aquatic Resources Alteration. Section 1200-4-7-08 "General permit for utility line crossings of streams" is specific to this contract. The Contractor shall be solely responsible for compliance with the requirements of this general permit for utility line crossings of streams and pollution laws and regulations applicable to construction of the work included in this contract. IF AN ARAP PERMIT IS REQUIRED FOR THIS CONTRACT, A NOTICE OF INTENT WILL BE INCLUDED WITH THE CONTRACT DOCUMENTS.

11. Pollution and Erosion Control Methods

Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches or other areas where siltation is a problem or where shown on the Plans or directed by the Engineer. In some areas silt fences reinforced with wire mesh fence may be required.

The use of Erosion control wattles are recommended and may be required in areas where the slope length need reducing or runoff velocities need reducing where the use of a silt fence would be extreme.

The Contractor shall be required to maintain the silt fence and all erosion control methods in a satisfactory condition for the duration of the project or until its removal is requested by the Engineer. The silt accumulation at the fence may be left in place and seeded, removed, etc. as directed by the Engineer. The silt fence becomes the property of the Contractor whenever the fence is removed.

All temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.

12. A copy of the Notice of Intent, the Tennessee Construction Activity Storm Water Permitting Checklist and the Contractor's Signature Form are included at the end of this document if it was determined that one was needed.

1-18 Section XVIII: Testing

1. All pipe and appurtenances, after installation, shall be hydrostatically tested. Testing by air shall not be permitted. The City shall witness the testing.

2. All pipe shall be tested under a hydrostatic pressure equal to the larger of 150 psi or 1.5 times the pressure at which the line will normally operate. The time of the test shall be one hour. The test shall be in accordance with AWWA C600-87 with proper correction applied if the test gauge is not at the lowest point.

3. Leakage shall not exceed 10.0 gpd per mile of pipe per inch of diameter based on 20-foot lengths of pipe in accordance with AWWA C600-87 for different length pipe refer to AWWA 600-87 for the leakage allowance.

4. Re-excavation to repair leaks shall be borne by the Contractor and no additional compensation will be allowed.

1-19 Section XIX: Clean Up

In areas where the water line has been backfilled, the Contractor shall clear the right-of-way and surrounding ground, and shall dispose of all waste materials and debris resulting form his operations. He shall fill and smooth over holes and ruts and shall repair all miscellaneous and unclassified ground damage done by him, and shall restore the ground to such stable and usable conditions as may reasonably be required, consistent with the condition of the ground prior to building of the pipeline.