STANDARD SPECIFICATIONS

FOR

CITY OF COOKEVILLE

SEWERLINES

CITY OF COOKEVILLE TENNESSEE

Department of Water Quality Control
City of Cookeville, Tennessee
1860 South Jefferson Ave
Cookeville, Tennessee 38506

Laurin Wheaton, Mayor
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TECHNICAL SPECIFICATIONS

SEWER LINES AND APPURTENANCES

2-01 Section I: Scope

1. This item shall consist of furnishing all plant, labor, equipment, materials, and appliances and performing all operations in connection with excavation, trenching and backfilling for sewer lines and appurtenant structures for sewer lines.

2. The Contract drawings indicate the extent and general arrangement of Sewer 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 arises, the Engineer/Owner shall decide the true intent and his decision shall be binding.

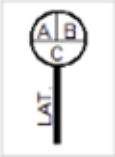
4. On contracts made with the City, the "Owner" is the City. On such contracts, the references to pay items apply.

5. 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.

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

7. As-builts shall be submitted to the owner upon completion of the project and shall be submitted in PDF and .dwg form. If a final plat is required, both forms of as-builts are required prior to signing. All as-builts shall show stationing, which shall be 0+00 at the downstream node, and the plan and profile shall be based on the standard engineering scale (i.e., 1”=20’, 1”=50’, etc.)

Sewer construction as-builts shall show the accurate invert elevation, top of casting elevation, pipe size, material, lateral locations based on footage from upstream manhole, lateral depth and length (See lateral symbol below). It shall be noted, if available, what material the new lateral was connected to (i.e., concrete, PVC, clay, etc.)



WHERE:
A = FT length of the lateral from the main to the property line
B = FT of depth where the lateral taps into the sewer main
C = FT from the nearest downstream manhole

This information shall require the manholes and stakes marking sewer lateral to be surveyed. Established benchmark must be referenced on plans and be installed on project site before construction can begin.

8. 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 any utility disturbed. Water services damaged during subdivision development will be replaced, not repaired.

9. Caution shall be taken around structures and utilities visible in the field or shown on the plans. 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 utility pole owner 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.

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

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

2-02 <u>Section II: Quality Assurance and Warranty:</u>

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 sewer lines and related appurtenances.

2-03 Section III: Applicable Documents and Specification References

The following publications 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. American Association of State Highway and Transportation Officials (AASHTO)

   T-99 Moisture Density Relations of Soils, Using a 5.5 Lb. Hammer and a 12-Inch Drop

   M198B Joints for Circular Concrete Sewer and Culvert Pipe using Flexible Watertight Gaskets

2. The term ASTM as used herein refers to the American Society for Testing Materials.
3. The term TDOT as used herein refers to the Tennessee Department of Transportation.

4. The term AWWA. as used herein refers to the American Water Works Association.

2-04 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 by the Owner and hauled to and distributed at the site by the Contractor.

3. Protection of the materials for this project before, during, and after installation; and protection of the 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.

4. Ductile iron or PVC pipe, manholes, frame, castings, 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.

2-05 Section V: Materials

1. GENERAL: 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.

   A. The interior of all pipe 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.

   B. 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.

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

2. POLYVINYL CHLORIDE PIPE

   A. Polyvinyl chloride (PVC) pipe and fittings shall meet and/ or exceed all of the requirements of ASTM Designation D3034. The bell shall consist of an integral wall section with solid cross section rubber ring factory assembly and securely locked in place to prevent displacement or designed for positioning a single rubber gasket ring in an annular recess or socket. All fittings and accessories shall have bell and spigot configuration identification identical to that of the pipe. Minimum "pipe stiffness" (FY) at 5% deflection shall be 115 or higher for all sizes when tested in accordance with ASTM Designation D2412. Pipe shall be SDR-26 PVC unless Ductile Iron Pipe is called for on the plans.

   All PVC pipe shall be stored at the project site in strict accordance with the manufacturer's recommendations and at all times prior to actual installation of the pipe the Contractor shall be responsible for providing uniform support for each length of pipe stored at the site. PVC pipe that has been bowed by the sun shall not be laid until it has been straightened and lies flat without restraint.

C. Flexible Elastomeric gaskets conforming to ASTM D3212 are required for all pipe. Field solvent welds and fittings are not acceptable.

3. MANHOLES

A. GENERAL

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.

(1) Precast Manhole Bases: The Contractor shall install the precast concrete manhole base upon a gravel (No. 57, or approved equal) base that is a minimum of six (6") inches thick. This gravel base shall be carefully brought to the required grade. Care shall be taken that the gravel bed is level and even, so that when the precast unit is set in place the manhole sidewall will be installed plumb, and the concrete manhole base is in full contact upon the gravel base. The precast manhole base shall be a minimum of six (6") inches in thickness.

Backfilling operations, as specified herein, may begin after the installation of the precast manhole sidewall with base has been completed and initial vacuum test completed. Upon completion of the backfilling operations, traffic may be allowed on the structure.

(2) Manhole Joints: Flexible plastic sealant for joints in precast manhole sections**,** grade rings and castings shall provide permanently flexible watertight joints, shall remain workable over a wide temperature range, and shall not shrink, harden, or oxidize upon aging. Material shall be butyl resin sealant ConSeal CS-102 or CS-202 as manufactured by Concrete Sealants, Inc. of New Carlisle, Ohio, RUB'R-NEK L-T-M manufactured by K. T. Snyder Co., Inc. of Houston, Texas, or other approved equal. A minimum of two (2) strips of joint sealant shall be required at each joint and shall conform to AASHTO M198B. Rubber gaskets conforming to the physical properties of ASTM C443 may be used in lieu of butyl sealant.

(3) Nonshrink Grout: This applies only to those penetrations were resilient rubber pipe to manhole connections, for some reason cannot be used. Grout to be used for sealing around sewer pipes at manhole wall penetrations shall be a nonmetallic, nonshrink, flowable grout. The expansion which occurs to compensate for normal hydration shall not create stresses in the pipe or manhole wall. Material shall be premixed and ready to use with only the addition of water required and shall be equal to Burke nonmetallic grout or Sonogrout as manufactured by the Sonneborn Company.

(4) Resilient Pipe Connections at Manholes: Resilient pipe connectors shall be manufactured in accordance with ASTM C923 and shall consist of a durable rubber boot which shall be clamped securely to the cutout in the manhole wall and to the pipe by means of stainless steel clamps or bands. Or, a compression ring gasket cast in to the manhole wall, pipe is inserted and held by compression. (A-LOK)

Resilient connectors shall be as manufactured by the NPC INC, KOR-N-SEAL Co. of Milford, New Hampshire, Press-Seal Gasket Corp., PRESS-BOOT of Fort Wayne, Indiana, A-LOK Products of Tullytown, PA, or approved equal.

(5) Manhole Steps: Manhole steps shall have an overall width of twelve (12”) inches, shall be nonskid injection molded copolymer polypropylene plastic encapsulating a one-half (1/2”) inch diameter grade sixty (60) steel reinforcing rod as manufactured by M.A. Industries, Inc., Peachtree City, Georgia or Press-Seal Gasket Corp., Fort Wayne, Indiana, or approved equal. Vertical manhole steps shall be placed in-line over the “bench” of the flow channel with even spacing of approximately twelve inches to sixteen inches between steps, and shall comply with ASTM C478 Precast Reinforced Concrete Manhole Sections.

(6) Manhole Inverts: Flow channels (inverts) for manholes shall consist of smooth, uniform cross sections conforming to the cross section of the pipes so as to provide a minimum of turbulence and avoid deposition of solids. Flow channels shall have a depth at least equal to one-half the pipe diameter. The finished floor of the manhole shall have a slope of approximately one-half (1/2”) inch from wall to channel to provide for proper drainage, but at the same time offer a safe footing for workers. Inverts in new manholes shall be precast in the base by the manhole manufacturer.

(7) Sizes and Heights: Manholes shall be 4' feet in diameter unless shown different on the plans, based on the pipe sizes and line deflections. Where necessary because of height restrictions, a shallow type manhole with a precast concrete cover slab may be used. The maximum height for a shallow type manhole shall be four (4') feet. This vertical centerline height shall be measured from the invert of the outlet pipe to the top of the manhole casting. Above this height, a manhole with an eccentric corbel section shall be installed. The access hole cast in the slab shall be located at the center of the slab. For manholes of five (5') through twelve (12') feet diameter, a precast transition ring slab shall be used to seat the riser sections of the manhole. Riser sections for all sizes of manholes shall be four (4') feet in diameter. Manhole entrances shall be twenty-four (24") inches. A minimum of 5'-6" of inside clearance shall be required between the pipe invert to bottom of transition slab.

The Contractor shall carefully order the precast manhole sidewall to meet the required field conditions. The manhole shall be manufactured in heights such that a finished manhole will have the least possible number of joints. The height of the unit in place shall be such so as to allow a precast concrete grade ring or rubber adjustment riser for pavement slopes to be placed on top of the manhole transition section prior to setting the casting.

(8) Drop Connection: Drop connections shall be built in manholes at the locations and in conformance with the details shown on the Standard Detail Drawing. The minimum size drop pipe shall be eight (8") inches. Generally, drop pipes shall be one size smaller than the sewer which they serve.

(9) Stubouts for Future Use: Stubouts for future extensions of the gravity sewer shall be built at the locations and grades shown on the Plans or as directed by the Engineer. Stubouts shall include a resilient pipe connector (see number (4) above) and a two-foot (2') section of plugged pipe installed in accordance with the specifications for bedding and backfilling for the type of pipe being. Proper bracing of plug is necessary prior to vacuum testing.

B. CONCRETE FOR MANHOLES

Concrete of the respective classes for precast manholes, manhole bases, drop manholes, manhole vents, special manholes, etc. shall conform to the following:

(1) Cement: Cement shall be Portland cement of a brand approved by the Engineers, and shall conform to "Standard Specifications for Portland Cement", Type 1, ASTM Designation C150, latest revision.

(2) Fine Aggregate: Fine aggregate shall be clean, hard, uncoated sand conforming to ASTM Designation C33, latest revision, "Standard Specifications for Concrete Aggregate".

(3) Coarse Aggregate: Coarse aggregate shall consist of clean, hard, dense particles of stone or gravel conforming to ASTM Designation C33, latest revision, "Standard Specifications for Concrete Aggregate". Aggregate shall be well graded between one and one-half (1½") inches and number four (4) sieve sizes.

(4) Water: Water used in mixing concrete shall be clean and free from organic matter, pollutants, and other foreign materials.

(5) Steel Reinforcing: Manhole reinforcing steel shall conform to the requirements of ASTM C478, latest revision. (*Standard Specification for Precast Reinforced Concrete Manhole Section)*

(6) Corrosion Resistant Additive: A crystalline waterproofing admixture conforming to ACI 212.3R, Chapter 15 on Permeability Reducing Admixtures shall be used. The admixture shall be Xypex ADMIX C-1000R (dye), Penetron USA; Penetron Admix RP, or approved equal. The admixture shall be added to the concrete during the batching operation to provide waterproofing and corrosion resistance. The use of the admixture, including storage, handling, dose rate, and curing of the concrete shall comply with the requirements of the manufacturer. The amount of cement shall remain the same and not be reduced. A colorant shall be added to verify the admixture was added to the concrete. Colorant shall be added at the admixture manufacturing facility, not at the concrete batch plant. Blend total concrete mix using normal practices to ensure formation of homogeneous mixture.

C. Standard Manhole Frames and Covers:
Manhole castings shall conform to ASTM Designation A48, latest revision, Class 30B, and shall be free from scale, lumps, blisters, sand holes, and defects of every nature which would impair their use. Castings shall be well cleaned. Bearing surfaces of frames and covers shall be machined to provide a solid bearing and prevent rocking. 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.

The covers shall be the solid self-sealing types with no holes except watertight pick notes, except end of line manholes. End of line manholes shall have four holes (minimum ½" diameter) for ventilation. The surface between the cover and frame shall fit smoothly without rocking and shall be thoroughly cleaned. The frame shall be attached to the manhole barrel by means of four 5/8-inch anchor bolts and shall be set in a bed of mastic so as to constitute a watertight seal between the barrel and the frame. If any grade adjustment ring is used, the anchor bolts shall extend through them into the manhole cone.

D. Watertight Manholes Frames and Covers

(1) The manhole frames shall be set in the same manner prescribed for standard frames, securing a watertight connection to the MH barrel.

(2) The watertight manhole frame and cover shall be a traffic type of gray cast iron ASTM Designation A48, latest revision with a 24-inch diameter minimum clear opening weighing not less than 450 lbs. and shall be of the two-cover design as shown on the Plans.

(3) The surface cover shall be the solid type with no holes except watertight pick notes. The surface between this cover and frame shall fit without rocking. The inner cover shall be of the solid type with no holes, shall have not less than two lifting handles and shall have a neoprene sealing gasket at least 7/16-inch diameter cross-section with a hollow center. The inner cover shall be mechanically sealed by means of a removable metal bar located over the inner cover with a centrally located bronze or stainless steel tightening bolt. This bolt shall have a tee-handle or bent-handle for turning. The bolt shall have Acme threads for durability. The inner cover shall have appropriate reinforcing ribs to prevent cracking or distortion when tightened. The inner cover shall have sufficient clearance to allow easy removal from the frame. The frame shall be attached to the manhole barrel by means of four 5/8-inch anchor bolts and shall be set in a bed of mastic so as to constitute a watertight seal between the barrel and frame.

E. Rubber Adjustment Risers for Inclines

(1) 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. Adjustment risers shall be Flex-O Ring Series BE 864 (inclined), Infra-RISER 32800 Series, or as approved by engineer.

(2) Manhole, riser, and casting surfaces shall be clean, dry, and free of grease, oil, or other substances before adding sealing compound as directed by manufacturer.

(3) Adjustment risers shall be bonded to adjacent surfaces by laying a continuous bead (5/16" thick cold applied joint sealant compound conforming to ASTM D1850, latest revision) on the top surface of the concrete on a diameter 1" smaller than the outside diameter of the rubber adjustment riser.

(4) If more than one adjustment riser is required, a continuous bead of sealant shall be applied between each unit in the same manner as in Part (3) above.

4. CONCRETE

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

(1) Minimum Cement Content: 6.0 bags (564 lbs.) per yd^3.

(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 lbs.) per yd^3.

(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 C39/C39M and C31, latest revision.

5. CONNECTIONS TO EXISTING LINES:

A. Taps on Existing Mains:
Service connections to existing sewer collector lines shall be made using a Romac Industries, Inc CB-6.66 Universal Sewer Saddle, 48 Strap (Romac Part Number 218-6664U). This shall be used on sewer mains from 8 to 12 inches in diameter. For larger mains the Romac Industries Universal Sewer Saddle for that size pipe shall be used. An Inserta Tee sized and installed per the manufacturer's recommendations is also allowed.

B. Straight Line Connection
Where indicated on the plans, new lines may be connected to existing lines other than PVC SDR-35 or SDR-26 by means of a flexible coupling. Coupling materials shall be Maxadapter, Fernco Strong Back RC 1000 Series or an approved equal as to be determined by the Engineer. SDR-35 or SDR-26 PVC lines shall be connected using bell and spigot with rubber gasket.

C. Connection to Existing Manholes
All connections of pipe to manholes shall be made with resilient connectors. Openings in the manhole sidewall for the pipe shall be precast or cored to provide required size and location. The hole shall be manufactured to allow for lateral and vertical movement, as well as angular adjustments through twenty (20°) degrees. A resilient connector between the manhole and pipes such as A-LOK- X-Cel, Kor-N-Seal or an approved equal shall be installed in the precast or cored opening. The resilient connector shall be molded from an EDPM or polyisoprene compound meeting requirements set forth in ASTM C923. An external band made entirely of corrosion resistant stainless steel shall be used to effect the seal around the pipe. The invert shall be built in the manhole as determined to be necessary by the Engineer or Owner using Class "C" concrete.

D. Manhole Over Existing Lines
On existing lines smaller than 18" in diameter, the contractor shall cut the existing line and install a new precast manhole connecting to the existing line with rubberboots. On lines 18" in diameter or larger, upon approval of the City, the contractor may install a "mouse hole" type manhole. Class C concrete and hydrotite shall be used to form the seal around the pipe and base. Concrete shall be vibrated to minimize honeycombing. Exterior of concrete and manhole shall be coated with two layers of bitumastic coating applied at right angles.

6. PIPE BEDDING AND BACKFILL

PVC pipe shall be laid in a bed of compacted crushed stone meeting the gradation requirements of the Tennessee Department of Transportation, Size No. 57, to a depth of 6 inches. A crushed stone (Size No. 57) envelope placed up to a point 12 inches above the top of the pipe is required. PVC pipe shall be installed in full compliance with the recommended practice for "Underground Installation of Flexible Thermo-plastic Sewer Pipe," ASTM Designation D2321.

7. TESTS AND QUALITY CERTIFICATES

The Contractor shall be responsible for furnishing the Engineer with certified test certificates and manufacturers' affidavits stating that all material furnished is in accordance with these Specifications, before any such material is placed or stored at the project site.

2-06 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 material 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.

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.

2-07 Section VII: Alignment and Grade

1. On subdivision projects, property pins must be installed before sewer construction can begin.

2. Benchmarks must be established on project site before construction can begin.

3. 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 contractor shall notify the Engineer immediately. The Engineer shall have the authority to change the Plans and 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.

4. 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.

5. 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.

2-08 Section VIII: Excavation

1. General

A. The excavation shall be carried to the depths indicated on the Plans and/or directed by the Owner to permit proper bedding of the pipe. The Contractor, at his own expense, shall provide adequate facilities for promptly removing water from all excavations. Unless otherwise indicated, trenches shall be excavated in open cut to the depths shown on the Plans. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe. Unless specifically directed otherwise by the Owner or where required to uncover or determine the presence of underground obstructions, not more than three hundred (300') feet of trench shall be opened ahead of the pipe laying, and not more than two hundred (200') feet of open ditch shall be left behind the pipe laying. Before laying the pipe, the Contractor shall open the trench far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline. Known obstacles may need to be uncovered prior to starting to lay that section of sewer so adjustments of slope and/or alignment may be made.

B. All barricades, lanterns, watchmen, and other such signs and signals as necessary to warn the public of the dangers in connection with open trenches, excavations, and other obstructions shall be provided by and at the expense of the Contractor.

C. The trench shall be straight and uniform so as to permit laying pipe to the proper lines and grades.

D. When so required by the Owner, one-half of the street crossings and road crossings shall be excavated, then temporary bridges consisting of 1/2 inch steel plate shall be placed over the side excavated for the convenience of the traveling public; then the remainder of the excavation shall be carried out. All back-filled ditches shall be maintained in such a manner that they offer minimal hazard to the passage of traffic. The convenience of the traveling public and property owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged.

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

F. 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.

G. 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. The Contractor shall follow all OSHA regulations on the worksite and follow guidelines as set by the Manual on Uniform Traffic Control Devices (MUTCD) for traffic control procedures and control devices on and around the construction site.

2. UNSTABLE TRENCH BOTTOM MATERIAL OR UNDERCUTTING

A. If wet, mucky and/or unstable or unsuitable material is encountered in a trench bottom, the Owner may require the unsuitable material to be removed and replaced with sand, gravel, or crushed stone to provide a suitable foundation. The Contractor will be reimbursed for

cost associated with this undercutting procedure only if there is a separate bid item on the Bid Form.

B. In such cases, the trench bottom shall be brought back up to proper grade with bedding material as provided herein and shown on the Plans. TDOT No. 3 (2") stone refill as required for subgrade stabilization shall be paid for at the unit price per ton set forth in the BID SCHEDULE, including all excavation, if such excavation and refill is directed by the Owner. In general, where No. 3 stone is required due to unstable pipeline trench conditions, the ditch shall be capped off with No. 57 stone as shown on the Plans. The Contractor will only be paid for the No. 3 stone. The owner considers the No. 57 Stone bedding material. If the Contractor has caused the extra work due to failure to properly dewater the ditch, no payment for undercutting and No. 3 stone refill will be made.

3. EXCAVATION NEAR POTABLE WATER LINES

A. The Contractor shall protect existing water lines that cross the sewer lines by providing 18-inch minimum separation between the top of the proposed sewer line and the bottom of the existing water line. When this vertical separation cannot be achieved, the existing water line shall be relocated to provide this separation or reconstructed with mechanical joint pipe with one full length of water pipe being centered over the sewer line so that both joints will be as far from the sewer line as possible.

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.

4. REMOVAL OF WATER

A. The Contractor shall, at all times during construction, provide and maintain means and devices with which to promptly dispose of all water entering the excavations or other parts of the work and shall keep said excavations dry.

B. The Contractor shall dispose of water from the work in a suitable manner without damage to adjacent property or sewers. No water

shall be drained into work built or under construction.

C. During the laying of sewers and until sewer pipe has been bedded in place with at least 1 foot of backfill over the pipe, the Contractor shall keep the groundwater table below the bottom of the trench.

D. No sewer installation will be permitted except in a dry trench. Running water shall be completely blocked off by dewatering and/or sheathing. The trench must be dry and clean to assure that the hub and spigot of the pipe are perfectly dry before a joint is made.

E. All removal and handling of water required to maintain dry trenches or other excavations for the construction of sewers or other structures in the trench shall be at the expense of the Contractor.

5. ROCK EXCAVATION

A. GENERAL

1. Rock excavation is <u>not</u> a separate pay item on contracts with the City of Cookeville <u>unless</u> there is an item included on the bid form for such.

2. The work covered by this section shall consist of the removal of all rock materials (as defined herein) that must be removed from their original beds so that construction can be performed as indicated by the Drawings or by these specifications. It shall include the drilling and blasting, or hydraulic hammer, incidental to excavation and the disposal of the excavated material as specified below.

3. Refer to other sections for work related to that discussed in this section.

4. DESCRIPTION OF ROCK EXCAVATION

a. Rock excavation shall consist of the removal of all sound, solid rock which is in its original position in ledges, bedded deposits, or unstratified masses and which is of such hardness and texture that, in the opinion of the Engineer, it cannot be loosened or broken down and removed without drilling and blasting.

b. In addition, if any boulders, stones, or pieces of masonry with a volume of 1/2 cubic yard or more are encountered within the

limits of excavation, their removal shall be considered as rock excavation.

c. The removal of all other materials, however, shall be classified as common excavation and subject to the provisions set forth in this Section. For instance, hard pan, small boulders with a volume of less than 1/2 cubic yard, chert, clay, soft shale, soft and disintegrated rock, and similar material shall not be considered as rock, although the Contractor may elect to excavate them by drilling and blasting, or hammering.

B. EXECUTION

1. Excavate rock in trenches over the horizontal limits of excavation and to a depth of not less than 6 inches below where the bottom of pipelines will be. Where pipelines are to be constructed on concrete cradles, excavate rock to the bottom of the cradles as shown on the Drawings. Then backfill the space below grade for pipelines with fine earth or other approved material, and tamp to the proper grade and make ready for construction. For structures, excavate rock to the outside bottom of the structure.

2. Conduct drilling and blasting with due respect for the safety of persons and property in the vicinity and in strict conformance with all ordinances and regulations governing blasting and the use of explosives. Conduct rock excavation near existing pipe or other structures with the utmost care to avoid damage. Damage to other structures and properties shall be promptly repaired by the Contractor at his own expense. Rock excavation shall be subject to all applicable provisions specified in this Section, including those concerning site preparation; the disposal of materials; slopes; compacting and tamping; sheeting, shoring, and bracing; and pipeline excavation.

3. At the location of tees or laterals, blast or break a minimum of 6 LF of ditch line beyond the end of the lateral and in the direction and to the approximate grade of the future lateral as indicated by the Engineer, but removal of the material is not required.

4. DISPOSAL OF MATERIALS

a. Whenever practicable, use all suitable material removed by excavation to backfill pipe trenches (i.e., material whose maximum size meets the requirements for backfilling specified herein, or use it for other purposes shown on the Drawings or as directed by the Engineer. Any material not so used shall be considered waste material and disposed of by the Contractor as specified below.

b. Waste material may be deposited in spoil areas at locations approved by the Engineer or removed from the site when no suitable areas are available. Do not leave waste materials in unsightly piles, but instead in reasonably uniform layers.

c. Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of the work. Leave the surface of the work in a neat and workmanlike condition.

6. SHEETING, SHORING AND BRACING OF EXCAVATION

Sheeting, shoring and bracing of excavation is <u>not</u> a separate pay item and is the Contractor's sole responsibility to determine if it is required and to meet all OSHA requirements.

7. OVER EXCAVATION OR BREAKAGE

a. Whenever the excavation is carried beyond or below the lines and grades given by the Owner, the Contractor, at his own expense, shall refill such excavated space with such material and in such a manner as will in the opinion of the Owner, ensure stability of the structure or line involved, including the use of crushed stone or Class "C" concrete.

b. Over-breakage is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Owner, including slides. All over-breakage shall be removed by the Contractor and disposed of as directed. Payment will not be made for removal and disposal of over-breakage.

2-09 Section IX: Pipe Bedding

1. All gravity sewers shall be laid on a bed of crushed stone meeting the requirements of the Tennessee Department of Transportation Size No. 57 or 67. 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.

5. Where rock is encountered, the trench shall be excavated to a depth of at least 6 inches below the invert of the pipe and refilled with the bedding material to a sufficient depth to provide a firm bed for the bottom quadrant of the pipe. Bedding material for pipe laid in suitable earth or in rock is not a separate pay item.

3. Material as specified herein-before for the type of pipe employed shall be brought up evenly along each side of the pipeline and tamped so as to secure the line and grade of the pipeline and to prevent damage thereto.

2-10 Section X: Special Provisions on Steep Slopes

Sewer lines on 18 percent slope or greater shall be anchored securely with concrete anchors or equal. On grades 18 percent to 25 percent the anchor spacing shall not exceed 36 feet. On grades 25 percent to 35 percent the anchor spacing shall not exceed 24 feet, and for grades greater than 35 percent the anchor spacing shall not exceed 16 feet.

2-11 Section XI: Sewer Main Installation

1. The trench shall be excavated to the required depth and width and bell holes dug in the bedding in advance of the pipe laying. The laying of gravity sewer pipes in finished trenches shall be commenced at the lowest point so that the spigot ends point in the direction of the flow. All pipes shall be laid with ends abutting and true to the line and grade indicated on the Plans or directed by the Owner. They shall be fitted and matched so that when laid in the work, they will form a sewer with a smooth and uniform invert. Supporting of pipes shall be as set out above and in no case will the supporting of pipes on blocks or earth mounds be permitted.

2. Sewer lines shall be installed using a pipe laser to ensure both vertical and horizontal alignment.

3. Branches and fittings for sewer lines shall be provided and laid as and where directed by the Owner or shown on the Plans. All open ends of the pipe and of branches shall be sealed with plugs or caps firmly held in place so as to be watertight and easily removable.

4. Open ends of unfinished pipelines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time.

2-12 Section XII: Backfilling of Sewer Lines

1. In the backfilling of the trench, material reasonably free from rock and acceptable to the Owner shall be used. Crushed stone shall be used to bed the pipe as shown on the Gravity Sewer Bedding detail on the plans. This procedure shall be required for all sewers. Crushed stone so used to bed the pipe is not a separate pay item.

2. Except as may be necessary in tamping or backfilling, walking or working on the completed portion of the pipeline shall not be permitted until the trench has been backfilled to a height of at least 12 inches above the top of the pipe as specified herein-before. The filling of the trench shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipeline will not be disturbed and injurious side pressures do not occur. Extra care shall be exercised until the backfill reaches a point 12 inches above the top of the pipe. No backfill material will be used which exceeds 6" in diameter at its greater dimension in the first four feet above the pipe. In the remainder of the ditch, no backfill material that exceeds 24" at its greatest dimension shall be used.

3. In filling the remainder of the trench, the backfill material may be shoveled into the trench without compacting, and heaped over whenever, it is not located in roadways or yards and in the opinion of the Owner, this method of backfilling may be used without inconvenience to the public. Within yards, compaction shall be approximately 85% standard proctor up to 18" of the ground level. The top 18" need not be compacted with the top 6" being top soil. Within State Highway rights-of-way or where street paving or shoulders are to be repaired, the contractor will be required to tamp or puddle all backfill as described hereinafter.

6. All backfill under existing pavement or sidewalks and 10 feet each side thereof, unless otherwise shown on plans or under pavement in state roads (state roads require flowable fill), shall be crushed stone and compacted in twelve (12) inch lifts.

7. In backfilling the pipeline trench in areas where the line is laid in the right-of-way of a State Highway, backfill shall be of select material of the same type as the existing natural material or fill in which the trench is dug. When so required by the Owner of the roadway, the backfill shall be placed in layers not exceeding six (6") inches and firmly tamped into place by

tampers or rammers. If it is under existing pavement of a State Highway, the first 12" over the pipe shall be backfilled with #57 stone as specified herein and the remainder of the ditch shall be backfilled with TDOT approved flowable fill up to the bottom of the existing asphalt. New asphaltic pavement shall then be placed as the same depth as the existing asphaltic pavement.

8. Backfilling of trenches or excavations on easements shall be performed in such a manner that the private property owner's facilities and grounds shall be restored to as near as possible their original condition immediately after pipe laying. The residue of the stockpiled bedding material shall be cleaned up and placed into the trench, then the previously excavated and stockpiled topsoil suitable for backfill shall be placed in the top of the ditch. Seeding and sodding shall proceed immediately following backfill.

9. If the backfilling operation is performed during extremely dry weather, the contractor should leave some stockpiled topsoil to use later as additional fill after settlement has occurred.

10. Trench backfill in the vicinity of water service lines shall be properly compacted to prevent settlement and shearing of water service lines.

11. Whenever it is necessary, the Contractor may be required to use a combination of any or all the above outlined methods for proper compaction of the backfill in the trenches.

12. Before final acceptance, the Contractor will be required to level off all trenches where backfill material has been piled up, or to bring the trench up to the level of the surrounding street, roadway, or terrain. The Contractor will be required to remove from the streets, roadways, and private property all excess earth or other materials.

2-13 Section XIII: Check Dams in Bedding and Backfill

1. Check dams shall be installed in the bedding and backfill of all new or replaced sewer lines to limit the drainage area subject to the french drain effect of gravel bedding. Dams shall consist of compacted clay bedding and backfill at least three (3) feet thick to the top of the trench and cut into the walls of the trench two (2) feet. Alternatively, concrete may be used, keyed into the trench walls. Dams shall be placed no more than 500 feet apart. The preferred location is upstream of each manhole.

2. All stream crossings will include check dams on both sides of the crossing.

3. Check dams are not a separate pay item.

2-14 Section XIV: Service Lines and Connections

1. Service Connection piping shall be 6" SDR-26 PVC pipe (unless shown as ductile iron or HDPE on the plans) meeting the requirements of these Detailed Specifications.

2. Joint shall be rubber gasketed slip-on type.

3. Service connections to new collector lines shall be made with a rubber gasketed slip-on type Tee-Wye.

4. Service connections to existing connector lines shall be made with the materials in Section 2-05, 5A.

5. The service line shall be excavated, bedded and backfilled as detailed for main lines within these specifications.

6. The ends shall be plugged with a watertight plug that can be easily removed by plumbers.

7. If a clean-out is directed to be built and the clean-out is in a concrete/pavement driveway and/or sidewalk, a Sigma MB-344 sewer clean-out box or City approved equal shall be used.

8. A Pressure treated 2 x 4 shall be placed vertically at the end of each service to aid in location of the laterals. 8' 2x4's shall be used with the bottom being equal to the invert of the lateral to aid in the proper elevation being used for the lateral on the record drawings.

9. The installation of house connections shall follow immediately or be concurrent with the construction of the main sewer. This requirement shall apply particularly where traveled streets are involved so that the said streets will only be closed once during the construction period. This method of construction will permit more advantageous handling of backfilling and street paving replacement, and will also avoid possible damage to the main sewer by subsequent exposure for connection of the service lines.

2-15 Section XV: Connections to Existing Sewers

1. Connection to existing sewer lines shall be made at the places shown on the Plans and in the manner shown. The materials specified in Section 2-05, 5A. shall be used. Unless a separate pay item is provided in the BID SCHEDULE, the cost of such connections shall be merged into the unit prices for the

pipeline to be connected.

2. Actual connections shall be coordinated so as to prevent spillage of raw sewage and so as to allow quality control tests to be performed unless an emergency dictates a temporary connection.

2-16 Section XVI: Installation of Gravity Sewer Pipe to be Encased with Class "C" Concrete

1. Where shown on the Plans or directed by the Owner, the pipe shall be encased in Class "C" concrete.

2. Where concrete encasement is to be used, pipe shall be placed on 6-inch concrete blocks positioned behind each pipe bell. After the pipe has been brought to grade and is firmly affixed in place for true alignment, the pipe trench shall be backfilled with Class "C" concrete to a point above the pipe as shown on the Plans or directed by the Owner.

2-17 Section XVII: Highway Crossing

1. Where shown on the Plans or required for the successful completion of this project, highway crossings for the gravity sewers may have to be installed by boring and jacking. 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. 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. The carrier pipe shall be supported within the casing by utilizing PSI Advance Products and Systems Model SI Epoxy Coated Casing Spacers or approved equal 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 and Systems end seals, or approved equal, in accordance with the instructions of the manufacturer of the seals.

5. Carrier pipe within casings shall be SDR-26 PVC pipe. 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.

2-18 Section XVIII: Stream Crossings

1. Sewers 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. A check dam must be installed along the pipe on both sides of the stream.

3. The contractor shall not unnecessary disturb or uproot trees and/or vegetation along the stream bank or in the vicinity of a stream, or dump soil/debris into streams or along the banks of streams. Contractor shall comply with the requirements of the ARAP permit for utility line crossings.

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

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

2-19 Section XIX: 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 reestablish vegetation within 30 days of disturbance. The owner has the authority to stop work if this protocol is not followed.
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. On city contracts, where the disturbed area is anticipated to be greater than or equal to one acre 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 shall be filed. Approximately thirty (30) days prior to the date on which construction is scheduled to begin, the Engineer will submit this on behalf of the Owner. The Contractor is required to sign a form to be provided by the Engineer prior to commencing construction activities that states that he understands the conditions of the General Permit and accepts responsibility for compliance for his portion of the work.

   The Contractor is also required to develop a "Storm Water Prevention Pollution Plan" in accordance with the provisions of the Tennessee Department of Environment & Conservation Rule 1200-4-10-05. This plan shall be submitted to the Engineer for approval and will be submitted to the state along with the Notice of Intent.

Work under this contract is 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.

Work under this contract is also 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.

8. **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 shall pay any penalties levied by any agency due to said violations.**

9. Pollution and Erosion Control Methods

Temporary silt fences and/or baled hay or straw 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. Silt fences shall be anchored into the soil, and hay bales shall be staked to the ground.

Bales of hay or straw shall be either hay or straw containing five (5) cubic feet or more of material.

The Contractor shall be required to maintain the silt fence 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.

10. On City contracts, 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 specifications, if this project requires such. The contractor must be willing to sign the Notice of Intent

2-20 Section XX: 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.

3. 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.

4. 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 such as 19-19-19 at the rate of 5 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 400 lbs. per acre for each operation in yards and 40 lbs per acre in pastures. 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 to 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, the Contractor shall delay this item of work until the proper season for such seeding or temporary seed with a warm season grass as directed by the Owner.

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

7. Seeding and Landscaping is not a separate pay item. Replacement of sod disturbed by the contractor's operation is not a pay item.

8. Trees that are removed during construction must be disposed of at contractor's expense. Any tree cut shall have the stump removed. Contractor may dig out or grind off stump.

9. 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.

10. 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).

11. 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 just repaired with a repair coupling.

12. 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.

2-21 Section XXI: Street and Driveway Replacement

1. REPLACING STREETS AND ROADWAYS:

~~The City of Cookeville is planning on doing full width paving on the disturbed streets and temporary patching as needed after the~~

~~contractor turns over maintenance for roads to the City. This will insure fewer complaints from property owners regarding the Contractor/Owner. It may be necessary for the City to close some roads during the construction period for patching/paving.~~

~~Where the entire ditch is to be backfilled with crushed stone, compacted Tennessee Department Size No. 57 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.~~

~~The Contractor is responsible for maintenance of the ditches for 14 days after notifying the City in writing that the road is ready to be turned over to the City. To make the road ready to turn over to the City the Contractor must have backfilled the road as described above, have all sections of sewer in that named road installed, and have all the testing of the lines and manholes and any necessary repairs in that road complete.~~

~~Crushed stone added to ditches for maintenance after initial backfill will not be cause for additional payment.~~

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 for approval. No pavement shall be replaced without paving subcontractor approval 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:

Where the entire ditch is to be backfilled with crushed stone, compacted Tennessee Department Size No. 57 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 after initial backfill will not be cause for additional payment. Crushed stone will be paid for at the unit price specified if included in the BID SCHEDULE.

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 one (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 constructed.

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, or new matching materials, in equally as good condition as that found before the work began.

2-22 Section XXII: Testing and Inspection

1. INSPECTION OF SEWER LINES FOR QUALITY AND LINE AND GRADE

A. The Contractor shall notify the Owner when pipe will be received on the Job so that arrangements may be made for inspecting the unloading and stringing, as well as inspecting the pipes properties and examining for the manufacturer's identification. Pipe shall be unloaded and stored in accordance with the manufacturer's recommendations. No pipe, materials or equipment shall be stored on private property without the permission of the property owner.

B. BEFORE THE CONTRACTOR BACKFILLS ANY OF THE LINES, THEY SHALL FIRST BE INSPECTED BY THE OWNER, UNLESS OTHERWISE DIRECTED BY THE OWNER. If any joints, pipes, or other workmanship or materials are found to be defective, they shall be removed and replaced by the Contractor without any extra compensation.

C. After the sewer lines have been brought to completion, and prior to final inspection, the Contractor shall clean out the entire system by pushing through each individual line in the system, from manhole to manhole, appropriate tools for the removal from the lines of any and all debris and obstructions or may, if possible, flush clean with water. If necessary during the process of rodding the system, water shall be turned into the system in such quantities to carry off the debris and

trash.

D. During the final inspection, the Owner will inspect each individual line, from manhole to manhole, to determine whether the completed lines are true to line and grade as laid out or as shown on the Plans.

E. All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be replaced at the Contractor's expense.

2. DEFLECTION TESTING

A. Deflection testing of all flexible pipes shall be conducted in the presence of the City's representative. The test shall not be conducted until after the backfill has been in place at least 24 hours.

B. No pipe shall exceed a deflection of 5%. The test shall be run with a rigid ball or a 9 arm mandrel having a diameter equal to 95% of the inside diameter of the pipe. The test must be performed by manually pulling the test device through the line.

3. AIR TESTING SEWER LINES

A. The Contractor will be required to perform a Low Pressure Air Test on all new sewer lines, including plugged service lines in the presence of the City's representative, as a condition of final acceptance. The line shall be tested from manhole to manhole. Basically, the test shall consist of installing a special pneumatic plug in the line to about 4 psi. After a 2-minute temperature stabilization period, the line pressure shall be brought to 3.5 psi and timing is begun with a stopwatch. The time required for a pressure drop of 1.0 psi will be recorded. The minimum test times and allowable air loss values for various pipe size per 100 feet is as follows:

Pipe size (inches)	Time (sec/100 ft)	Allowable Air Loss (ft^3 /min)
6” or 8”	72	2.0
10	90	2.5
12	108	3.0
15	126	4.0

If the time for the 1-psi pressure drop is less than the calculated value, the line shall be repaired and retested until it passes the test.

B. If groundwater is present, the test pressure shall be increased 1.0 psi for each 2.3 feet of water above the pipeline.

C. A complete tabulated report of the tests for each section of sewer shall be prepared by the contractor and submitted to the Owner.

D. In the event of a marginal test at the time of the final inspection, the Owner may hold a portion of the Contractor's final payment pending another inspection of the lines during the worst anticipated seasonal groundwater conditions.

4. TESTING MANHOLES

A. The Contractor shall vacuum test all manholes installed to at least 10 inches of mercury in the presence of the City's representative. The test shall be considered acceptable for a 4 ft. manhole if the vacuum remains at 10 inches of mercury or drops to no less than 9 inches of mercury as specified below:

MANHOLE DEPTH	DIAMETER	TIME TO DROP 1" HG
4 – 10'	4 ft.	75 seconds
10 - 15'	4 ft.	90 seconds
15 - 25'	4 ft.	105 seconds

The test shall be conducted with the frame secured to the manhole as shown on the Plans and/or specified herein. For manholes 5 ft. in diameter, add an additional 15 seconds to the time requirements for 4 ft. diameter manholes. For manholes 6 ft. in diameter, add an additional 30 seconds to the time requirements for 4 ft. diameter manholes.

B. If the manhole fails the initial test; the Contractor shall locate the leak(s) and make the appropriate repairs, acceptable to the Engineer in preparation for additional tests.

C. Contractor shall furnish all equipment necessary for testing. The cost of this work shall be merged into the unit price for manholes.

5. INSPECTION OF SEWER LINES FOR INFILTRATION/ INFLOW

Prior to final acceptance or during the warranty period of completed gravity sewer lines, the lines may be inspected during rainfall events or at times of high ground water for extraneous flow. If flow is discovered in a section prior to connections being made to that section of line, the contractor will be responsible for locating the leak(s) and making the appropriate repairs.

The contractor may also be required to air test the line(s) in question again.

The sewerlines shall not have more than 15 gallons per day-inch-mile of pipe diameter.

2-23 Section XXIII: Bypassing of Raw Sewage

Under no circumstances will the dumping of raw sewage on private property or into lakes, streams, storm sewers, or in City streets be allowed. Bypass pumping shall be the responsibility of the Contractor and separate payment shall not be made unless there is a separate item on the Bid Form.

2-24 Section XXIV: Clean Up

In areas where the sewer line has been backfilled, the Contractor shall clear the right-of-way and surrounding ground dispose of all waste materials and debris resulting from 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.