STANDARD
SEWER LINE SPECIFICATIONS

SEWERS, MANHOLES AND APPURTENANCES

SHELBYVILLE, TENNESSEE

REVISED – NOVEMBER 2025

WPN 25.0773
Standard Sewer Line Specifications
Shelbyville, Tennessee
APPROVED
THE DOCUMENT BEARING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE
TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION
DIVISION OF WATER RESOURCES
AND IS HEREBY APPROVED BY THE COMMISSIONER
Matthew Taylor
December 4, 2025
THIS APPROVAL SHALL NOT BE CONSTRUED AS CREATING A PRESUMPTION OF CORRECT OPERATION OR AS WARRANTING BY THE COMMISSIONER THAT THE APPROVED FACILITIES WILL REACH THE DESIGNED GOALS.
APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE

City of Shelbyville
Shelbyville Power, Water, and Sewerage System
308 South Main Street
Shelbyville, Tennessee 37160

Prepared by:
J. R. Wauford & Company Consulting Engineers, Inc.
2835 Lebanon Road
Nashville, Tennessee 37214
JRWCO Job No. 2027

TABLE OF CONTENTS

SEWER LINE SPECIFICATIONS
SEWERS, MANHOLES AND APPURTENANCES

****

SEWERS, MANHOLES AND APPURTENANCES

1. Scope of the Work

The work under this Detailed Specification consists of the furnishing of all labor, materials, equipment and services necessary for the construction of Sanitary Sewer Lines for the Shelbyville Power, Water and Sewerage System of Shelbyville, Tennessee. **NOTE: If project to be installed includes a pumping station and force main, contact the Manager of the Sewer System for details.**

2. Alternate Pipeline Materials - Gravity Sewers

a. General

The following pipeline materials are approved for installation in the Shelbyville Sewer system: (1) ductile iron pipe and (2) polyvinyl chloride pipe.

Specifications for each pipeline material are outlined in the following Subparagraphs.

b. Ductile Iron Pipe

(1) Materials, Manufacture and Joints

Ductile iron pipe shall be centrifugally cast, Grade 60-42-10 manufactured and tested in accordance with the requirements of the latest revision of ANSI Specification A21.51.

The pipe shall have a single rubber gasket seal, push-on joint unless mechanical joints are specifically called for. Thickness class of the pipe shall be Pressure Class 350. Laying length may be either eighteen (18) or twenty (20) feet.

IN CASES WHERE INDUSTRIAL WASTES ARE PRESENT, DUCTILE IRON PIPE SHALL BE SPECIALLY LINED.

(2) Fittings

Fittings shall be either mechanical joint or single gasket push-on joint as shown or determined during construction. The fittings required at manholes shall be furnished to meet the same specifications as the pipeline materials. Fittings for services shall be tees, wyes, or tapping saddles with "O" ring gaskets.

(3) Pipe Bedding and Backfill

Ductile iron pipe used for gravity sewers shall be laid in a bed of crushed stone meeting the gradation requirements of the Tennessee Department of Transportation (TDOT) Size No. 67 to a depth of one-eighth (1/8) the pipe diameter or six (6) inches, whichever is greater. Select backfill shall be placed in ten (10) inch loose lift layers and lightly compacted (eighty [80] percent Standard Proctor Density) to the top of the pipe. Select backfill shall be imported or native material excavated from the trench, free of rocks, foreign material or frozen earth.

Bedding material and backfill in City of Shelbyville streets shall be as specified in Paragraph 13. Pipeline Trenches Within Roadways of this Detailed Specification and as shown on the Standard Detail Sheet.

(4) Markings

Each length of pipe and fittings shall have plainly marked on the pipe's exterior:

(a) Nominal size
(b) Class
(c) Manufacturer
(d) Quality Control Code

(5) Mechanically Restrained Joints

Where required for bored highway crossings, bored railroad crossings or stream or river crossings, Pressure Class 350 mechanically restrained joint ductile iron pipe in accordance with AWWA/ANSI C151/A21.51 shall be utilized. The restrained joint pipe shall be American Lok-Ring joint pipe, U.S. TR Flex joint pipe or approved equal. The gland shall be a heavy section ductile iron casting, Grade 60-42-10. All nuts and bolts shall be stain-less steel.

c. Polyvinyl Chloride Pipe

(1) Materials and Manufacture and Joints

Polyvinyl chloride pipe for sewer lines shall be made from Class 12454-B or 12454-C Polyvinyl Chloride plastic as defined in the latest revision of ASTM Specification D17 84, "Rigid Poly (Vinyl Chloride) (PVC) Compounds".

The pipe and fittings shall conform to and/or exceed the latest revision of ASTM Specification D 3034 Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings as it applies to Class

12454-B or 12454-C Polyvinyl Chloride plastic pipe. Sewer pipe shall be SDR 26 with push-on elastomeric gasket joints designed to allow the pipe to be connected on the job. Push-on joints shall form a watertight seal and lubricants shall be non-toxic and compatible with the gasket and pipe materials. Joints and lubricants shall conform to the latest revision of ASTM Specification D 3212. Gaskets shall be vulcanized natural or vulcanized synthetic rubber conforming to the latest revision of ASTM Specification F477.

Upon the completion of installation, the PVC pipe shall be capable of passing a rigid ball or a Manager of the Sewer System approved nine (9) arm mandrel having a diameter equal to ninety-five (95) percent of the inside diameter of the pipe with the pipe in place and covered. A minimum of twenty-four (24) hours shall elapse after backfilling has been completed prior to checking deflection with the mandrel.

The pipe shall be furnished in nominal lengths of twelve and one-half (12 1/2) and/or twenty (20) feet. All fittings and accessories shall have bell and spigot configurations identical to that of the SDR 26 pipe.

The pipe supplier shall furnish special fittings (as approved by the Manager of the Sewer System) for use in connecting PVC pipe to existing pipe or ductile iron pipe where specified.

The pipe and joints shall conform to the Specifications of the American Society for Testing and Materials (ASTM) and the National Sanitation Foundation Testing Laboratories (NSF) and Detailed Specifications the pipe and manufacturer shall be approved by the Division of Water Pollution Control, Tennessee Department of Environment and Conservation.

THE MANAGER OF THE SEWER SYSTEM RESERVES THE RIGHT AT THE END OF THE ONE (1) YEAR WARRANTY PERIOD TO RUN A GO-NO-GO MANDREL THROUGH SELECTED LINE SEGMENTS AS CHOSEN BY THE MANAGER. FAILURE TO PASS THIS TEST WILL REQUIRE PIPELINE REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.

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 STRAIGHTENED AND LIES FLAT WITHOUT RESTRAINT.

(2) Pipe Bedding and Backfill

PVC pipe shall be laid in a bed of compacted crushed stone meeting the gradation requirements of TDOT Size No. 67, up to a depth of one-eighth (1/8) pipe diameter or six (6) inches, whichever is greater. See requirements of Paragraph 10. Pipe Bedding -Gravity Sewers of this Detailed Specification. A crushed stone (Size No. 67) envelope placed in six (6) inch loose lift layers with a minimum of eighty-five (85) percent Standard Proctor Density up to a point twelve (12) inches above the top of the pipe is required. In addition to the construction procedures outlined in other Paragraphs of this Detailed Specification, PVC pipe shall be installed in full compliance with the recommended practice for "Underground Installation of Flexible Thermoplastic Sewer Pipe", ASTM Designation D 2321.

Bedding material and backfill in city of Shelbyville streets shall be as specified in Paragraph 13. Pipeline Trenches Within Roadways of this Detailed Specification and as shown on the Standard Detail Sheet.

(3) Markings

As a minimum the pipe shall have the following data applied to each piece:

(a) Nominal Size
(b) Type of Material (PVC Cell Classification)
(c) SDR or Class (Color Coded)
(d) Manufacturer
(e) NSF (National Sanitation Foundation) Seal of Approval
(f) Quality Control Code

3. Highways Crossings

a. Bored State Highway Crossings

All bored crossings of U.S. and State of Tennessee Highways, shall be made by boring with a steel casing pipe as specified in Paragraph 5.b. Steel Casing Pipe hereinafter. The pipe shall be jacked through a bored hole. Where boring is required, the holes shall be bored under the highway at least four (4) feet below the surface with no disturbance to the surface. The Contractor shall obtain all approvals and post all bonds.

b. Open-Cut Highway Crossings

If approval of the Tennessee Department of Transportation can be obtained by the Contractor, special open-cut highway crossings of U.S. and state of Tennessee Highways will be permitted. The following Tennessee Department of Transportation requirements shall apply: "Where open cutting is allowed, the following conditions shall be met: (a) all backfill material shall be compacted crushed stone, and (b) one-half (1/2) of the traveled portion of the paving must be open at all times." The Contractor shall keep the pipeline trench to a minimum to prevent excessive disturbance of the existing pavement. The proposed sewer line shall be at least four (4) feet below the highway. The Contractor shall be fully responsible for the successful operation, without interruption, of traffic and shall be held responsible for returning the highway to its original condition. The Contractor shall be responsible for any settlement which occurs as a result of his work. The Contractor shall also post signs warning approaching motorists of the work underway. During construction, flagmen will be required. Any open trenches shall be bridged with temporary bridges consisting of one-half (1/2} inch steel plate for the convenience of the traveling public.

c. Open-Cut County and City Highway Crossings

Whenever possible, crossings under highways will be open-cut. There 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, and (b) one-half (1/2) of the traveled portion of the paving must be open at all times." Crossings of city streets and county roads will be open-cut with the permission of the City of Shelbyville and the Bedford County Highway Department.

THE CONTRACTOR WILL BE REQUIRED TO PURCHASE A ROADWAY BOND AND FILE A ROADWAY PERMIT WITH THE CITY OF SHELBYVILLE FOR EACH OPEN-CUT CROSSING.

4. Railroad Crossings

a. Jacked or Bored Railroad Crossings

The Contractor should familiarize himself with the requirements of the railroad within whose rights-of-way the Contractor is working. The Contractor will obtain and pay for any permit it is required to obtain to place the utility within the right-of-way and shall secure any permit he is required to obtain to work within that right-of-way, if such permit is required. The Contractor shall pay for any insurance to the amount and extent required by the railroad involved.

Generally, pipeline crossings of railroads shall be made by boring or jacking a smooth wall steel casing pipe under the railroad bed and inserting the carrier therein. The steel pipe shall be manufactured and tested in accordance with

ASTM Specification Al39 or A53, Grade B with the minimum wall thickness meeting that specified in Paragraph 5.b. Steel Casing Pipe hereinafter and have a minimum yield strength of 35,000 psi. Casing pipe shall be so constructed as to prevent leakage of any substance from the casing throughout its length except at ends. Casing shall be so installed to prevent the formation of a waterway under the railroad, with an even bearing throughout its length, and shall slope to one end (except for longitudinal occupancy).

Bored or jacked installations shall have a bored hole diameter essentially the same as the outside diameter of the pipe. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately one (1) inch, remedial measures as approved by the Railway Company shall be taken. Boring operations shall not be stopped if such stoppage would be detrimental to the railroad.

b. Open-Cut Railroad Crossings

If approval of the railroad company can be obtained by the Contractor, open cutting of the railroad crossing may be permitted. Installations by open trench methods across railroad tracks shall comply with American Railway Engineers Association (AREA) specifications covering "Installation of Pipe Culverts". In the case of open cut railroad crossings, a steel casing pipe will be used as specified in Paragraph 5. Steel Casing Pipe for Highway and Railroad Crossings hereinafter of this Detailed Specification.

5. Steel Casing Pipe for Highway and Railroad Crossings

a. General

Where required, highway and/or railroad crossings shall be bored or tunneled so as to prevent interruption to traffic and to prevent later settlement of the roadway, roadbed, or railroad. The Contractor must be fully equipped and experienced in the installation of large diameter structures by boring or tunneling methods. The Contractor shall be fully responsible for the successful operation without interruption of traffic and shall be held responsible for any settlement which occurs as a result of his work.

b. Steel Casing Pipe

Black steel casing pipe shall be manufactured and tested in accordance with ASTM Specifications A139 or A53, Grade B, 35,000 psi yield strength, and shall meet the American Railway Engineering Association (AREA) Specification for Coated Corrugated Metal Pipe and Arches, Chapter 1, Part 5. Steel casing pipe where shown shall be as follows:

Diameter Carrier in inches	Diameter Casing in inches	Minimum Wall Thickness of Casing in inches
4	12	0.250
6	14	0.250
8	16	0.281
10	20	0.344
12	24	0.407
14	24	0.407
16	36	0.532
18	36	0.532
20	40	0.563
24	40	0.563

6. Alternate Manhole Design

a. General

In order to prevent excessive leakage of water into manholes, special care is warranted in the design and construction of manholes; therefore, this design requires high quality watertight precast manholes. Special emphasis is placed on the connection of the pipeline to the manhole in such a manner as to preclude shearing and/or leakage; for this reason, a waterstop consisting of a ductile iron wall pipe with an integral waterstop is required for poured-in-place manholes and a neoprene boot with an integral expanding band to clamp and seal the boot in the core-drilled opening or an A-lok is required for the precast manholes. THE CONTRACTOR MAY INSTALL EITHER PRECAST MANHOLES, AS SPECIFIED HEREINAFTER OR POURED-IN-PLACE MANHOLES. For pipe twenty-one (21) inch in diameter and smaller, manholes shall have an inside diameter of four (4) feet. For pipe twenty-four (24) inch in diameter and larger, manholes shall have an inside diameter of five (5) feet.

Where manholes are replaced or when new lines connect to existing line, a flexible coupling as specified in Subparagraph a. (4) hereinafter shall be utilized.

(1) Standard Manhole Frames and Covers

Manhole frames shall be furnished and set in a bed of mastic and BOLTED to the concrete as shown on the Standard Detail Sheet. The standard frame and cover shall be traffic type of grey cast iron ASTM Specification A 48 Class 30 with a twenty-four (24} inch diameter opening weighing not less than four hundred (400) pounds as shown on the standard Detail Sheet. The covers shall be the solid MACHINED self-sealing type with no holes except water-tight pick notches. The surface between the cover and frame shall be MACHINED, shall fit smoothly without rocking and shall be thoroughly cleaned. If a gasket is utilized, special attention shall be given to insure the proper installation of the rubber gasket in the self-sealing

cover. The gasket shall have at least one-fourth (1/4) inch diameter cross-section. The frame shall be attached to the manhole barrel by means of four (4) five-eighths (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.

Standard manhole frames and covers shall be John Bouchard and Sons No. 1110 or approved equal. An actual sample manhole frame and cover shall be submitted to the Manager of the Sewer System for approval along with shop drawings.

At the end of all line segments, a vented cover shall be substituted.

(2) Watertight Manholes Frames & Covers

The manhole frames shall be set in the same manner prescribed for standard frames except special attention shall be paid to securing a watertight connection to the manhole barrel.

The watertight manhole frame and cover shall be a traffic type of grey cast iron ASTM Specification A 48 with a twenty-four {24) inch diameter minimum clear opening weighing not less than four hundred fifty (450) pounds and shall be of the two (2) cover design as shown on the Standard Detail Sheet.

The surface cover shall be the solid type with no holes except watertight pick notches or a heavy lifting ring. 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 (2) lifting handles and shall have a neoprene sealing gasket at least seven-sixteenths (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 (4) five-eighths (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.

Watertight manhole frames and covers shall be John Bouchard & Sons No. 1266D or approved equal**.** An actual sample manhole frame and cover shall be submitted to the Manager of the Sewer System office along with the shop drawings.

(3) Manhole Steps

Manhole steps shall be made of copolymer polypropylene plastic meeting ASTM Specification D 4101 and shall have a one-half (1/2) inch diameter Grade 60 reinforcing rod meeting the latest revision of ASTM Specification A 615 through its center. Each step shall be twelve (12) inches in width and capable of carrying a load of 1,000 pounds in the center of the step when projected six (6) inches from the wall. Each step shall be equipped with non-skid grooves.

(4) Manhole Inverts

Manhole inverts shall be formed from Class "C" concrete as shown on the Standard Detail Sheet. Inverts for "Straight-through" manholes may be formed by laying the pipe straight through the manhole, pouring the concrete invert and then breaking out the top half of the pipe. Curved inverts shall be constructed of concrete and shall form a smooth, even, half-pipe section as shown on the Standard Detail Sheet. The inverts shall be constructed when the manhole is being built. XYPEX admix C-1000 shall be incorporated into all precast manholes.

(5) Connection of Sewer Line to Manhole

The connection of the manhole to the pipeline(s) shall be accomplished as follows:

	Type of Manhole	
Type of Pipe	Precast	Poured-in-Place
DIP	A-lok, Kor-N-Sea1	Wall Pipe
PVC	A-lok, Kor-N-Sea1	A/C Manhole Adaptor

The A-lok gasket for use with precast manholes shall be a neoprene gasket cast into the manhole wall and providing the manufacturer's recommended pipe deflection while maintaining a watertight seal. The Kor-N-Seal connection shall consist of a neoprene boot with an internal expanding opening and stain-less steel band and clamp.

If a ductile iron wall pipe is used, it shall be connected to the polyvinyl chloride pipeline with an adaptor utilizing stainless steel bands, if applicable. If the wall pipe is used in conjunction with a poured-in-place manhole, it shall be cast into the manhole with adequate extra thickness and wire mesh reinforcement to ensure strength. The wall pipe shall have a joint within twelve (12) to eighteen (18) inches of the manhole wall. Where main lines enter the manhole two (2) feet or more above the invert, a drop shall be installed. Drop connections shall be made of flanged or mechanical joint ductile iron pipe as specified.

An actual sample of the proposed pipe section with the waterstop welded or secured thereon shall be submitted for the Manager of the Sewer System's consideration. The same installation procedures described for the ductile iron wall pipe above shall be used except that no adapter will be required to connect the similar pipeline material.

b. Precast Concrete Manholes

Precast manholes shall be constructed on a reinforced concrete foundation. Wet cast manholes as modified herein shall be utilized. The bottom section of the manhole shall be precast integrally with the precast ring and shall be four (4) feet in diameter. All concrete used in connection with the construction of manholes shall be Class "A" concrete (4,000 psi).

Precast concrete rings shall be constructed using standard .forms and shall conform to ASTM Specification C 478 except that:

(1) The concrete mixture shall contain no less than eight hundred forty-six (846) pounds per cubic yard (nine [9] bag mix) of Portland Cement. Detailed Specifications.

(2) An eccentric top cone will be allowed provided it meets this Detailed Specification.

(3) All joints shall conform to Section 8 of ASTM Specification c 361 except the Contractor shall utilize a double seal of Ram-Neck as shown on the standard Detail Sheet.

(4) XYPEX admix C-1000 shall be incorporated into all precast manholes.

The precast section shall be manufactured and installed in a manner so that there is no visible leakage in the manholes. The manhole sections shall be manufactured in lengths such that a finished manhole will have the least possible number of joints. Where practical, only one (1) section less than four (4) feet in length will be allowed per manhole and that being the section required to bring the manhole to grade. NO HOLES FOR LIFTING WILL BE ALLOWED. The precast rings shall be jointed using a confined “O” ring gasket joint, as shown on the Standard Detail Sheet, and the joint shall be grouted smooth.

The outside surface of all precast manholes shall be coated with two (2) layers of bitumastic coating supplied by the Contractor and applied at right angles of each other.

Should a grade ring become necessary to bring the manhole to grade, it shall be set in a bed of mastic and bolted to the cone.

7. Lines and Grades

Unless otherwise directed by the Manager of the Sewer System, lines and grades shall be set to conform to those shown on the approved Plans submitted to and approved by the Manager of the Shelbyville Power, Water and Sewerage System and the Tennessee Department of Environment and Conservation, Division of Water Pollution Control.

Lines and grades shall meet minimum requirements set out by the Tennessee Department of Environment and Conservation, Division of Water Pollution Control.
Sewers shall be laid at least ten (10) feet horizontally from any existing or proposed water line. The distance shall be measured from edge to edge. If this condition cannot be met, the sewer line may be installed in a separate trench and the top of the sewer line shall be a minimum eighteen (18) inches below the water line invert.

Whenever sewer lines cross over or under water lines, the sewer shall be laid such that at least eighteen (18) inches of vertical separation is present. The area between the two (2) pipelines shall be backfilled with crushed stone as specified hereinafter.

8. Excavation for Pipeline Trenches and Manholes

a. General

The excavation shall be carried to the depths indicated on the approved Plans and/or as directed by the Manager of the Sewer System 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 approved 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, but unless specifically authorized by the Manager of the Sewer system, trenches shall not be excavated wider than one (1) foot six (6) inches plus the nominal diameter of the pipe, at the level of the crown of the pipe or at a depth of cut of five (5) feet, whichever is less.

Unless specifically directed otherwise by the Manager of the Sewer System 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.

All barricades, lanterns, watchmen, and other such signs and signals as may be 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.

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

When so required, by the Shelbyville Power, Water & Sewerage System or the City of Shelbyville, one-half (1/2) of the street crossings and road crossings shall be excavated, then temporary bridges consisting of one-half (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 backfilled 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 the property owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged.

In excavation for masonry and concrete structures, including manholes, the required width shall be such as to permit forms to be constructed in the proper manner and to permit proper backfilling upon completion of the structures. Depth of excavation for footings shall be as shown on the approved Plans and/or as directed by the Manager of the Sewer System to obtain sufficient bearing.

All excavated material not needed for backfilling purposes shall be disposed of in a manner satisfactory to the Shelbyville Power, Water & Sewerage System.

In all areas along City Streets or State Highways where the pipeline is being laid in the pavement or in the right-of-way of the street of the City of Shelbyville or the road of the Tennessee Department of Transportation requires that excavation during each day shall be limited to the footage of pipe that can be laid and the trench be backfilled so that no ditch is left open overnight in such areas. All other rules and regulations of the Tennessee Department of Transportation and the City of Shelbyville shall apply. THE CONTRACTOR SHALL BE REQUIRED TO OBTAIN ALL PERMITS AND PAY ALL PERMIT FEES REQUIRED. NO WORK SHALL BEGIN UNTIL ALL PERMITS ARE APPROVED BY THE AFFECTED GOVERNMENTAL ENTITIES.

All excavation shall be accomplished in accordance with applicable safety laws and regulations; the Shelbyville Power, Water & Sewerage System, as previously stated, does not assume responsibility of any degree or sort for acts of the Contractor.

b. Unstable Trench Bottom Material or Undercutting

If wet, mucky and/or unstable or unsuitable material is encountered in a trench bottom, the Manager of the Sewer System may require additional excavation to insure a firm foundation for the pipe. The quantity of undercutting will be determined by the Manager of the Sewer System. In such cases, the trench bottom shall be brought back up to proper grade with TDOT Size No. 67 stone.

c. Excavation Near Potable Water Lines

The Contractor shall protect existing water lines that cross the sewer lines by providing eighteen (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 (1) 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.

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

d. Excavation on Easements

Excavation of pipeline trenches on easements shall be performed in such a manner that the private property owner's facilities and grounds shall be restored to as near their original condition as possible considering the work performed. The grass cover of the ditches or excavations shall be the same type as the original undisturbed cover.

Before any excavation is begun or before drilling and blasting, a minimum of nine (9) inches of the topsoil or original cover shall be removed and stockpiled in a manner as not to contaminate the topsoil with other fill or excavated material. Should the depth of excavation require a trench wider than specified in Subparagraph a. above, a minimum of nine (9) inches of topsoil or original cover shall be removed from the additional area and stockpiled as described hereinbefore.

Excavated materials suitable for backfill shall be placed at a distance far enough from the ditch to allow excavated rock to be placed next to the open trench; however, stockpiling outside the easement shall be done only with the property owner's written permission.

e. Removal of Water

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 until the structures to be built therein are completed. No concrete shall be placed in water nor shall water be allowed to rise over structures if there is danger of flotation or of setting up unequal pressures in the concrete until the concrete has set at least twenty-four (24) hours and any danger of flotation has been removed.

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.

During the laying of sewers and until sewer pipe has been bedded in place with at least two (2) feet of backfill over the pipe, the Contractor shall keep the groundwater table below the bottom of the trench.

No sewer will be permitted to be laid 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.
All removal and handling of water required to maintain dry trenches or other excavations for the construction of sewers or other structures in the dry trench shall be at the expense of the Contractor.

9. Pipe Bedding - Gravity Sewers

a. General

ALL gravity sewers shall be laid on a bed of crushed stone meeting the requirements of the TDOT Size No. 67. In general, the trench shall be opened below the bottom of the pipe to the depth previously specified and refilled with the bedding materials to provide a firm bed for the bottom quadrant of the pipe at the proper grade and line.

When rock is encountered, the trench shall be excavated to a depth at least six (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.

Material as specified hereinbefore 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.

b. Bedding and Backfill Protection for Ductile Iron

Gravity Sewer Line Ductile iron gravity sewer lines shall be excavated and backfilled as specified in Paragraph 2.b.(3) Pipe Bedding and Backfill, Paragraph 11. Backfilling of Pipeline Trenches and where applicable Paragraph 12. Pipeline Trenches Within Roadways of this Detailed Specification.

c. Bedding and Backfill Protection for Polyvinyl Chloride Gravity Sewer Line

PVC gravity sewer lines shall be excavated and back-filled as specified in Paragraph 2.c.(2) Pipe Bedding and Backfill, Paragraph 11. Backfilling of Pipeline Trenches and where applicable Paragraph 12. Pipeline Trenches Within Roadways of this Detailed Specification.

d. Unstable Trench Bottom Material or Undercutting

If wet, mucky and/or unstable or unsuitable material is encountered in the trench bottom, it shall be excavated and backfilled as specified in Paragraph 8.b. Unstable Trench Bottom Material or Undercutting, hereinbefore.

10. Pipe Laying - Gravity Sewers

The trench shall be excavated to the required depth and width and bell holes dug in the bedding in advance of 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 approved Plans or as directed by the Manager of the Sewer System.

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 under Paragraph 9. Pipe Bedding - Gravity Sewers and Paragraph 11. Backfilling of Pipeline Trenches and in no case will the supporting of pipes on blocks or earth mounds be permitted.

Branches, fittings and specials for sewer lines shall be provided and laid as and where directed by the Manager of the Sewer System or shown on the approved Plans. ALL open ends of the pipe and of branches shall be sealed with stoppers or bulkheads firmly held in place so as to be watertight and easily removable.

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. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TAKING PROPER PRECAUTIONS TO PREVENT PIPELINE FLOTATION.

11. Backfilling of Pipeline Trenches

a. General

In the backfilling of the trench, material reasonably free from rock and acceptable to the Manager of the Sewer System shall be used. CRUSHED STONE SHALL BE USED TO BED THE PIPE AS SHOWN ON THE GRAVITY SEWER BEDDING DETAIL ON THE STANDARD DETAIL SHEET. THIS PROCEDURE SHALL BE REQUIRED FOR ALL SEWERS OF ALL MATERIALS.

Except as may be necessary in tamping or backfilling, walking or working on the complete pipeline shall not be permitted until the trench has been backfilled to a height of at least twelve (12) inches above the top of the pipe as specified hereinbefore .. 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 twelve (12) inches above the top of the pipe.

In the backfilling of the trench outside of roadway rights-of-way, material reasonably free from rock and acceptable to the Manager of the Sewer system shall be used. Walking or working on the complete pipeline, except as may be necessary in tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least one (1) foot above the top of the pipe. 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.

In filling the remainder of the trench, the backfill material may be shoveled into the trench without compacting, and heaped over whenever, in the opinion of the Manager of the sewer System, this method of backfilling may be used without inconvenience to the public. Within street or State Highway rights-of-way or where street paving or shoulders are to be repaired, the Contractor will be required to tamp all backfill as described in Subparagraph b. hereinafter.

Mechanically tamped crushed stone (Class A, Grading D) backfill will be required on lines where roadway pavement is to be replaced immediately as specified in Subparagraph b. hereinafter. All other paved areas shall use crushed stone (No. 67) as specified in Paragraph 12. Pipeline Trenches Within Roadways hereinafter.

In backfilling the pipeline trench in areas where the line is laid in the right-of-way of a street or State Highway, but outside of paved roadways, shoulders and driveways, 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 Shelbyville Power, Water & Sewerage System, the backfill material shall be placed in layers not exceeding six (6) inches and firmly tamped into place by tampers or rammers. The Manager of the Sewer System may also require puddling wherein, in his opinion, it is necessary for proper compaction.

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.

b. Backfill in Paved Areas

Where sewers are to be installed within the paved surface or shoulders of City of Shelbyville streets, the backfill material shall be TDOT Size No. 67 crushed stone as shown on the Standard Detail Sheet.

c. Backfilling Operations Conducted on Easements

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.

After the pipe bedding, pipe and pipe bedding along the sides of the pipe and over the pipe as specified hereinbefore has been placed, the excavated rock next to the ditch shall be placed in the ditch. Excavated rock shall not be placed any closer than eighteen (18) inches from the finished grade and any excess rock shall be removed by the Contractor and disposed of as directed.
The residue of the stockpiled bedding material shall be cleaned up and placed into the trench, leaving no bedding stone scattered over the area. The previously excavated materials suitable for backfill shall be placed into the ditch only upon clean-up and backfill of the bedding material. The top portion of the trench or excavation shall be filled using the stockpiled topsoil. The ditch shall be left high to allow for settling unless in the opinion of the Manager of the Sewer System this method of backfilling will cause inconvenience to the private property owner. Seeding or sodding shall proceed immediately following backfill.

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.

THE CONTRACTOR. WILL BE HELD RESPONSIBLE FOR THE CONDITION OF GRASS COVER AND THE CONDITION OF THE GROUND SURFACE AT THE TIME OF FINAL INSPECTION UNLESS THE PRIVATE OWNER HAS PLOWED OR EXCAVATED THE GROUND.

d. Disposal of Excess Material

The Contractor shall be responsible for the off-site disposal of any and all excess or unsuitable material excavated in the construction of the project. He shall be responsible for obtaining any and all permits, license fees, *etc*., associated with the disposal of excess material.

12. Pipeline Trenches Within Roadways

Except for the area enumerated in Paragraph 11.b. hereinbefore, where excavation is within the traveled portion of City of Shelbyville streets, all native earth and/or rock shall be removed and hauled away and disposed of by the Contractor at his own expense. The resulting backfill material shall be as specified in Paragraph 11.b. of this Detailed Specification.

13. Unauthorized Excavation and Over-Breakage

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

Over-breakage is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Manager of the Sewer system, including slides. All over-breakage shall be removed by the Contractor and disposed of as directed.

14. Installation of Gravity Sewer Pipe to be Encased with Class "C" Concrete

Where the grade of the pipe requires less than four (4) feet or cover in streets or in the shoulders of streets or less than three (3) feet of cover across fields .or lawns, as measured from the top of the pipe, Class "C" concrete encasement or cast or ductile iron pipe will be required. Generally, where the line is not being tapped for services, ductile iron pipe will be utilized.

Where concrete encasement is to be used, pipe shall be placed on six (6) inch concrete blocks positioned behind each pipe bell. After jointing the pipe, it shall be brought to the established grade by driving wooden wedges between the pipe and the concrete block. 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 approved Plans or directed. Expansion joints shall be provided at not less than twenty (20) foot intervals by making a vertical gap in the concrete of one (1) to three (3) inches; these joints shall coincide with a pipe joint. After twenty-four (24) hours, the backfill will then be completed as specified in Paragraph 11. Backfilling of Pipeline Trenches hereinbefore.

15. Open-Cut Point Repairs

a. General

At the points shown on the Plans or directed, major sags, offset joints, or collapsed pipe in the line to be renovated shall be repaired by open-cut method. The Contractor shall mobilize the necessary equipment to dig-down to the pipeline. Pipe for dig down point repairs shall be DR 26 PVC or specially lined Class 350 Ductile Iron Pipe as shown on the Plans.

It is important for the Contractor to understand that it is easy to create additional leaks by shocks to the pipeline caused by mechanical equipment striking the pipeline. Any pipeline damaged by the Contractor’s negligence shall be replaced or satisfactorily repaired at no additional expense to the Shelbyville Power, Water & Sewerage System.

b. Excavation

Mechanical equipment may be used to dig out the trench to a depth slightly above the pipeline so as not to disturb the pipeline. Excavation around the pipeline shall be by hand. Upstream and downstream sewers shall be temporarily plugged to prevent sewage from entering the trenches.

All excavation shall be accomplished in accordance with applicable safety laws and regulations; the Shelbyville Power, Water & Sewerage System, as previously stated, is not responsible for safety or acts of the Contractor.

c. Methods of Repair

The method of repair shall include careful removal of one or more joints of the existing pipe and replacement with new pipe, complete with flexible couplings as provided by Maxadaptor Coupling by Gripper Gasket or approved equal, at each end of the replaced section.

16. Check Dams and/or Collars

The Contractor shall install a compacted clay check dam on the downstream side of all creek or stream crossings. The Contractor shall install a compacted clay collar on sewer line segments which exceed eight (8) percent grade.

The compacted clay check dam and collar shall be as shown on the Standard Detail Sheet.

17. Concrete Cradles, Collars, Anchors, and Encasements

Concrete cradles, collars, anchors, and encasement for the sewer lines shall be placed where and as shown on the Sheet, or as directed by the Manager of Standard Detail the Sewer system. Concrete for cradles, anchors or encasement shall be Class "C". Concrete shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed when used for cradles, anchors or encasement. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints.

18. Rock Excavation

Rock Excavation is the responsibility of the Contractor.

19. Sheeting, Shoring and Bracing of Excavation

Sheeting, shoring and bracing of excavation is the Contractor's SOLE responsibility to determine if it is required.

20. Connections to Existing Sewers

Connections to existing sewers shall be made at the location shown on the approved Plans and in the manner shown.

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.

21. Service Connection and Piping

Service connection piping shall be ductile iron pipe meeting the requirements of Paragraph 2.b.(1) or PVC pipe meeting the requirements of Paragraph 2.c.(1) of this Detailed Specification. Service connections to the sewer line shall be made as shown on the Standard Detail Sheet. The ends shall be plugged with a watertight plug that can be easily removed by plumbers.

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.

22. Inspection of Gravity Sewer Lines for Quality and Line and Grade

The Contractor shall notify the Manager of the Sewer System when pipe will be received on the job so that arrangements may be made for inspecting and unloading and stringing, as well as inspecting the pipe proper and examining for the manufacturer's identification. Pipe shall be unloaded and stored in accordance with the manufacturer's recommendations. No pipe (or other materials or equipment) shall be stored on private property without the permission of the property owner.

BEFORE THE CONTRACTOR BACKFILLS ANY OF THE LINES, THEY SHALL BE FIRST INSPECTED BY THE MANAGER OF THE SEWER SYSTEM; AND THE MANAGER OF THE SEWER SYSTEM SHALL GIVE THE CONTRACTOR PERMISSION TO PROCEED WITH THE BACKFILLING. If any joints, pipes, or other workmanship or materials are found to be defective, they shall be removed and replaced by the Contractor.

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.

During the final inspection, the Manager of the Sewer System 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.

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 removed and replaced at the Contractor's expense.

23. Inspection of Gravity Sewer Lines for Infiltration/Inflow

a. General

Prior to final acceptance of completed gravity sewer lines, the lines will be inspected or shall be tested to insure compliance with the following provisions (it should be recognized that much of the prescribed should be done prior to backfilling).

b. Allowable Pipeline Leakage

Generally, the Contractor will be required to lay sewer lines so that the groundwater infiltration shall not average more than fifty (50) gallons per twenty-four (24) hours per inch of nominal diameter per mile of sewer, including manholes and plugged services and as measured in a high groundwater condition approximately at the surface of the ground. These requirements may be applied to the entire system or may be applied to any single section of line between two (2) manholes. The more restrictive provisions set forth for specified items shall govern those items.

In order to test for infiltration/inflow, the Manager of the Sewer System will require that the Contractor plug the open ends of all lines at a manhole so that measurements may be made at each section of the sewer line. Temporary pumps may also be required. The Contractor will be expected to locate and repair leaks even if the location of same requires T.V. inspection. Grouting of leaks with 3M will be permitted as a last resort.

Manholes or flexible connectors shall have NO visible leaks.

c. Testing Manholes

The Contractor shall vacuum test all manholes to at least ten (10) inches of mercury. The test shall be considered acceptable if the vacuum remains at ten (10) inches of mercury or drops to no less than nine (9) inches of mercury within one (1) minute. The test shall be conducted with the frame secured to the manhole as shown on the Standard Detail Sheet and specified hereinbefore. If the manhole fails the initial test, the Contractor shall locate the leak(s) and make the appropriate repairs acceptable to the Manager of the Sewer System in preparation

for additional tests. The Contractor shall furnish all equipment necessary for this test.

d. Testing Sewer Lines

The Contractor will be required to perform a Low Pressure Air Test on all new sewer lines, including plugged service lines and manholes, 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 at each manhole and pressurizing the line to about four (4) psi. After a two (2) minute temperature stabilization period, the line pressure shall be brought to three and one-half (3 1/2) psi and timing is begun with a stop watch. The time required for a drop in pressure of one (1) psi will be recorded. The minimum allowable time in seconds for this pressure drop to occur shall not exceed the times listed in the table below:

Less Than 500 L.F. of Gravity Sewer Line	Minimum Time Required For 1.0 PSI Pressure Drop (Seconds)
8-inch	340
10-inch	425
12-inch	510
15-inch	638
18-inch	1020
20-inch	1100
21-inch	1090
24-inch	1360

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

If groundwater is present, the test pressure shall be increased one (1) psi for each 2.3 feet of water above the pipeline.

The tests shall be conducted in the presence of the Manager of the Sewer System and a complete tabulated report of the tests for each section of the sewer shall be prepared by the Contractor and submitted to the Manager of the Sewer System.

In the event of a marginal test at the time of the final inspection, the Manager of the Sewer System may recommend that a portion of the Contractor's final acceptance be withheld pending another inspection of the lines during the worst anticipated seasonable groundwater conditions.

24. Bypass Pumping

BYPASS PUMPING OF SEWAGE SHALL BE CONSIDERED A SUBSIDIARY OBLIGATION OF THE WORK.

Where flow stoppage may be necessary and the flow is so great as to require, the Contractor shall bypass the sewage around the section or sections of line that are being repaired by plugging an existing upstream manhole and pumping the sewage into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow.

UNDER NO CIRCUMSTANCES WILL THE DUMPING OF RAW SEWAGE ON PRIVATE PROPERTY, OR INTO STREAMS, STORM SEWERS OR IN CITY STREETS BE ALLOWED UNLESS THE CONTRACTOR SECURES WRITTEN PERMISSION FROM THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION, DIVISION OF WATER POLLUTION CONTROL AND THE ENVIRONMENTAL PROTECTION AGENCY.

Except as may be approved otherwise by the Manager of the Sewer System at the end of each working day, temporary connections shall be made so that overnight pumping is not required.

25. Removing and Replacing Concrete Driveways, Sidewalks and Paved Ditches

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

After the sub-base has been brought to a satisfactory grade, a three (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.

The driveways shall consist of six (6) inches of Class "A" concrete, struck off to accurately placed screeds and worked with a wooden float until the mortar appears on top. After the surface has been thoroughly floated, it shall be brushed to leave markings of a uniform type similar to the existing driveway. All joints and edges shall be finished with an edging tool. The allowable joint variation shall be one-eighth (1/8) inch to ten (10) feet transversely and longitudinally.

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.

26. Removing and Replacing Concrete Curb and Gutter

Where a concrete curb and gutter are damaged or disturbed during the construction work, it shall be replaced, using Class "A" concrete, in fully as good or better condition to than that which existed prior the Contractor's operation.

27. Replacing Streets and Roadways

a. General

The Contractor shall replace in kind all streets, alleys, roadways, driveways, parking lots, *etc*., which may be removed, disturbed, or damaged in connection with his operation. The Contractor shall reconstruct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition as that which existed prior to his operations.

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.

AT LEAST ONE-HALF (1/2) OF THE TRAVELED PORTION OF THE ROADWAY MUST BE OPEN TO TRAFFIC AT ALL TIMES.

b. Backfill Material

Where sewers are installed within the traveled portion of a City street, all backfill material shall be as specified in Paragraph 11, Subparagraph b. Backfill in Paved Areas of this Detailed Specification.

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 ten (10) inches of finished grade as specified hereinbefore, the Contractor shall place approximately ten (10) inches of crushed stone, TDOT Class "A", Grade "D", in five (5) inch layers 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 it.

The Contractor shall maintain the traffic-bound base course by adding crushed stone as specified above in a safe and passable condition for a period of sixty (60) days, or until such time as sufficient settlement has taken place and trenches are ready for final resurfacing.

d. Subgrade for Final Resurfacing

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

When the trench has reached a condition of settlement satisfactory for final resurfacing, the Contractor shall first strip the base course or backfill with crushed stone backfill material to obtain the proper subgrade elevation. The subgrade shall then be rolled with an approved type roller, or tamped until thoroughly compact.

Any depressions 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. 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 cut back approximately one (1) foot outside the trench or limits of construction, as applicable, 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.

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 411, Grading D, with eighty-five (85) to one hundred (100) penetration grade asphalt cement. Compacted thickness of asphaltic concrete pavement replacement shall be as directed or shown on the Standard Detail Sheet.

f. Double Bituminous Surface Treatment (Chip & Seal)

Where double bituminous surface treatment (chip & seal) is required or as directed by the Manager of the Sewer system, the traffic-bound base shall comprise the subgrade upon which the bituminous surfacing shall be constructed.

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 gallon per square yard.

Where the prime coat has become tacky but not hard, cutback asphalt RD-800 shall be applied in two (2) applications at the rate of 0.35 to 0.45 gallon per square yard for each application. The Contractor shall apply approximately fifty (50} pounds per square yard of crushed stone chips between the two (2) applications o£ bituminous material and thirty-five (35) to forty (40) pounds of chips after the final application of bituminous material.

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 specified above to at least the thickness of the existing pavement.

28. Seeding, Sodding and Landscaping

All areas disturbed by construction which are not a part of pavements shall be seeded in accordance with the requirements below. Roadway shoulders which were crushed stone or receive crushed stone are considered as pavements. Special attention shall be directed to the work performed on private easements.

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, Italian Rye Grass, Kentucky Fescue #31 and/or such other grasses as are specified by the Manager of the Sewer System (in pastures, *etc*., the property owner's preference of grasses shall be used). When the final grading has been completed, the entire area to be seeded shall be fertilized with ammonium nitrate at the rate of five (5) pounds per 1,000 square feet and an approved commercial fertilizer at the rate of ten (10) pounds per 1,000 square feet. The analysis of the commercial fertilizer shall be determined by soil tests.

After the fertilizer has been distributed, the Contractor shall rake or harrow the ground to thoroughly work the fertilizer into the soil. The seed shall then be sowed in two (2) operations, broadcast either by hand or by approved sowing equipment. The applications shall be thirty (30) pounds per acre for each operation. If the Manager of the Sewer System determines to use "hulled" or "unhulled" Bermuda, the application rate shall be seven (7) pounds 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 (3) percent weed. The seeded area shall then be covered with straw at the rate of one and one-half (1/2) ton per acre.

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 Manager of the Sewer System, 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 Manager of the Sewer System.

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.

29. Rip-Rap

Where directed by the Manager of the Sewer System, rip-rap shall be of the rubble-stone type (Plain) and placed to a depth of not less than twelve (12) inches. Materials and construction methods for rubble stone rip-rap (Plain) shall conform to the requirements of Section 709 of the Tennessee Department of Transportation Standard Specifications.

30. Temporary Project Water Pollution Control (Soil Erosion)

a. General

Temporary pollution control provisions shall be taken to avoid damage to embankments and cut slopes and to avoid transport of sediment to adjacent property owners and/or streams.

The erosion control shall consist of temporary measures as shown on the Standard Detail Sheet or directed by the Manager of the Sewer System during the life of the work to control erosion and water pollution through the use of temporary silt fences.

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.

b. Construction Requirements

The surface area of erodible earth material exposed by clearing and grubbing shall be kept to a minimum. The Contractor shall provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other water-courses, lakes, ponds or other water impoundment such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds or as directed by the Manager of the Sewer System.

The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time. Temporary pollution control measures shall be used to correct conditions that develop during construction; that are, needed prior to installations of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices but are not associated with permanent control features on the project.

Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages.

In the event of conflict between these requirements and pollution control laws, rules or regulations, or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

c. Pollution and Erosion Control Methods

Temporary silt fences with 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 approved Plans or directed by the Manager of the Sewer System. Silt fences are constructed of wire mesh with a covering of filter cloth of fence composed burlap, plastic filter fabric or some other suitable material on the upper grade side of the fence and anchored into the soil.

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 Manager of the Sewer System. The silt accumulation at the fence may be left in place and seeded, removed, *etc*., as directed by the Manager of the Sewer System. The silt fence becomes the property of the Contractor whenever the fence is removed.

The 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.

****