

CONSTRUCTION METHODS

SECTION 3

SECTION 3 – CONSTRUCTION

1. LOCATION OF LINES

The streets, roads, and easements in which lines shall be placed have been indicated on the Plans. Final location of the pipelines within these locations shall be made by the Engineer and the Department of Public Services at the time of construction.

2. TRENCHING

Trenching must be done in a neat and workmanlike manner, maintaining proper alignment except where necessary to make deviations to miss obstruction. Trenching for installation of water distribution piping shall be such that the pipe will have a minimum cover of thirty (30) inches over the bell. The bottom of trenches must be shaped by hand and bell holes must be dug so that full length of pipe is resting on trench bottom. Blocking shall not be used.

All shade trees, telephone poles, etc. along the line of work shall be protected and sufficient barricades, lanterns, etc. shall be provided for the protection of the public.

- 2.1 Rock Excavation in Trenches – Where rock is encountered in trenches, the excavation shall be carried to a depth of 6” below the barrel of the pipe and the excess excavation shall be backfilled with approved bedding material firmly compacted. Boulders and large stones, rock or shell shall be removed to provide a clearance of at least 6” below all parts of the pipe or fittings and to clear width of at least 6” on each side of all pipe and appurtenances. For narrow trenches, rock or shell shall be removed to provide a clearance of at least 1.5” below all parts of the pipe or fittings and to clear width of at least 1.5” on each side of all pipe and appurtenances.

Where rock is encountered, the Contractor shall “mattress” the trench during blasting operations and shall use all precautions necessary to protect adjacent property against damage resulting from his operations. Rock excavation in proximity to other pipes or structures shall be conducted with the utmost care to prevent damage to the existing structures and any such damage caused shall be promptly repaired at the Contractor’s expense. Blasting operations shall not be conducted within 25’ of finished sewer or water pipe; and rock excavation shall be completed at least 25’ ahead of pipe laying.

Extreme care shall be exercised in blasting with the signals of danger given and displayed before the firing of any charge. The Contractor shall, in all his acts, conform to and obey all rules and regulations for the protection of life and property that may be imposed by any public authorities or that may be made from time to time by the Engineers relative to the storing and handling of explosives and the blasting operations. No blasting shall be done at any time except by persons experienced in this line of work.

- 2.2 Obstructions of Streets, Premises, Etc. – All materials excavated shall be placed so as to interfere as little as possible with public vehicular traffic. In general, excavated material shall be kept clear of the sidewalk except where local conditions make other arrangements desirable. In this event, the Contractor will receive appropriate instructions from the Engineer.

At such street crossings and other points as may be directed by the Engineer, the trenches shall be bridged in a proper and secure manner so as to prevent any serious interruption of travel upon the roadway or sidewalk, and also to afford necessary access to particular public premises.

The Contractor shall plan his operations so as to cause a minimum of inconvenience to property owners and to traffic. No road, street or alley may be closed unless absolutely necessary, and then only if the following conditions are met:

1. Permit is secured from appropriate State, County or Municipal authorities having jurisdiction.

2. The following offices must be contacted prior to the cutting or closing of any City Street:

A. LEBANON SPECIAL SCHOOL DISTRICT	453-8522
B. WILSON COUNTY SCHOOLS	444-3282
C. WILSON COUNTY SHERIFF'S OFFICE	444-1412
D. WEMA	444-8777
E. LEBANON POLICE DEPARTMENT	444-2323
F. FIRE DEPARTMENT	443-2827
G. PUBLIC SERVICES	444-0825
H. CITY OF LEBANON STREET DEPT	444-0825
I. TDOT	443-2755
J. LEBANON DEMOCRAT	444-3952 ext. 13

3. Suitable detours are provided and are clearly marked.

No driveways shall be cut or blocked without first notifying the occupant of the property. Every effort shall be made to schedule the blocking of drives to suit the occupant's convenience, and except in case of an emergency, drives shall not be blocked for a period of more than 8 hours. The Contractor shall furnish and maintain barricades, signs, flashing lights, and other warning devices as necessary for the protection of public safety. Flagmen shall be provided as required on heavily traveled streets to avoid traffic jams or accidents.

2.3 Surface Obstructions – All buildings, walls, fences, poles, bridges, railroads, trees, and other property or improvements encountered shall be carefully protected from all injury, and in the event that any of the foregoing are damaged or removed during the process of the work, they shall be repaired or replaced in a satisfactory manner. Special care must be exercised in trenching under or near railroads in order to avoid or minimize delays or injuries resulting therefrom. Where it is necessary to cross beneath railroad tracks, the Contractor shall make such installations in a casing of large diameter as approved by the Railroad Company, the Engineers and the Department of Public Services.

2.4 Subsurface Obstructions – In excavating, backfilling and laying pipe, care must be taken not to remove, disturb, or injure other pipes, conduits, or structures without the approval of the City Engineering Department. If necessary the Contractor, at his own expense, shall sling, shore up and maintain such structures in operation and within a reasonable time shall repair any damage done thereto. Repairs to these facilities shall be made to the satisfaction of the City Engineering Department.

The Contractor shall give sufficient notice to the interested utility of his intention to remove or disturb any other pipe, conduit, etc., and shall abide by their regulations governing such work. In the event subsurface structures are broken or damaged in the prosecution of the work, the Contractor shall immediately notify the proper authorities and shall be responsible for any damage to persons or property caused by such breaks.

When pipes or conduits providing service to adjoining buildings are broken during the progress of the work, the Contractor shall have them repaired at once. Delays such as would result in buildings being without service overnight or for needlessly long periods during the day will not be tolerated, and the Owner reserves the right to make repairs at the Contractor's expense without prior notification. Should it become necessary to move the position of a pipe, conduit, or structure, it shall be done by the Contractor in strict accordance with instructions given by the Engineer or the utility involved.

The City Engineering Department or Engineer will not be liable for any claim made by the Contractor based on underground obstructions being different than that indicated on the Plans. Where ordered by the engineer, the Contractor shall uncover subsurface obstructions in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstructions.

The Contractor shall be governed by instructions of the Engineer regarding the laying of pipe along State Highways and the latter will determine whether the pipe shall be laid over, under, or along the end of various drainage structures encountered.

3. LAYING WATER PIPES

- 3.1 General – In case of any item not covered by this Section, the manufacturer's recommendations shall govern the manner in which water pipe is laid.

Immediately before being placed in trench, all pipe shall be examined for defects and shall be swabbed clean and free of all dirt or rubbish. While suspended in sling and before lowering in trench, pipe shall be carefully examined for defects and no pieces shall be laid which are known to be defective. Defective pipe shall be rejected and Contractor shall remove at once from work area.

Bell holes for bell and spigot and mechanical joint pipe shall be dug in trench to allow entire length of pipe barrel to be bedded and to allow proper jointing of pipe. Alignment of pipe shall be as true as possible in order to avoid air pockets. When work is suspended either for the night or for any other reason, open ends of the pipe shall be securely plugged to prevent the entrance of foreign materials. Dead ends of the pipe and unused branches of crosses, tees, valves, etc. shall be closed with plugs suitable to the type of pipe in use.

Cutting of pipe shall be done in a neat, workmanlike manner without damage to pipe, coatings and linings and so that a smooth end remains at right angles to axis of pipe.

No pipe shall be laid in trench with water in it which, in opinion of Engineer or the City Engineering Department, prevents successful jointing, laying or backfilling of trench.

Note: Where PVC water mains are allowed, the contractor shall place detectable tape and trace wire as specified.

- 3.2 Ductile Iron Pipe – Provisions of AWWA Specification C600, latest revision, “AWWA Standard for Installation of Gray and Ductile Iron Water Mains” shall apply. Laying conditions shall be type 2 (flat bottom trench without blocks with tamped backfill).

Joints shall be an approved slip-on type or mechanical joint. Unless otherwise indicated on Drawings, lines laid below ground shall have approved slip-on joints; lines laid above ground shall have mechanical joints. Flanged joints shall be used only where designated on Drawings. Cement joints will not be permitted.

Mechanical joint and slip-on type water line shall be jointed together in trench according to recommendations of pipe manufacturer. Inside of bell and outside of spigot end shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter. Circular rubber gasket shall be flexed inward and inserted in gasket recess of bell lubricant shall be applied to inside surface of gasket or spigot end of pipe or both. Gasket lubricant shall be as supplied by pipe manufacturer and approved by Engineer. Spigot end of pipe shall be inserted into socket, with care used to keep joint end to bottom of socket with forked tool, jack-type tool, or other device approved by Engineer. Pipe not furnished with depth mark shall be marked before assembly to assure that spigot end is inserted to full depth of joint. Field cut pipe lengths shall be filled or ground to resemble spigot end as manufactured.

Whenever it is desirable to deflect slip-on joint in order to form long-radius curve, amount of deflection shall not exceed maximum limits as follows:

<u>Diameter</u>	<u>Joint Length</u>	<u>Deflection</u>
4” thru 12”	18 ft.	19 in.
14” thru 24”	18 ft.	11 in.

Consult Engineer for cases not covered in above table.

4. INSTALLATION OF FITTINGS

- 4.1 General – Fittings in pipe lines shall be firmly secured to prevent the fitting from being blown off the line when under pressure. When connections are made between the new work and existing mains, the connections shall be made using specials and fittings to suit the actual conditions.

All tees, caps, plugs, bends or other fittings subjected to unbalanced forces tending to pull the joints apart shall be protected with concrete thrust blocks. Thrust blocks shall be provided in accordance with standard detail drawing of these Specifications, and must bear against an undisturbed trench face. Thrust blocks must be used unless written permission is obtained from the Engineer to use special locked-joint fittings, anchoring fittings, or pipe clamps with tie rods.

Fittings shall be placed in locations indicated on Drawings or designated by Engineer and the City Engineering Department.

Before being placed in trench, all fittings shall be subjected to inspection by Engineer; and any defective, unsound or damaged fittings shall be rejected and Contractor shall remove at once from work area.

- 4.2 Fittings – Fittings shall be installed in accordance with provisions of these Specifications dealing with laying of ductile iron pipe. Joints shall be as designated under Division 2, Materials.

5. INSTALLATION OF VALVES, VALVE BOXES

Valves shall be placed in the locations indicated on the Plans or at locations designated by the Engineer. All valves shall be set vertically. Before being placed in the trench, all valves shall be carefully examined by the Contractor and Engineer to see that they are in good working order.

All valves shall be installed with locking tee or regular tee with Foster Adaptor.

Over each valve shall be placed a valve box. All valves which, when properly set, have operating nuts deeper than 30” below the top of the valve box shall have extension stems with operating nuts located within 12” of the valve box cap. The valve box shall be centered with the operations nut of the valve.

Valve box shall not come in contact with valve at any point. Backfill around boxes shall be tamped to maintain centered and plumbed alignment of box.

Box shall be installed with top set flush with finished surface in paved areas and 2 inches above natural ground level in unpaved areas. Concrete collars in unpaved areas shall be poured around valve boxes and shall be 2’ diameter (minimum) by 6” thick (minimum).

Valve and valve box installations shall conform to the standard detail drawing of these Specifications.

6. INSTALLATION OF FIRE HYDRANTS

Hydrants shall be located generally as shown on the Drawings subject to review and approval by the City Fire Department. Location shall provide complete accessibility and minimize possibility of damage from vehicles or injury to pedestrians.

Hydrants shall stand plumb (vertically) with pumper nozzle facing street or public rights-of-way. Hydrants shall be set so that ground line, as indicated on hydrant barrel, is within 4” of finished grade. Hydrants without ground lines marked on barrel shall be set so that barrel flange is no more that 2” below finished grade. Hydrant barrel extensions shall be used to conform to these requirements, if necessary.

Fire hydrant locking tees shall be used or standard tees with rodding from the valve to the tee. Separate rods must be used from the tee to the valve and from the valve to the hydrant. No fire hydrant shall be rodded from the tee through the valve with a continuous piece of

rodding. If the hydrant is removed the closed valve must remain anchored to the piping system. (See Detail Drawings enclosed).

Fire hydrant lead lines shall be Class 52 Ductile Iron Pipe.

A hydrant drain consisting of at least 7 cubic feet of clean, washed gravel or crushed stone shall be placed around base of hydrant. After installation is complete, hydrant will be tested for drainage and Contractor must correct situation if hydrant does not drain satisfactorily.

Painting of hydrants after installation shall be required if factory finish is not satisfactory or has been damaged. All hydrants shall be **YELLOW** unless otherwise directed by the Engineer.

In case of damaged or otherwise unsatisfactory paint, Contractor shall apply two (2) coats of approved enamel.

Hydrant installation shall conform to details of these Specifications.

7. INSTALLATION OF SERVICES

Services shall be installed in the best workmanlike manner with 30" minimum cover. Corporation cock at the main shall be installed in top quadrant of main. The service line shall run from main to meter box in as straight a line as possible and at an angle of 90 degrees \pm to the main.

Meter boxes shall be installed in public-right-of-way adjacent to right-of-way line with top of casting grade projecting slightly above finished grade.

Service lines require a minimum 6" thick envelope of ¾" crushed stone or crush and run from the water main to the water meter box

Installation shall be in accordance with the standard detail drawing of these Specifications.

8. INSTALLATION OF SPECIAL ITEMS

8.1 Connections to Existing Mains – Connections to existing mains for line extensions or fire hydrant installation shall be made in the manner approved by the City Engineering Department.

Where existing mains must be valved off to make connections, the Contractor shall notify the City Engineering Department not less than 24 hours prior to the making of the connection and the actual time of the service interruption shall be subject to the approval of the City Engineering Department.

It shall be the responsibility of the Contractor to measure outside diameters of existing pipes before ordering tapping sleeves or other fittings intended for connection to existing mains.

8.2 Concrete Work – concrete is to be proportioned in two classes according to use as follows:

Class “A” for reinforced concrete structures, non-reinforced portions of manholes, control chambers and interceptor structures, curbs and gutters, driveways, sidewalks, and surface base courses for highway and street paving.

Class “B” for encasement around sewers and water lines for cradle, refill and tunnel backfill, for thrust blocks.

Class “A” concrete is to be proportioned one 94 lb. sack Portland Cement, 195 lbs. sand, and 270 lbs. coarse aggregate. These proportions may be varied by the Engineers after the materials supplied have been tested and proportions for the greatest density and workability determined, provided that no more than 7.25, nor less than 5.5 bags of cement per cubic yard of concrete will be required. Class “A” concrete shall have a minimum compressive strength of 4000 lbs. per square inch in 28 days.

Class “B” concrete shall have a minimum compressive strength of 2000 lbs. per square inch and shall contain not less than 4 ½ sacks of cement per cubic yard of concrete. The relative amounts of fine and coarse aggregate shall be comparable to that for Class “A” concrete.

8.4 Installation of Stub-Outs for Future Lines – The Contractor shall anchor the valve and stub-out for future lines to the main line tee. These anchors are to be in addition to the standard concrete thrust blocking. At temporary ends of line where a tee is not located, after placing the required fire hydrant assembly, a short pipe stub with a gate valve and plug is required.

9. BACKFILLING

9.1 General – All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, (boulders, rocks or stones larger than 1 foot in diameter), or other material that in the opinion of the Engineer is unsuitable. From one foot above top of pipe to within twelve inches of finished grade in unpaved areas, backfill may contain enough dirt to fill voids between rock.

When backfill material is not specified on project plans or elsewhere in these Specifications, Contractor may backfill with the excavated material provided material consists of loam, clay, sand, gravel, or other materials that, in opinion of Engineer, are suitable for backfilling.

Backfilling shall not be started until pipe work has been inspected and approved by Engineer or the Department of Public Services.

Backfilling shall not be done in freezing weather and it shall not be made with frozen material. No fill shall be made where materials already in trench is frozen. Backfill shall not be made with material, which in Engineer’s opinion, is too wet.

9.2 Backfilling Under and Over Pipe – All trenches shall be backfilled by hand from bottom of trench to 1 foot above top of pipe with ¾” crushed stone. Crushed Stone shall be placed in 6” layers and thoroughly compacted by hand tamping. Backfill material shall be deposited in trench for its full width on each side of pipe, fittings and appurtenances simultaneously. Care must be taken to compact fill along sides of pipe and appurtenances adjacent to pipe wall.

9.3 Backfilling Under Pipe In Rock – Where trench is excavated in rock or shale, 6” space below pipe shall be backfilled with ¾” crushed stone firmly compacted for a cushion for pipe

and appurtenances. For narrow trench excavation in rock or shale, 1.5" space below pipe shall be backfilled with ¾" crushed stone firmly compacted for a cushion for pipe and appurtenances.

9.4 Backfilling Over Pipe – From centerline of pipe, fittings and appurtenances to a depth of 1 foot above top of pipe, trench shall be backfilled with ¾" crushed stone by hand or by approved mechanical methods in 6" layers and thoroughly compacted by hand tamping or by approved mechanical methods. Contractor shall use special care in placing this portion of backfill in order to avoid injuring or moving pipe.

9.5 Backfilling To Grade – From one foot above top of pipe to grade, trench shall be backfilled by hand or by approved mechanical methods (power equipment).

In Areas Subject to Vehicular Traffic – Where excavations are made through pavements, curbs, driveways, sidewalk, road shoulders, or other areas subject to vehicular traffic or supporting permanent structures, or where such areas, items or structures are undercut by excavation, entire backfill shall be #57 stone as approved by Engineer.

Where excavation is made through permanent pavements, backfill shall be placed as described above to subgrade elevation only. Remainder of backfill shall be crushed stone placed as directed to finished pavement grade to serve as temporary pavement.

From time that backfilling is complete until time permanent pavement surface is replaced or, in absence of pavement replacement, until job is accepted, Contractor shall, at direction of Engineer, water streets, roads, etc., to settle dust where excessive dust has, in opinion of Engineer, been caused by Contractor's operations. If Contractor refuses or delays unnecessarily to obey direction of Engineer, the Owner shall, after 24 hours written notice through Engineer, be permitted to proceed with such work with cost to be billed to Contractor.

In Areas Not Subject to Vehicular Traffic – Where excavation is made in areas not subject to vehicular traffic or supporting permanent structures and where settlement is unimportant, Contractor may backfill trench from 1 foot above top of pipe to top of trench with approved excavated material using hand or approved methods. Backfill shall be neatly rounded over trench to sufficient height to allow for settlement to grade after consolidation.

10. TUNNEL/BORE

Water Main In Tunnel/Bore – The carrier pipe in the tunnel/bore shall be as specified in the Materials section of this specification. All work performed beneath existing structures, across railroad rights-of-way, and under pavements shall be performed in accordance with the requirements of the parties or agencies having jurisdiction over these locations. The Contractor shall contact the parties or agencies prior to starting work and shall meet all requirements of the parties or agencies in regard to methods of construction and the safety precautions to be taken in performing the tunnel work. All costs involved in meeting these requirements shall be paid for by the Contractor and no additional compensation allowed.

At the Contractor's option and with consent of the parties or agencies having jurisdiction, steel pipe may be jacked or bored into place in lieu of a liner plate tunnel provided the

Contractor be responsible for all approvals from the parties and/or agencies having jurisdiction including, but not limited to, furnishing complete details of the methods to be employed for approval.

The water main pipe shall be adequately secured in the tunnel/bore casing by a method approved by the Engineer. At a minimum, the carrier pipe must be secured and non-compressible sand or pea gravel shall be placed in the space between the liner/casing and the carrier pipe by a method approved by the Engineer. Concrete bulkheads will be placed at the end of the tunnel, thickness and placement of which shall be subject to the Engineer's approval. Excavation shall be unclassified and no distinction made between rock and other materials excavated, with the cost of excavation merged in the unit price per foot of pipe water.

Note: In situations where the bore method is utilized with a steel casing pipe, the carrier pipe shall be secured inside the steel casing pipe with casing chocks (minimum three per joint) as manufactured by Powerseal Pipeline Products Corporation of Wichita Falls, Texas, or Engineer approved equal. Where casing chocks are used inside steel casing pipes, the requirement for sand or pea gravel backfill can be eliminated. Additionally, the ends of the steel casing pipe shall be sealed with casing pipe "End Seals", "Link-seal", or Engineer approved equal.

Construction of the tunnel/bore shall be carried on in such a manner that settlement of the ground surface above the tunnel/bore shall be held to an absolute minimum. Where ground conditions are unstable, poling plates or poling boards shall be used to prevent caving of material above the tunnel before the liner plates can be installed. Steel liner plates shall be installed as soon after the excavation is removed as possible and excavation shall not be removed more than 24 inches ahead of the installed liner plates.

Excavation shall be carried on in such a manner that voids behind the liner plates will be held to a minimum. However, should any boulders larger than one foot (1') in diameter be encountered, they shall be removed so that none are closer than 6 inches to the outer face of the liner plates. Should piling be encountered, each pile shall be cut out so that no portion remaining shall be closer than one foot (1') to the outer face of the liner. Where boulders or piling are excavated, the holes shall be backfilled by tamped material.

The steel lining shall consist of plates not to exceed 18 inches wide. Each circumferential ring shall be composed of the number and length of plates to complete the required diameter. The Contractor shall submit details of the lining for approval.

The strength of the casing or tunnel lining will be determined by its section modulus. Thickness of the metal for these steel plates shall not be less than 8 gauge allowing for standard mill tolerance.

All plates shall be punched for bolting on both longitudinal and circumferential seams and shall be so fabricated as to permit complete erection from the inside of the tunnel. The longitudinal seam shall be of the lap type with offset equal to gauge of metal for full width of plates including flanges and shall have staggered bolt construction so fabricated as to allow the cross-section of the plate to be continuous through the seam. All plates shall be of uniform fabrication and those intended for one size tunnel shall be interchangeable.

The material used for the construction of these plates shall be new and unused and suitable for the purpose intended. Workmanship shall be first-class in every respect.

After the plates are formed to shape and after all holes are punched, the plates shall be galvanized on all surfaces by the hot-dip process. A coating of prime western spelter, or equal, shall be applied at the rate of not less than three (3) ounces per foot of double exposed surface. If the average spelter coating as determined from the required samples is less than the amount specified above, or if any one specimen shows a deficiency of 0.2 ounce, the lot shall be rejected. Spelter coating shall be of first-class commercial quality free from injurious defects such as blisters, flux and uncoated spots.

All nuts and bolts shall be galvanized.

Plates shall be fabricated with grout holes to facilitate grouting above and around the tunnel liner. These grout openings shall be 2-inch I.P.T. half couplings welded into a hole in the center corrugation couplings welded into a hole in the center corrugation of a plate and a galvanized C.I. plug shall be provided for each opening to permit tight closure after grout holes so that the spacing of 18 inch centers at the top of the tunnel and at the top quarter points, staggered with the holes at the top.

Field coating material shall be asphaltic mastic, Trumbull 5X, or approved equal, and shall be applied with hydraulic spray equipment using a minimum of 2,400 pounds of pressure at the nozzle tip. The material shall be supplied at spraying consistency and shall be applied both the outside and inside of the liner plates. Plates may be hot-dipped to produce a similar coating.

When installing liner plate by the tunneling method, the excavation shall be performed in such a manner that voids between the undisturbed earth and the liner plate shall be maintained at a minimum. Any void occurring shall be filled with a Portland cement and sand grout pumped under pressure through grouting openings in the liner plate.

The minimum provision for grouting openings shall be one (1) opening in a top plate of the tunnel or conduit at locations not to exceed 54 inches apart. Additional plates with grouting openings are to be installed at the top quarter points on each side between the top openings. The opening shall be staggered but shall not exceed 54 inches in any one line. Grout vent pipes will be required at a minimum of one per monolithic pour.

The grout shall consist of Portland cement, water, sand and 2% approved additive (Bentorite, Septamine Seax, Hydrocide liquid, etc.). One part Portland cement with additive shall be combined to four parts clean sand and sufficient water added to provide a grout having the consistency of thick cream when well mixed.

A pump shall be provided for placing the grout which shall be capable of exerting sufficient pressure to assure the filling of all voids between the liner plate/ casing and the undisturbed ground. Minimum acceptable pressure will be five (5) pounds per square inch.

Pumping of grout shall be done (1) at the completion of the installation of approximately each 9 feet of liner plate, (2) at more frequent intervals than 9 feet if conditions indicate the necessity, and (3) at the end of a work day or when there is work stoppage for any reason.

The carrier pipe shall be furnished by the Contractor. Upon acceptance of the liner/casing, install the carrier pipe in the casing by jacking it through the casing. A concrete invert may be poured if necessary to achieve proper line and grade on the carrier pipe to offset any minor variations in the alignment of the casing.

11. PAVEMENT REMOVAL

Where existing paved streets, roads, parking lots, drives or sidewalks must be disturbed during construction of the project the Contractor shall take the necessary steps to minimize damage. Permanent type pavement shall be saw cut in a straight line before removal and care shall be taken during excavation to avoid damage to adjacent pavement. Where trucks or other heavy equipment must cross curbs or sidewalks, such areas shall be suitably protected.

A ROAD EXCAVATION PERMIT must be obtained before excavating in any city Street.

12. PAVEMENT REPLACEMENT

In paved or improved roads, or where sidewalks, curbs, gutters or driveways have been damaged by Contractor, and where replacement of surfaces or damaged items is required, items shall be repaired or replaced without any needless delay in the best workmanlike manner with same kind of materials as were removed or damaged in the construction operation. Underlying foundation courses of roads, etc., finished surface, etc., shall conform to undisturbed portions of damaged items and shall in every respect be equal to quality, materials and workmanship in original, undisturbed item. Decision of Engineer shall be final as to classification of any form of pavement or surfacing not specified on project plans or of any forms of pavement or surfacing where classification is at all doubtful. Should Contractor fail or refuse to repair any damage after receiving directions of the Engineer, the Department of Public Services may, after 24 hours written notice, employ such force and furnish such materials as may be necessary to do the work with cost to be billed to the Contractor.

13. CLEAN-UP PROCEDURES AND REQUIREMENTS

The Contractor shall not, without the permission of the Engineer, remove from the line of work any earth excavated therefrom which may be suitable for backfilling or surfacing until the excavation has been refilled and surfaced.

As soon as the backfilling of any excavation is completed and when in areas of existing development, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of the fill. He shall also remove all the pipe and other material placed or left on the street by him except material needed for the replacement of paving, and the street shall be opened up and made passable for traffic. Following the above work, the repairing and complete restoration of the street surfaces, bridges, crossings, and all places affected by the work shall be done as promptly as possible.

All excavated material shall be cleared from adjacent street surfaces, gutters, sidewalks, parkways, railroads, grass plots, yards, etc., and the whole work shall be left in tidy and acceptable conditions. Contractor will be required to re-grass lawns or neutral grounds where trenches are excavated in these locations or where Contractor has damaged lawns or neutral grounds by his operations.

The Engineers shall be sole authority in determining time in which rough and final clean up shall be prosecuted. Rough clean-up shall consist of removal of rocks larger than 1 foot in any dimension, grading of excess backfill material over pipe line or removal of said material, opening of any drainage device, restoration of any street or roadway to condition so that traffic may safely and conveniently use street or roadway, restoration of pedestrian ways to condition where pedestrians may safely and conveniently use same. Rough clean up shall, in general, be prosecuted no later than 1 day after pipe laying and backfilling or no farther behind pipe laying operations than 1000 feet; whichever time limit is shortest shall govern. Final clean-up consisting of pavement replacement, sidewalk replacement, removal of rocks, hand raking with seeding, strawing, etc., of lawns and neutral grounds, adjusting grade of ground over pipeline, property repairs, and other items shall, in general, be prosecuted no later than 2 to 3 weeks after pipe has been laid and backfilled.

14. SLOPE PROTECTION AND EROSION CONTROL

This section shall consist of temporary control measures as shown in the Drawings or directed by the Engineer or as required by the State of Tennessee – Water Pollution Control Division during the life of the Contract to control erosion and water pollution through the use of control devices.

Note: The Developer/Contractor's attention is directed to the fact that a permit from the Division of Water Pollution Control might be required for aquatic resource alteration for work in and/or around streams.

The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features to assure economical, effective, and continuous erosion control throughout the construction and post-construction period.

- a. Rock check dams are temporary measures to control erosion and prevent siltation. Rock check dams shall be used where the existing ground slopes in ditches or other areas where siltation erosion or water run-off is a problem.
- b. Temporary silt fences – Silt fences utilizing posts, filter cloth (burlap or plastic filter fabric, etc.) or other approved materials are temporary measure for erosion control. These fences shall be installed to retain suspended silt particles in the run-off water.
- c. 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.

In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of work as scheduled, and are ordered by the Engineer, such work shall be performed by the Contractor at his own expense.

- d. Erosion control outside project area – Temporary pollution control shall include construction work outside the project area where such work is necessary as a result of construction such as borrow pit operations, haul roads and equipment storage sites.

- e. No separate measurement and payment will be made for this work. It will be considered a subsidiary obligation of the Contractor under other bid items to which it reflects

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