

## SECTION 7

### EXCAVATION AND BACKFILL FOR PIPELINES

#### 7.1 GENERAL

The work covered by this specification consists of furnishing all labor, tools, materials, equipment, and performance of all operations in connection with the excavation, trenching, and backfilling for underground pipelines and appurtenances.

#### 7.2 UTILITY COORDINATION

Coordinate all interruptions of utility services with the City and Owner. Notify affected users a minimum of twelve hours in advance of, and restore service within four hours after, any interruption. City valves shall only be operated by City personnel or under their direction. Protect from damage any underground pipes, utilities or structures encountered. If such is damaged, restore to original or better condition.

#### 7.3 CONTROL OF GROUNDWATER

All trenches shall be kept free from water during excavation, fine grading, pipe laying, jointing, and embedment operations. Where the trench bottom is mucky or otherwise unstable because of the presence of groundwater, and in cases where the static groundwater elevation is above the bottom of any trench, such groundwater shall be lowered to the extent necessary to keep the trench free from water and the trench bottom stable when the work within the trench is in progress. Surface water shall be prevented from entering trenches.

All water pumped from the trenches shall be conveyed to existing drainage channels, gutters, or drains. Any conflicts and costs incurred by the improper disposal of this water shall be borne by the Contractor. No surface or subsurface water shall be allowed to enter the existing City sewer system.

#### 7.4 EXCAVATION FOR PIPELINE

All sewer lines shall be excavated and constructed starting at the existing facilities and proceeding continuously up stream with no interim segments left unconstructed. No variance therefore shall be allowed except upon written approval by the City Engineer.

Excavation for pipelines shall follow lines parallel to and equidistant from the location of the pipe centerline. Provide neat cut on asphalt surfaces to be removed during trench work to prevent excessive asphalt damage. Trenches shall be excavated to the depths and widths required accommodating the construction of the pipelines, as follows:

A. Except in ledge rock, cobblerock, stones or water-saturated earth, mechanical excavation of trenches shall not extend below an elevation of four (4) inches above the bottom of the pipe after placement in its final position. All additional excavation necessary for preparation of the trench bottom shall be made manually. Any unauthorized excavation made below grade for any reason shall be backfilled as specified under "Foundation Stabilization."

B. Excavation for trenches in ledge rock, cobblerock, stones, mud or other material unsatisfactory for pipe foundation, shall extend to a depth of at least four (4) inches below the bottom of the pipe. A bedding material shall be placed and thoroughly compacted with mechanical tampers in four (4) inch lifts to provide a smooth, stable foundation. Bedding material shall consist of suitable earth materials free from roots, sod, or organic matter. Trench bottoms shall be hand shaped.

Where unstable earth or mud is encountered in the excavation at the grade of the pipe, a stable foundation must be created by removing the unsuitable material and backfilling with foundation stabilization material (depth 6 inches to 24 inches as required).

The unsuitable wet material or muck shall be hauled off and disposed of by the Contractor. The Contractor shall take whatever measures are necessary to prevent the dry and wet trench materials from being commingled.

C. The maximum width of trench, measured at the top of the pipe, shall be as narrow as possible as but not wider than 12 inches on each side of the pipe. Greater trench widths may be used only upon the approval of the Public Works Department.

## 7.5 FOUNDATION STABILIZATION

Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and the super-imposed load, and where water must be drained to maintain a dry bottom for pipe installation, the subgrade shall be excavated to the specified depth and replaced with crushed rock or gravel (depth 6 inches to 24 inches as required).

Gravel for pipe foundations shall be clean crushed rock or gravel conforming to the following gradation:

<u>Screen</u>	<u>% Passing</u>
1 1/2"	100
3/4"	5

The gravel material shall be deposited over the entire trench width in six (6) inch maximum layers; each layer shall be compacted by tamping, rolling, vibrating, spading, slicing,

rodding or by combination of one or more of these methods. In addition, the material shall be graded to produce a uniform and continuous support for the pipe to be installed.

#### 7.6 BLASTING

Blasting will not be allowed except by permission from the City Engineer. The Contractor shall comply with all laws, ordinances, and applicable safety code requirements and regulations relative to the handling, storage, and use of explosives and protection of life and property, and shall be fully responsible for all damage attributable to blasting operations. Excessive blasting or over-shooting will not be permitted and any material outside the authorized cross-section which may be shattered or loosened by blasting shall be removed by the Contractor.

#### 7.7 SHEETING, BRACING AND SHORING OF EXCAVATIONS

Excavation shall be sheeted, braced, or shored as required to support the walls of the excavations to eliminate sliding and settling and as may be required to protect the workmen, the work in progress, and existing utilities and improvements. All such sheeting, bracing, and shoring shall comply with the requirements of the Utah State Industrial Commission.

All damage resulting from lack of adequate sheeting, bracing, or shoring shall be the responsibility of the Contractor. The Contractor shall make all necessary repairs or reconstruction resulting from such damage.

#### 7.8 ACCESS TO TRENCHES

Safe and suitable ladders extending two feet above the top of the trench shall be provided for all trenches over five feet in depth. One ladder shall be provided for each 100 feet of open trench, or fraction thereof, and be located so that workmen in the trench need not move more than 50 feet to a ladder.

#### 7.9 BACKFILLING

The Contractor shall not proceed to backfill until each section of utility line has been inspected by the City. Backfill shall be carefully placed around and over pipes and shall not be permitted to fall directly on a pipe from such a height as to cause damage. In these specifications, the process of preparing the trench bottom to receive the pipe to a level at the pipe spring line is defined as bedding except for plastic or transite in which case the bedding is considered to extend to twelve (12) inches above the top of the pipe. Where the excavated material has rocks over two (2) inches in diameter or the material is unstable making it unsuitable for bedding material, the zone shall be backfilled with modified bedding materials meeting the following gradations: 100% passing a one (1) inch screen and 5% passing a No. 4 sieve. Pea gravel shall not be accepted.

The bedding material shall first be placed so that the pipe is supported for the full length of the barrel with full bearing on the bottom segment of the pipe equal to a minimum of 0.5 of the outside diameter of the barrel, then the remainder of the bedding shall be placed. Alternative methods of pipe laying which are recommended by the pipe manufacturer may be used if approved by the Engineer.

Trench backfilling above the level of the pipe bedding shall normally be accomplished with native excavated materials and shall be free from frozen earth, organic materials, and rocks and solid objects larger than six (6) inches in diameter, except as required to protect pipe as per manufacturers' specifications.

The backfill in all utility trenches shall be either compacted or consolidated according to the requirements of the materials being placed. The in-place density shall be a minimum of 95% of the maximum dry density as determined by AASHTO T-99. Perform a minimum of one test per 150 lineal feet of trench per two (2) feet depth of trench to assure overall compliance. In the event that testing indicates additional compaction is required, perform additional testing as needed to assure compliance.

#### 7.10 CONSOLIDATION OF BACKFILL

Consolidation of backfill to within four (4) feet of the ground surface, shall be mechanically compacted by means of tamping rollers, sheep foot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers.

Compaction by jetting will be permitted under the following conditions: (1) Backfill consists of sand material which does not contain clay or other expansive material which prevents complete water penetration and material is totally free draining, and (2) the Contractor shall submit proposed procedures for review and approval to the Engineer at least 48 hours in advance of commencing work.

All precautions necessary shall be taken by the Contractor to prevent damage and movement (including floating) of the pipeline, structures, and existing adjacent improvements and utilities. The allowance of the use of consolidation methods shall not be construed as guaranteeing or implying that the use of such methods will not result in damage to adjacent ground. The Contractor shall make his own determination in this regard and shall assume all risks and liability for settlement or lateral movement of adjacent ground, or improvements, or utilities, either on the surface of the ground or underground.

#### 7.11 COMPACTION OF BACKFILL (TOP 4' OF TRENCH)

Backfill shall be compacted by means of sheepsfoot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers of a size and type approved by the City Engineer.

The backfill in all utility trenches shall be either compacted or consolidated according to the requirements of the materials being placed. Under pavements, or other surface improvements, and within three (3) feet of finished grade the in-place density shall be a minimum of 95% of laboratory standard maximum dry density as determined by AASHTO T-99. Perform a minimum of one test per 150 lineal feet of trench per two (2) feet depth of trench to assure overall compliance. In the event that testing indicates additional compaction is required, perform additional testing as needed to assure compliance.

Where compaction methods are used, the material shall be placed at moisture content such that after compaction, the required relative densities will be produced; also, the material shall be placed in lifts which, prior to the compaction, shall not exceed six (6) inches.

Prior to compaction, each layer shall be evenly spread and moistened.

If the required relative density is not attained, test sections will be required to determine any adjustments in compacting equipment, thickness of layers, moisture content, and compactive effort necessary to attain the specified minimum relative density.

Approval of equipment, thickness of layers, moisture content, and compactive effort shall not be deemed to relieve the Contractor of the responsibility for attaining the specified minimum relative densities. The Contractor in planning his work shall allow sufficient time to perform the work connected with test sections, and to permit tests for relative densities.

If, in the judgment of the City Engineer or the Public Works Department, the trench shows signs of being improperly backfilled, or if settlement occurs, the trenches will be reopened to a depth required for proper compaction, refilled, and recompacted, all in accordance with these specifications and to the satisfaction of the Engineer.

#### 7.12 IMPORTED SELECT BACKFILL MATERIAL

In the event the native excavated material is not satisfactory for backfilling as determined by the City Engineer or the Public Works Department, the Contractor shall provide imported granular material. This granular material shall (as a minimum) be free from sod, vegetation, and other organic or deleterious materials, and meet the following gradations: 100% passing a three (3) inch sieve and no more than 15% passing a #200 sieve. The depth of material herein required may be up to three (3) feet as determined by the City Engineer.

#### 7.13 DISPOSAL OF EXCESS MATERIALS

All excess materials shall be hauled away from the construction site and disposed of by the Contractor.

