



# Public Works Standards & Specifications

## DIVISION I TRENCHES

### **101 TRENCH EXCAVATION, BEDDING AND BACKFILL**

#### **101.1.00 DESCRIPTION**

Minimum general standards for facilities shall be as set forth in Section 00405 of the Oregon Standard Specifications for Construction, current edition. This work consists of excavating trenches, constructing trench foundations, placing bedding, pipe zone material, and trench backfill.

#### **101.1.01 PIPE ZONE**

The pipe zone is defined as the full width of the trench from 4-inches below the bottom outside surface of the barrel of the pipe to 12-inches above the top outside of the barrel of the pipe.

#### **101.1.02 TRENCH FOUNDATION**

The trench foundation shall be undisturbed material. Where ground water, unsuitable material, or other unstable conditions exist additional excavation may be required.

### **101.2.00 MATERIAL**

#### **101.2.01 BEDDING & PIPE ZONE**

Pipe zone material and bedding for pipes and structures shall be Class C backfill, or other select material as directed by the Engineer. Samples of the proposed material including technical information such as gradation, proctor test results, and certifications shall be submitted to the Engineer for approval prior to construction.

#### **101.2.02 TRENCH BACKFILL**

Material used for trench backfill below subgrade shall be earth, gravel, rock, or combinations thereof, free of frozen material and with less than 1 percent by weight of deleterious material such as humus, organic matter, vegetable matter, clods, sticks, and debris. The backfill material shall predominate in the finer sizes and, in place, shall present no isolated voids, silt pockets, or areas of larger stones, which could cause fracture or denting of the utility or structure, or subject it to undue point stresses.

Pumice and cinders are not acceptable for trench foundations, pipe bedding, pipe zone or trench backfill material. Material with a compacted density less than 80 pcf based on AASHTO T-99 standard proctor is not acceptable.

Trench backfill shall consist of the following material:

#### **101.2.02A Class A Backfill**

Class A backfill shall be native or common material acceptable to the Engineer. The intent is that material excavated on the site may be used for backfill after being screened on a 3-inch screen. Class A backfill shall meet the following:

- 1) No rock, soil clod or hardpan fragment has a dimension of greater than 3-inches.
- 2) No more than 30 percent by weight shall be larger than  $\frac{3}{4}$ -inch.
- 3) Material passing the #200 sieve shall not exceed 25 percent by weight of the total sample.

### **101.2.02B Class B Backfill**

Class B backfill shall be pit run or bar run material, well graded from coarse to fine. The maximum dimension shall be 3 inches and meet the following criteria:

- 1) Shall have more than 90 percent by weight passing a 3/4-inch screen
- 2) Shall contain no rock, soil clod or hardpan fragment larger than 1-inch
- 3) Shall be free of humus, organic matter, vegetable matter, frozen material, clods, sticks and debris
- 4) Shall contain no more than 10 percent by weight passing the #200 sieve.

**101.2.02C Class C Backfill:** Minimum standards under new or existing asphalt and pipe zone.

Class C Backfill shall be  $\frac{3}{4}$ - clean, well graded crushed rock /gravel, free from organic matter and in accordance with the latest ODOT Standards and Specifications.

### **101.2.02D Class D Cement Treated Base (CTB) Backfill**

Cement Treated Base shall conform to the requirements of the Oregon Department of Transportation, State Highway Division. It shall contain 4.5%- 5.5% cement by weight (1 to 2 sacks of cement per ton). CTB shall be used as trench backfill for street crossings where subgrade conditions are likely to cause differential settlement of the trench section, and for high traffic areas as directed by the Engineer.

### **101.2.02F Controlled Low Strength Material**

Controlled Low Strength Material (CLSM) shall conform to Section 00442 of the Oregon Standard Specifications for Construction. The minimum proportions of the mix shall be one sack cement to one ton of sand. CLSM may be placed in one lift, but do not agitate or use mechanical compaction. CLSM shall be required as backfill for trenches less than 18 inches in width (section 101.3.01C) or in high traffic areas as required by the Engineer.

## **101.3.00 CONSTRUCTION**

### **101.3.01 TRENCH EXCAVATION**

#### **101.3.01A General**

The Contractor shall be solely responsible for obtaining all applicable State, County, or City street cutting permits, and shall comply with all provisions of the permits. The Contractor shall comply with all City, County, State and Federal Highway Construction Safety and Health Standards pertaining to trenches and excavations, and traffic control. Prior to installing pipe or other utility in an unimproved street, the roadway shall be staked for subgrade to assure that adequate bury, depth of cover, and utility separation is acquired.

#### **101.3.01B Trench Width and Depth**

The trench depth below the finish profile elevations and width at the bottom shall be as listed in the following table for the size and type of pipe as indicated on the approved plans. The top of the ditch shall be 6 inches wider than the nominal width and shall conform to all safety standards and regulations.

Pipe Size I.D.	Min. Depth Wtr & Sewer	Max Width Wtr & Sewer	Min. Width Water	Min. Width Sewer
Less than 6"	32"	30"	24"	30"
6"	48"	36"	24"	30"
8"	50"	36"	24"	30"
10"	52"	42"	30"	30"
12"	54"	42"	30"	30"
14" - 16"	56" – 58"	48"	36"	36"
18" - 24"	60" - 66"	52"	40"	40"
Greater than 24"	66"	60"	48"	48"

**101.3.01C Trenches Narrower Than 18 Inches**

Trenches less than 18 inches in width under pavement shall be backfilled with controlled low strength material (CLSM).

**101.3.02 PIPE BEDDING**

The bottom of the trench shall be graded by hand to the elevation at which pipe is to be placed with a 6-inch depth of compacted pipe bedding material as specified in 101.2.02. Before each section of pipe is installed the grade shall be checked with a straight-edge, level/rod, or laser level, and any irregularities found shall be corrected. The pipe bedding shall form a continuous and uniformly compacted bearing surface and support for the pipe or structure.

A coupling or bell hole shall be dug in the trench bottom having a length, width and depth sufficient to allow assembly of the pipe, and to maintain a minimum clearance of 6 inches between coupling and undisturbed trench bottom. The trench bottom between coupling holes shall be dug flat and cut true and even to grade so as to provide continuous contact of the bedding with the pipe.

No blocking shall be used to achieve the required depth of bedding.

**101.3.03 PIPE ZONE**

Pipe zone material shall be Class C material as specified in 101.2.02C. Backfill material above, and around the pipe shall be carefully and thoroughly tamped in layers no more than 6 inches deep to achieve 95% of maximum density as determined by AASHTO T-99 or ODOT Manual of Field Test Procedures.

**101.3.04 TRENCH BACKFILL**

Backfill material shall be Class C placed in accordance with APWA Section 00405.46 except for the following options:

- 1) For trenches outside of the existing or new asphalt roadway the backfill material may be Class A backfill as specified in 101.2.02A from 12" above the pipe zone to subgrade.
- 2) For trenches under ODOT and Deschutes County roadways and for specific other cases designated by the City Engineer the backfill material shall be Class D or F depending on jurisdiction as specified in 101.2.02D or F from 18" above the pipe zone to subgrade.

The material shall be carefully and thoroughly tamped in layers to achieve 95% of maximum density as determined by AASHTO T-99. Methods of testing materials in the field may include nuclear densometer, sandcone, WA densometer, or other methods approved by the Engineer.

### **101.3.05 COMPACTION TESTING**

For trenches with three feet or less of cover over the pipe zone, one compaction test shall be taken per 100 lineal feet of trench at top of pipe zone and at finish subgrade elevations. For installations deeper than three feet trench backfill shall be tested at one passing test for each 3 feet of fill and 100 LF of trench, or as directed by the Engineer. Passing tests shall meet the requirements for compaction in that segment of the trench backfill. All sampling and testing shall be performed by an independent testing laboratory acceptable to the City of Sisters. All results, including failing tests, shall be submitted to the City of Sisters inspector or Engineer prior to any subgrade inspection and approval.

### **101.4.00 MEASUREMENT AND PAYMENT**

#### **101.4.01 LINEAR FOOT BASIS**

The length of trench shall be measured horizontally from center to center of manholes, or to the end of pipe, whichever is applicable.

Payment for TRENCH EXCAVATION will be at the unit price bid per lineal foot for the specified pipe class and diameter as measured. Payment shall include all materials, tools, labor, equipment, bedding, backfill and incidentals required to excavate and backfill the trench as specified. All excavation shall be considered as unclassified as specified in Section 204.1.02, unless specifically called for in the Schedule of Bid Items.

#### **101.4.02 INCIDENTAL BASIS**

When not listed in the Schedule of Bid Items as a separate pay item, TRENCH EXCAVATION shall be considered incidental to the price bid for the specified pipe or conduit and diameter.