
CITY OF REDMOND, OREGON

2010 STANDARD 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.

101.1.03 UTILITY CROSSINGS UNDER RAILROAD

Utilities crossing under the railroad require a permit from the Burlington Northern Santa Fe Railroad.

101.2.00 MATERIAL

101.2.01 BEDDING & PIPE ZONE

Pipe zone material and bedding for pipes and structures shall be Class B 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 any non-plastic, granular material, pit run gravel or sand, or non-plastic soil meeting the following criteria:

- 1) Shall have more than 90 percent by weight passing a $\frac{3}{4}$ -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

Class C backfill shall be clean sand with no particle size larger than $\frac{1}{4}$ -inch, and with no more than 10 percent of material passing the # 200 sieve, or well graded $\frac{3}{4}$ "-0 granular material with no more than 10 percent by weight passing the No. 200 sieve as acceptable to the Engineer.

101.2.02D Class D Backfill

Class D backfill shall be native or common material acceptable to the Engineer. Class D backfill shall be used only in trenches exceeding 9 feet in depth, and only in areas where roadway construction is not scheduled to follow the completion of the utility installation.

The intent of this specification is that material excavated on the site may be used for backfill after being processed on a bar screen to remove rocks larger than 12-inches in dimension. The bar screen shall have a clear space not greater than 9-inches between the bars. The Contractor shall make every reasonable effort to remove rocks larger than 12-inches in major dimension from the stock pile by means such as, but not limited to, scalping and wasting the base perimeter of the stockpile where such rocks collect. The material shall be predominately of the finer sizes such that no voids are evident in the stockpile, nor shall voids or pockets of rock occur in the compacted backfill. The Engineer or his/her representative shall approve the stockpile prior to incorporation into the work.

The material shall be placed in 3-foot maximum loose lift thickness and compacted by mechanical means to a non-yielding condition. The Contractor may be required to prove compaction by water jetting the backfill. Should subsidence be evident, the backfill shall be reworked and compacted to density non-yielding condition based upon a proof-roll or other load test acceptable to the Engineer.

Where Class D backfill is specified, it shall not be placed within 36 inches of the top of the pipe, within 24 inches of any other utility, nor within 36 inches of subgrade elevation or finish grade. Class D backfill shall be placed only in a trench of sufficient width to permit heavy equipment to place and compact the backfill to the satisfaction of the Engineer.

101.2.02E Cement Treated Base (CTB)

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 Concrete Backfill

Concrete Backfill shall conform to ASTM C-94, Alternate 3. Proportion the mix to obtain a 28-day compressive strength of 2,500 pounds per square inch. The mix design shall have a minimum of five sacks of cement per cubic yard of concrete.

101.2.02G Controlled Low Strength Material

Controlled Low Strength Material (CLSM) shall conform to Section 00442 of the APWA 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 24 inches in width (section 101.3.01C) or in high traffic areas as required by the Engineer.

101.2.02H Utility Bores Under Railroad

- 1) Sewer Pipe: Conform to Section 303 of the Specifications.
- 2) Water Pipe: Conform to Section 402 of the Specifications.
- 3) Casing: Casing shall be steel pipe conforming to AWWA C200. Minimum yield strength shall be 35,000 psi. Diameter and wall thickness shall be as indicated on drawings. The Contractor shall be responsible for selecting the size and wall thickness of the casing required to permit construction to the required lines and grades consistent with the operation and as approved by the permitter. However, in no case shall the casing diameter and wall thickness be less than those shown. If a casing diameter larger than the minimum is used, increase wall thickness accordingly. Submit wall thickness design calculations and revised pipe support and blocking details to the Engineer for approval
- 4) Excavation or Boring: Excavation or boring shall be unclassified and shall include whatever materials are encountered. The Contractor shall make an estimate of the kind and extent of the various materials which will be encountered to complete the work.
- 5) Stainless Steel Bands: One-half inch wide by 0.020 inch thick, 304 stainless steel bands, or equal.
- 6) Supports (Skids): Lumber for supports shall be of No.2 pressure treated Douglas fir, cedar or redwood graded in accordance with the WWPA Current Grading Rules for Western Lumber. Blocking shall be sized adequately to prevent flotation or lateral movement of the carrier pipe in the event the casing should be inundated by ground water.
- 7) Supports (Hangers): Hangers shall be fabricated from plate steel, size as indicated on the drawings.
- 8) Alternative Supports: In lieu of the hangers and skids as shown on the drawings, the Contractor may elect to fabricate a support structure for both water and sewer lines which can be installed inside the casing. Details and design calculations shall be submitted for the

Engineer's review should an alternative be desired.

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"	42"	36"	24"	30" *
8"	46"	36"	24"	30" *
10"	48"	42"	30"	30" *
12"	52"	42"	30"	30" *
14" - 16"	54" - 56"	48"	36"	36"
18" - 24"	58" - 60"	52"	40"	40"
Greater than 24"	60"	60"	48"	48"

*For pipes with less than 60" of cover, minimum width of 26" will be allowed.

101.3.01C Trenches Narrower Than 24 Inches

Trenches less than 24 inches in width under pavement, curb, or sidewalk 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 4 inch depth (6 inch for water mains) 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 4 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 B material as specified in 101.2.02B. 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 B placed in accordance with APWA Section 00405.46 except for the following options:

- 1) For trenches deeper than 6 feet from top of pipe to subgrade (except for water lines), the backfill material may be Class A backfill as specified in 101.2.02A from 24 inches above the pipe zone to subgrade.
- 2) For trenches deeper than 9 feet from top of pipe to subgrade (except for water lines) and outside of the street right of way, the backfill material may be Class D backfill as specified in 101.2.02D from 36 inches 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 Redmond. All results, including failing tests, shall be submitted to the City of Redmond inspector prior to any subgrade inspection and approval.

101.3.06 UTILITY BORES UNDER RAILROAD

- 1) General: Prior to the start of the work, submit satisfactory evidence to the Engineer that all insurance coverage requirements called for by the Permittee have been complied with. All proposed construction methods and materials for each under crossing shall be approved by the Engineer and Permittee prior to the crossing operation, and no construction shall be started until written approval to proceed from the Permittee has been submitted to the Engineer.
- 2) Casing: Casings shall be continuously welded at joints. Bored installations shall have a hole diameter that shall not exceed the outside diameter of the casing pipe. Boring operations shall be conducted in such a manner as not to be detrimental to the facility being crossed. If there are excessive voids or the bore is larger than the casing pipe, prompt remedial measures shall be taken by the Contractor, subject to approval by the Engineer and the Permittee.
- 3) Installation of Pipe: Provide strapped timber skids around the barrel of sewer pipe as shown on the drawings, join pipe, and slide into casing. Pipe barrel shall bear continuously on cradles. Provide temporary supports for the water pipe prior to welding hangers in place. Conform to

any additional requirements of the pipe manufacturer.

- 4) Pipe installation to conform to applicable portions of Section 303.3 of the Specifications, including hydrostatic or air testing and line and grade.
- 5) Seals: Place 2 inch timber seals at the ends of the under crossing casing to prevent foreign material from entering the casing after it is backfilled. Shape and notch timbers to fit around pipe to provide a tight seal.

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. Measurement of the various depth classes as stated in the Schedule of Bid Items will be from the pipe invert as constructed to the design subgrade elevation at the point of measurement.

Payment for TRENCH EXCAVATION will be at the unit price bid per lineal foot for the specified pipe class and diameter, and at the depth 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, and at the specified depth.

101.4.03 UTILITY BORES UNDER RAILROAD

Payment for each crossing will be based upon the lump sum price stated in the proposal. Payment on the lump sum basis shall constitute full compensation for all labor, materials, and equipment required to complete the installation, within the limits shown in addition to the amount per linear foot for each pipeline. Payment to the Contractor for any services provided by the Permittee shall also be included in this item.