

CITY OF UNION, OREGON

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PART 1 - GENERAL

1.1 Summary

These Specifications cover excavation and backfill of trenches for the installation of storm sewer, sanitary sewer, water lines, service lines, pressure sewer lines, and other underground utilities.

Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of work to be constructed. All applicable sections, as determined by the City Engineer, shall control the work outlined in the Drawings and Specifications.

1.2 Definitions

- A. Foundation material or stabilization fabric will only be required when standard bedding requirements will not adequately support the pipe.
- B. Backfill is the filling of the trench to the existing ground level or the finish grade line shown on the Drawings.
- C. General trench excavation shall include whatever materials that are encountered (except solid rock) to the depths shown on the Drawings or as required to properly install the pipe.
- D. Solid Rock
 - 1. Solid rock is defined as being rock formations other than cemented gravels that require hard ripping, jackhammering, blasting, or other extra work beyond the capability of heavy-duty trench excavating equipment such as a Caterpillar 235 or 345B Excavator.
 - 2. Cemented gravel excavation may be included as "Rock Excavation" when said excavation requires hard ripping, jackhammering, or blasting and ONLY when, in the opinion of the City Engineer, such conditions were unforeseen and are beyond the capability of heavy duty trench excavating equipment such as a Caterpillar 235 or 345B Excavator.

1.3 Safety

See requirements for project safety in the General Requirements.

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1.4 Existing Utilities

See the General Requirements for contract requirements for existing utilities and for preservation of survey monumentation.

1.5 Dust and Mud Control

The Contractor shall take appropriate action to control dust and mud caused by his operations. This shall include, but not be limited to, watering of exposed areas, cleaning of roadways, etc. This is considered a normal part of the construction project.

PART 2 - MATERIALS

2.1 Foundation Material/Trench Stabilization Fabric

Foundation material or stabilization fabric will only be required when standard bedding requirements will not adequately support the pipe. Foundation material shall be a well-graded 2-1/2"-0 or 1-1/2"-0 crushed rock.

As an alternative to over-excavation and placement of foundation material, a geotextile stabilization fabric may be used if field use proves acceptable and is approved by the City Engineer. The fabric material shall be placed on the bottom of the trench and the bedding material placed over the fabric to proper pipe grade. The fabric width shall be one foot wider than the trench bottom. Fabric material shall be Mirafi 500X or approved equal.

2.2 Bedding and Select Backfill

Bedding and select backfill materials shall be subject to the approval of the City Engineer. Acceptable materials include well-graded 3/4"-0 or 1"-0 crushed rock.

2.3 General Backfill

- A. General backfill will consist of material excavated from the trench, or material imported by the Contractor. General backfill material shall be free of vegetative matter, boulders (10-inch plus), frozen material and any other unsuitable material, and shall have a moisture content that will allow for the required compaction of the general backfill material unless approved otherwise by the City Engineer. Use of backfill material containing consolidated masses 10-inch in diameter or greater is prohibited.

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- B. When necessary, the Contractor shall selectively separate suitable general backfill material from unsuitable general backfill material.
- C. When the City Engineer determines that the native material excavated from the trench is unsuitable or unacceptable for use as general backfill, the City Engineer may require the Contractor to remove the unsuitable material from the project site and import suitable general backfill material. When imported general backfill must be placed in or below the groundwater, the imported general backfill shall be free draining granular material with less than 20 percent passing a No. 4 sieve and less than 3 percent passing a No. 200 sieve.

2.4 Controlled Density Fill

- A. Controlled density fill material shall be a flowable cement, sand or pea gravel, and Fly Ash Pozzolanic, or other approved materials, mixture that contains 75 to 120 pounds of Type II cement per cubic yard.
- B. The sand and other aggregates shall generally conform with the requirements of ASTM C 33.
- C. Air-entraining agent shall be added at the rate of 3 to 5 oz. per cubic yard.
- D. The material shall have a 28-day compressive strength of 100-200 psi and have a slump of 7 inches plus or minus 1-1/2 inches at the time of placement. The Contractor shall provide a mix design and data on the controlled density fill material he proposes to use along with typical compression test results.

PART 3 - EXECUTION

3.1 Clearing and Grubbing

- A. Contractor shall do all clearing and grubbing and removal of structures, etc. necessary to permit proper installation of the pipeline and to eliminate the possibility of stumps, logs, brush, or rubbish being mixed with the backfill material. A sufficient amount of all stumps and stump roots shall be removed so that any future removal of any remaining parts of the stumps and/or roots will not damage the pipeline. All stumps, roots, logs, brush and rubbish shall be removed and disposed of in conformance with the requirements of local authorities controlling air pollution, and solid waste disposal.

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- B. Should the area in which construction takes place be served by rural mail carrier service, the Contractor shall cooperate with the mail service and re-install, in a convenient location, any rural mail boxes which will have to be removed or be blocked by construction operations. As soon as the work is completed, all mail boxes removed shall be replaced undamaged in their original location.
- C. As soon as the work is completed, all signs, guardrails, utility poles, fences, etc., which were moved for the construction operation shall be replaced undamaged in their original location. Damaged items shall be replaced by the Contractor with new items of equal quality.

3.2 Cutting of Asphalt Pavement and Concrete Sidewalks, Curbs and Driveways

- A. Where the excavation is made in an existing paved street, the asphalt surface shall be cut on each side of the trench prior to excavation, to provide a vertical joint in the surface. Cutting of the asphalt will be made with a saw designed for the cutting of asphalt.
- B. The use of a jackhammer, wheel cutter, or other similar tool may be allowed by the City Engineer only when the Contractor can demonstrate that the alternate method provides a neat straight edge.
- C. Prior to excavating across a concrete structure such as a curb, sidewalk, or driveway, the Contractor shall cut and remove a section of the structure in order to provide for his excavation. The dimensions of the removed section shall be such that the Contractor's excavation will not result in undermining of the remaining structure.
- D. The Contractor shall cut the concrete structure with a diamond saw or other equipment designed for that purpose such that a neat, straight, vertical edge is left on the remaining concrete structure. The Contractor shall similarly cut and remove any such concrete structure undermined or damaged by his construction work.
- E. Following proper backfill and compaction of his excavation, as specified herein, the Contractor shall repair streets, replace the curbs, sidewalks, or driveways in conformance with the Drawings and Specifications, and permit requirements. Surface restoration shall be performed in accordance with Technical Specifications - "Surface Restoration."

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3.3 Trench Excavation

A. Trench Width

1. The maximum trench width in the pipe zone shall be 2 feet plus the O.D. of the pipe and the minimum trench width in the pipe zone shall be 1 foot plus the O.D. of the pipe. This width shall be maintained to the top of the pipe.
2. The maximum clear width above the top of the pipe will not be limited except in cases where excess width of excavation would cause damage to adjacent structures or utilities. The determination of the safe trench width is the sole responsibility of the Contractor.

B. Unsuitable Material

When natural soil conditions exist in the bottom of the trench that are unsuitable for proper pipe installation, the Contractor shall immediately notify the City Engineer. The Contractor may then be requested to over-excavate the trench below the design grade to a depth specified by the City Engineer and place foundation material, or the Contractor may be requested to install a geotextile stabilization fabric.

C. Exploratory Work

The Contractor shall perform appropriate exploratory work to locate utilities when they are known to exist but the specific location is unknown or not marked accurately. Appropriate exploratory work shall be performed in these situations.

3.4 Shoring, Sheeting, and Bracing of Trenches

- A. The Contractor shall adequately sheet and brace the trench during excavation whenever necessary to satisfy trench safety standards, prevent cave-ins, or to protect adjacent structures or property. Where sheeting and bracing are used, the Contractor shall increase trench widths for the bracing material accordingly.
- B. The sheeting must be kept in place until the pipe has been placed, backfilled at the pipe zone, tested for defects, and repaired if necessary. All sheeting, shoring, and bracing of trenches shall conform to the provisions included in the Project Safety section of the General Requirements and requirements of the public agency having jurisdiction.

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3.5 Dewatering Excavated Areas

- A. All groundwater, seepage, or stormwater that may occur or accumulate in the excavation during the progress of the work shall be removed. In areas where the nature of soil and hydrostatic pressures are of such a character as to develop a quick condition in the earth mass of the trench, the dewatering operation shall be conducted so that the hydrostatic pressure will be reduced to or near zero in the immediate vicinity of the trench.
- B. All excavations shall be kept free of water during the construction.
- C. The Contractor shall dispose of all waste and water removed from the trench. Disposal shall be in accordance with all state and local regulations.

3.6 Location of Excavated Materials

- A. During trench excavation, the excavated material shall be located within the construction easement or right-of-way so that the excavated material will not obstruct any private or public traveled roadways or streets, or cause undue damage to the streets.
- B. The Contractor shall provide means of containing overly saturated soils, i.e., muck, or remove the muck from the work area as it is excavated, if such soils are encountered in the excavation. The intent is to prevent excessive damage or disruption to street rights-of-way or easement beyond what would normally occur during such work. Pile and maintain material from trenches so that the toe of the slope of the material excavated is at least two feet from the edge of the trench. It shall be the Contractor's responsibility, however, to determine the safe loading of all trenches.

3.7 Disposal of Excavated Materials

The Contractor shall dispose of all excavated material, which is not required for, or is unsuitable for, backfill. The Contractor's method of disposal shall comply with regulations of the governing body having jurisdiction.

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3.8 Trench Backfill

A. General

The term backfill, as hereafter used, is the filling of the trench to the natural ground level or the finish grade line shown on the Drawings. All backfill material shall be placed into the trench so that free fall of the materials into the trench is prevented until at least two feet of cover is provided over the pipe. Under no circumstances shall sharp or heavy pieces of material be allowed to drop directly onto the pipe. Methods of backfilling, other than as specified herein, shall be used only upon the approval of the City Engineer.

B. Bedding and Select Backfill

1. A minimum 4-inch depth of bedding shall be placed on the trench bottom, compacted to 85 percent of the maximum density as determined by ASTM D 698 and smoothed to provide uniform bedding so the pipe is supported along its full length and not by the bells.
2. It shall be understood that the 4-inch depth is a minimum depth only, not an average depth and does not preclude the Contractor at his option from placing additional depth of bedding to facilitate his work. Once the pipe is properly installed, the bedding material shall be brought up to the spring line of the pipe in 4-inch lifts and compacted to 85 percent density. Care shall be used to ensure that the bedding material is properly worked under the haunch of the pipe for its full length.
3. Select backfill shall then be brought up from the spring line to a minimum of 6 inches for water lines, and 12 inches for sewer and storm sewer lines above the top of the pipe, leveled and compacted to 85 percent of ASTM D 698 density. Compaction of the bedding and select backfill by hand tamping will be allowed if the 85 percent density is achieved; otherwise, mechanical tamping will be required.
4. When an open-graded material is used for bedding or foundation material to facilitate trench dewatering, the open graded material shall be placed to the spring line of the pipe. The Contractor shall make provisions to ensure that fines from the select backfill do not migrate into the open graded bedding or foundation material. To prevent soil migration the Contractor may use any of the following:

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- a. Provide a properly graded select backfill approved by the Engineer;
- b. Provide an approved fiber/fabric between the open graded bedding material and select backfill;
- c. Hydraulically jet select backfill fines into open graded bedding material after dewatering is complete and before general backfill is placed; or
- d. Provide an alternative approved by the City Engineer.

C. Placement

All general backfill material shall be pushed first onto the slope of the backfill previously placed and allowed to roll down into the trench. The Contractor shall not push the backfill material directly into the trench until at least two feet of cover is provided over the pipe.

D. Compaction

1. In roadways, driveways, under curbs and sidewalks, general backfill shall be placed in horizontal lifts and compacted to 90 percent of the laboratory density as determined by ASTM D 1557. The method of compaction shall be selected by the Contractor.
2. The Contractor shall exercise extreme care to avoid damage to the pipe during compaction of the trench. Where materials consist of cobbles and coarse gravels, compaction of each lift shall be accomplished by at least five passes of an appropriate vibrating type compactor. When materials are such that meaningful in-place density test cannot be run, then the Contractor and City Engineer will agree on a method of compaction which will provide adequate compaction.
3. In sections where specific compaction requirements are not specified, or required by the City Engineer, general backfill shall be compacted, as a minimum, to a density equal to that of the natural ground adjacent to the trench. All trenches shall be maintained for a period of one year after final acceptance of the project. Any settlement of the trenches during the one-year guarantee period shall be remedied promptly at the request of the City Engineer and at no cost to the City.

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- E. Controlled Density Fill (Flowable Fill or Lean Mix Backfill)
1. When called for on the Drawings or Specifications, or where required by state highway or county road crossing permits, the Contractor shall backfill trenches with controlled density fill.
 2. The controlled density fill shall be placed in the trench in such a manner to ensure the trench is completely filled to the lines and grades called for on the Drawings or in the permit. The controlled density fill shall be protected from traffic loads for a three-hour period after which required surface restoration work may be performed.
- F. Canal or Irrigation Ditch Crossing
1. Where the trench crosses a canal, irrigation ditch or culvert, the backfill shall be compacted the entire trench depth with mechanical tampers to 90 percent of the laboratory density as determined by ASTM D 1557.
 2. All backfill material in the canal or ditch liner and in the trench cut-off wall shall be imported clay or a soil/bentonite mixture as approved by the City Engineer. Unless required otherwise, the soil/bentonite mixture shall be 1 part bentonite to 10 parts soil by weight. A high grade bentonite material shall be used.
 3. The ditch lining, conduit, or pipe shall be restored to its original condition. The crossing shall be water tight and free of any leakage or seepage. The Contractor shall be fully responsible for repairing canal or ditch banks at no cost to the City should leakage occur at the crossing.

3.9 Execution of Dust and Mud Control

If the Contractor fails to properly control the dust and mud, the City may request him to do so in writing. If, after 24 hours from this request, the Contractor has not corrected the dust or mud problem, the City may elect to have the corrective work performed, bill the Contractor for the work, and withhold final acceptance of the project until the bill is paid.

3.10 Restoration, Finishing, and Cleanup

- A. The Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees and shrubbery, lawns, pastures and fences, or other existing facilities

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disturbed by his work unless otherwise specified. Restoration and cleanup shall be a continuing operation and shall be diligently pursued until completed.

- B. All surplus material and temporary structures as well as excess excavation shall be removed by the Contractor and the entire site of Contractor operations shall be left in a neat and clean condition as outlined in the General Conditions.
- C. Surface restoration shall be performed in accordance with Technical Specifications - "Surface Restoration." All other existing facilities shall be replaced or restored equal to their original condition.

END OF SECTION