

PART 1 GENERAL

1.1 DESCRIPTION:

- A. TUNNELING - Tunneling shall include all methods by which the underground passageway is first excavated and then lining materials are brought in and placed.
- B. BORING - Boring shall include all methods by which a conduit is pushed or pulled into place and by which excavation method precludes the stationing of a worker within the conduit without stopping or removing the excavation equipment.
- C. JACKING - Jacking shall include all methods by which a conduit is pushed or pulled into place with one or more workers inside to excavate and assist in keeping the conduit on the required grade and alignment.

PART 2 PRODUCTS

2.1 PIPE BEDDING AND PIPE ZONE MATERIAL:

- A. Pipe bedding and pipe zone material shall conform to the requirements of Section 3800.

2.2 PIPE:

- A. Pipe materials shall conform to the strength, class and type specified and in accordance to Section 2600.

2.3 CASING:

- A. The Contractor shall provide casing of a size to permit proper construction to the required lines and grades. Casing shall be of smooth steel pipe or concrete pipe suitable for the purpose intended.
- B. The class of casing specified is based upon the superimposed loads and not upon the stresses resulting from jacking or boring operations. Any increase in casing strength to withstand jacking or boring operations shall be the responsibility of the Contractor.
- C. Jacked casings shall be equipped with nipples at the spring line and the crown at 10-foot centers when pressure grout is specified.
- D. Optionally, the casing may be constructed of galvanized standard offset tunnel plate with gauge and section modulus as approved. Nipples for pressure grouting, when specified, shall be installed at the spring line and crown at 10-foot centers.

2.4 GROUT CAP:

- A. Grout, for capping pipe ends, shall conform to Section 2050 CEMENTITIOUS PATCHING & GROUTING MATERIALS.

- B. Grout for pressure grouting outside jacked carried or casing pipe shall be one part Portland cement and three parts sand, by volume, or as approved.
- C. See Standard Detail 3820-1.

2.5 INSULATOR SPACERS:

- A. Insulator spacers as manufactured by Calpico (San Francisco, CA Tel: 800.998.9115) or approved equal. Size as recommended by Manufacturer, shall be appropriate for casing and carrier pipe sizes specified.
 - 1. Supply 4 plastic runners, two on top and two on the bottom.
 - 2. Band shall be 8-inch wide stainless steel with stainless steel hardware. Supply PVC liner for placement inside bands.
- B. End seals shall be concrete grout as specified in 2.4, See Standard Detail 3820-1.

PART 3 EXECUTION

3.1 GENERAL:

- A. The work shall conform to all federal, state and local laws and regulations pertaining to tunneling and specifically to the standards set forth in the current volume of the Oregon Safety Code for Places of Employment, Chapter 24, Safety Code for Mining, Tunneling and Quarrying, published by the Oregon Industrial Accident Commission.

3.2 EXCAVATION:

- A. Excavation shall be unclassified and shall include whatever materials are encountered to the depths shown or required.

3.3 TUNNELING DETAILS REQUIRED:

- A. The Contractor shall submit details of the following to the Engineer for approval before beginning tunnel construction.
 - 1. Tunnel shaft bracing and dimensions.
 - 2. Tunnel supports.
 - 3. Method of backpacking tunnel supports.
 - 4. Bracing to prevent lining from shifting or floatation.
 - 5. Backfill material or pressure concrete mix design, placement method, and equipment.
 - 6. Poling plate dimensions and details, when required.

3.4 JACKING DETAILS REQUIRED:

- A. The Contractor shall submit details of the following to the Engineer for approval before beginning jacking or boring.
 - 1. Jacking pit construction.
 - 2. Jacking pit bracing.
 - 3. Casing or conduit.
 - 4. Jacking head.
 - 5. Excavation method.
 - 6. Tee or wye installation.
 - 7. A Substitute design for any part of the system that must be changed as a result of jacking or boring operation.
 - 8. Any structure that is required because of the particular method or procedure used by the Contractor.
 - 9. If placed in a casing: bracing to prevent pipe shift and flotation, and the materials, method and equipment for backfilling.
 - 10. Backfill material or pressure grout mix and the placement method and equipment.

3.5 TUNNELING:

- A. Tunneling will be permitted only where specified or approved. All proposed construction methods and materials shall be approved by the Engineer before the start of construction.
- B. The subgrade upon which the pipe is to be constructed shall be firm, thoroughly compacted, true to grade, and with at least 6- inches of approved bedding material under the pipe. If the material in the bottom of the tunnel is ledge rock, excavation of the tunnel shall extend to a depth below the bottom of the pipe and a bedding of crushed aggregate or concrete shall be provided as specified in Section 3800.

3.6 JACKING AND BORING:

- A. Jacking or boring may be allowed in lieu of the open trench method or tunneling with approval of the Engineer. All conduits shall be jacked or bored to the required line and grade.
- B. The leading section of conduit shall be equipped with a jacking head. All excavation shall be carried out entirely within the jacking head.
- C. Should appreciable loss of surrounding material occur during the jacking or boring operation

the voids shall be backpacked or grouted before the completion of the shift. All voids shall be filled or backpacked with grout or granular material as approved.

D. See Standard Detail 3820-1.

3.7 CONCRETE PIPE AND BOX SECTIONS:

A. The Contractor shall protect the driving ends of concrete conduit against spalling and other damage. Intermediate joints shall be similarly protected by the installation of sufficient bearing shims to properly distribute the bearing stresses. Any section of conduit showing signs of failure shall be removed and replaced with a new section or with an approved cast-in-place section, which is adequate to carry the loads imposed upon it.

3.8 SMOOTH STEEL CASING:

A. Sections of smooth steel casing to be jacked or bored shall be joined by welding the joints with a continuous weld for the full circumference or by other approved means. The Contractor shall provide joints that are capable of resisting the jacking or boring forces.

B. Pipe installed in casing shall be braced to prevent shifting or flotation. The void between the casing and pipe shall be filled with grout or other material as specified or approved.

3.9 GROUTING VOIDS OUTSIDE CARRIER PIPE:

A. Where shown, the Contractor shall completely fill the annular space between the pipe and the casing, tunnel liner or tunnel case with approved grout or sand to prevent pipe flotation. The Contractor shall accomplish the filling by pouring or pumping from the two ends and from intermediate points as necessary. Grouting, once commenced at any one point, shall be completed without stopping. The Contractor shall accomplish sand filling by similar methods using a gunite machine, or other approved equipment.

1. Grout at the spring line hole at one end and pump grout until it appears in the grout hole at the crown.
2. Grout through the opposite spring line hole until grout appears at the hole in the crown.
3. Grout through the hole at the crown until grout appears in the next set of holes along the pipe.
4. Plug the holes at the starting point and move to the next set of holes; and,
5. Repeat the sequence until the full length of the pipe has been grouted.

3.10 CASING ISOLATORS OR SPACERS:

A. Place plastic runners, PVC liner, and bands as recommended by manufacturer.

B. Carrier pipe shall be in the center of the casing and shall bear continuously on the spacers.

- C. See Standard Detail 3820-1.

3.11 END CAPS:

- A. Construct grout end caps with fill tube and vent to ensure full encasement of annular space around carrier pipe.
- B. See Standard Detail 3820-1.

3.12 DEWATERING:

- A. Dewatering shall conform to the requirements as outlined in Article H.6 of the General Conditions of the City of Woodburn, OR.

3.13 SHORING:

- A. Shoring, sheeting and bracing of trenches and pits shall conform to Article H.5 of the General Conditions of the City of Woodburn, OR.

3.14 RAILROAD AND ODOT CROSSINGS:

- A. All work to be performed by the Contractor in railroad and ODOT rights-of-ways shall be performed in compliance with the Permit.

3.15 MEASUREMENT & PAYMENT:

- A. Payment will be made on the unit price for work and materials constructed complete, minus the carrier pipe, in the amount indicated on the Bid for quantity measured in the field.

PART 4 TESTING

4.1 GENERAL:

- A. All products and workmanship shall be tested in accordance with the applicable section and/or specification.

END OF SECTION