

CONSTRUCTION STANDARDS

SECTION CS 3

TRENCH FOUNDATION, BEDDING AND BACKFILL

CS 3-01 GENERAL:

- A. The foundation, bedding and backfill for all trenches shall conform with the requirements of the City Standard Specifications and the Drawings. These requirements also apply to non City-owned Utilities located within the City right-of-way. The Project Plans may require more stringent requirements than specified in the City Standard Specifications and Standard Drawings.
- B. The trench foundation shall be defined as the material below the bottom elevation of the bedding.
- C. Bedding shall be defined as that material supporting the pipe from the trench foundation surrounding, and extending to one foot above the top of pipe.
- D. Backfill for all pipe materials other than CAST-IN-PLACE CONCRETE PIPE (CIPCP) shall be defined as that layer of material extending from above the bedding material to the elevation of the subgrade within the proposed or existing paved area. The limits of backfill for CIPCP shall be defined as provided for in Section CS 10-02B CAST-IN-PLACE CONCRETE PIPE. The backfill shall extend to the finish grade and conform to the adjacent grade where the trench is located within an unpaved area.
- E. No jetting will be allowed for trench bedding or backfill.
- F. All existing pipes within the trench zone and any other facilities adjacent to the trench shall be supported and protected from damage as a result of the Contractor's operations.

CS 3-02 SPECIAL FOUNDATION TREATMENT:

- A. Special foundation treatment shall be required whenever the bottom of the trench has been over excavated as required in Section CS 2, Trench Excavation, of the City Standard Specifications.
- B. The over excavated portion of trench shall be backfilled with Crushed Rock in accordance with these City Standards.
- C. Geotextile filter fabric shall be placed between the Crushed Rock and bedding material where sand is required as the bedding material.

- D. An additional layer of Geotextile Fabric may be required to stabilize the trench bottom. The specification for this fabric shall be as approved by the Director of Public Works.

CS 3-03 BEDDING:

- A. Particular attention must be given to the placement of the bedding material to ensure that firm support to the pipe is obtained to prevent any change in alignment of the pipe.
- B. The bedding shall be shaped to accommodate the pipe bell and other related appurtenances to allow the bottom of the pipe to be supported uniformly by the bedding. The bedding material shall be sliced into the haunch of the pipe with a shovel or other hand tool to fill the voids in this area. The remainder of bedding shall be carefully placed and consolidated to the proper depth in eight (8) inch maximum lifts.
- C. Bedding Material
 - 1. Bedding materials for non City-owned utilities shall conform to the Utility Company specifications except that at a minimum, the material shall conform to the minimum requirements for Bedding Material as specified in these City Standard Specifications whenever the trench is located within the limits of an existing paved area.
 - 2. The requirements for bedding material shall not apply to trenches constructed by the method of Rock Wheel Excavation.
 - 3. Bedding material for ductile iron pipe and all water main and service pipe installations shall consist of sand with 100% passing the #4 sieve and a minimum Sand Equivalent value of a 30.
 - 4. Bedding and backfill for street lighting conduit installation shall conform to Section CS 15, Street Lighting of the City Standard Specifications and the Standard Drawings.
 - 5. Bedding and backfill for traffic signal conduit installation shall conform to the provisions of the Caltrans Standard Specifications except that Asphalt Concrete shall conform to the City Standard Specifications.
 - 6. Bedding material for all other City-owned utilities and structures shall consist of Crushed Rock conforming to the criteria in **Table CS 3-1** and other requirements listed.

Table CS 3-1

Crushed Rock Gradation Requirements	
Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
½ inch	20-50
No. 4	0-5

- 90% of the aggregate shall have at least one fractured face.
- 75% of the aggregate shall have at least two fractured faces.
- 50% of the aggregate shall have at least three fractured faces.

CS 3-04 GEOTEXTILE FILTER FABRIC:

- A. The contractor shall install nonwoven geotextile filter fabric between the Bedding and Backfill material in such a manner to prevent migration of the backfill material into the bedding whenever Crushed Rock is used as bedding.
- B. Geotextile Filter Fabric shall conform to the requirements specified in Section CS 7, Geotextile Fabrics, of the City Standard Specifications.

CS 3-05 BACKFILL:

- A. The Contractor shall not place any backfill material until the Inspector has inspected and accepted the placement of the Bedding.
- B. Backfill shall conform to the Standard Drawings.
- C. Native material and Class II Aggregate Base Rock backfill shall be placed in uniform layers. The thickness of each layer of backfill shall not exceed eight (8) inches before compaction. Compaction equipment or methods which may cause displacement or damage to the pipe shall not be used.
- D. **EXISTING PAVED AREAS:** Trenches located within the existing paved areas shall be backfilled with Class II Aggregate Base Rock (Aggregate Base) conforming to the City Standard Specifications. The Aggregate Base backfill shall

be compacted to the requirements indicated on the Standard Drawings. The Aggregate Base shall be placed to the elevation to allow for placement of Asphalt Concrete in accordance with the Standard Drawings. Temporary paving shall be installed and maintained until final pavement is completed. Asphalt Concrete shall conform to the City Standard Specifications and placed in accordance with the Standard Drawings.

E. NEW PAVED AREAS: Trenches located within new paved areas (areas required to be paved with the Project Plans) may be backfilled with native material providing that the native material is free of rock(s), rubbish, debris and other objectionable material. The maximum size of any component of the native material shall not exceed 2-1/2 inches in size. The backfill shall be compacted to the requirements indicated on the Standard Drawings. When the required compaction can not be achieved with the native material, select import material shall be required. The backfill shall be placed up to the new pavement subgrade elevation shown on the Project Plans.

F. UNPAVED AREAS: Trenches located within unpaved areas may be backfilled with native material providing that the native material is free of rock(s), rubbish, debris and other objectionable material. The maximum size of any component of the native material shall not exceed 2-1/2 inches in size. The backfill shall be compacted to the requirements indicated on the Standard Drawings. When the required compaction can not be achieved with the native material, select import material shall be required. The backfill shall be placed to final grade to conform to the elevation of the adjoining surface elevation.

CS-3-06 TUNNELING, BORING, AND JACKING:

- A.** Tunneling, boring, and jacking shall only be permitted when approved by the Director of Public Works.
- B.** Any pipe or facility that is placed underground in any method other than open cut trenching (including rockwheel trenching) shall be considered as tunneling or boring and jacking.
- C.** All existing utilities shall be potholed for actual depth prior to tunneling or boring and jacking.
- D.** All voids between the inside of the casing and the pipe shall be completely backfilled by blowing sand or pumping grout between the casing and the pipe.

CS 3-07 ROCKWHEEL TRENCH: Where allowed, rock wheel excavation and backfill shall be performed in accordance with the City Standard Specifications and Sections 19 and 86 of the Caltrans Standard Specifications, except as modified below:

- A. The conduit shall be placed in the bottom of the trench and the trench shall be backfilled with slurry cement backfill containing not less than 282 lbs. of Portland cement per cubic yard.
- B. Slurry cement backfill shall be backfilled to within 1-1/2 inches of the finish grade, and then topped with permanent Asphalt Concrete in accordance with the City Standard Specifications. All rockwheel trenching shall be performed prior to any Asphalt Concrete overlay being placed.

CS 3-08 UTILITY COMPANY CONDUIT INSTALLATION: Installation of Utility Company conduit shall be done by either open cut trenching (when the trench width is greater than six inches), rockwheel trenching (when the trench width is six inches or less) or by bore and jack. The method of installation shall be shown on the Project Plans and subject to the approval of the Director of Public Works.

When Utility Company conduit installation is performed by open cut trenching and the trench width is greater than six inches, the trench, bedding and backfill shall conform to the requirements of Standard Drawing 3-21 and the City Standard Specifications. When the Utility Company conduit installation is performed by rockwheel trenching, the trench, bedding and backfill shall conform to CS- 3-07 and the City Standard Specifications. When the Utility Company conduit installation is performed by bore and jacking, the installation shall conform to CS- 3-06 and the City Standard Specifications.