

## **SECTION 12 TRENCH EXCAVATION AND BACKFILLING**

### **12.01 DEFINITIONS**

- A. BACKFILL - Material which covers and surrounds the pipe and extends from the pipe bedding to the top of the trench, including pipe bedding, initial backfill, select backfill, and finish backfill.
- B. PIPE BEDDING - Material that provides support for the bottom of the pipe, measured from the bottom of the trench to the bottom of the pipe.
- C. INITIAL BACKFILL - Material surrounding and covering the pipe extending from the pipe bedding to six inches above the top of pipe.
- D. SELECT BACKFILL - Material that extends from the initial backfill zone to the finish backfill zone.
- E. FINISH BACKFILL - Material which extends from the select backfill zone to a minimum of three (3) inches below finish grade on existing streets, or to the bottom of the street structural section on new (previously undeveloped) streets, or to the top of the trench in non-street rights-of-ways. Finish backfill shall be Class II AB in an existing street and may be native material conforming to Section 12.06 or Class II AB in a non-street right-of-way or as shown on the approved construction plans.
- F. TRENCH - A narrow excavation (in relation to length) made below the surface of the ground. In general, the depth of a trench is greater than its width, but the width of the trench (measured at the bottom) is not greater than fifteen (15) feet.

### **12.02 TRENCH EXCAVATIONS**

Excavation for appurtenant structures such as, but not limited to, manholes, transition structures, junction structures, vaults, valve boxes, catch basins/inlets, thrust blocks, and boring pits shall be deemed to be in the category of trench excavation.

Trench excavation shall include the removal of all water and materials of any nature, which interfere with the construction work. Placement of spoil materials on the paved street area will not be allowed. The treatment and disposal of water from any source shall be in compliance with all water quality regulations and permit requirements.

Trench excavation for the installation of conduit shall be by open trench unless otherwise specified or shown on the improvement plans. However, should the Contractor elect to tunnel or bore and jack or use another type of trenchless technology for any portion not so specified, the Contractor shall first obtain written approval from the City Engineer.

Open trenching shall be prohibited on all newly paved and newly overlaid streets and

reconstructed streets for a period of three (3) years, unless otherwise approved by the City Engineer.

Pursuant to the provisions of Public Contracts Code Division 2, Part 1, Chapter 7, Section 7104, for any work involving the digging of trenches or other excavations, the following shall apply:

- A. THE CONTRACTOR SHALL PROMPTLY, and before the following conditions are disturbed, notify the City in writing of any:
  - 1. Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II Class III disposal site in accordance with provisions of existing law.
  - 2. Subsurface or latent physical conditions at the site differing from those indicated on the plans or within the specification.
  - 3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for on the plans and/or specifications.
- B. FOR CITY CAPITAL IMPROVEMENT PROJECTS, the City shall promptly investigate the conditions, and if it finds that the conditions do materially differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work shall issue a change order under the procedures described in the Contract.
- C. IN THE EVENT THAT A DISPUTE ARISES on Capital Improvement Projects between the City and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or increase in the Contractor's cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law, which pertain to the resolution of disputes and protests between the contracting parties.

### **12.03 TRENCHES**

- A. TRENCH LENGTH - The maximum length of open trench, where prefabricated pipe is to be laid, shall be the distance necessary to accommodate that amount of pipe, which can be installed in a single day. The distance is the collective length at any location, including open excavation, pipe laying, and appurtenant construction and backfill which has not been temporarily resurfaced.
- B. TRENCH WIDTH - The maximum clear width of the trench at the top of the pipe shall not be more than the outside diameter of the pipe at any point plus two (2) feet. Greater width of trench at the top of the pipe shall be permitted only upon written approval of the City Engineer. In no case shall the free working space on each side of

the pipe be less than six (6) inches.

If the maximum trench width is exceeded, the Contractor shall provide additional bedding, another type of bedding, or a higher strength of pipe than shown on the plans or as otherwise approved by the City Engineer, at no additional cost to the City.

- C. TRENCH PLATING - Steel plates will be allowed as an open trench cover (to a maximum length of fifty (50) feet) for instances where stoppage of work is required (i.e., overnight, design change, etc.) Steel plates shall be joined together with tack welds and shall be secured to the existing road surface with steel pins, etc. In addition, steel plates shall have cold mix asphalt concrete placed around all edges, which are exposed to pedestrian and/or vehicular traffic. Non-skid steel plates shall be required in all paved areas.

Use of trench plates shall be minimized. Maximum duration of trench plate use in any one location shall be ten (10) calendar days unless otherwise approved by the City Engineer.

- D. TRENCHING REPLACEMENT ADJACENT TO CURB AND GUTTER - For trenching within existing street, if the distance from the nearest edge of new trench paving to the lip of gutter is less than thirty-six (36) inches, the existing strip of asphalt between the lip of gutter and trench line shall be removed and repaved in conjunction with the trench resurfacing (see Standard Details No. 110 through 115).

#### **12.04 BRACING (OR SHORING) EXCAVATIONS**

The manner of bracing (or shoring) excavations shall be as set forth in the rules, orders, and regulations of the Division of Industrial Safety of the State of California. Contractor shall provide a copy of the State approved bracing or shoring plan to the City prior to start of any excavation work.

#### **12.05 PIPE BEDDING**

Pipe bedding shall be defined as that material providing support to the bottom of the pipe measured from the bottom of the trench to the bottom of the pipe (see Standard Details No. 110 through 115).

If soft, spongy, unstable, or similar other material is encountered upon which the pipe bedding material is to be placed, this unsuitable material shall be removed to a minimum depth of six (6) inches or as directed by the City Engineer and replaced with drain rock suitably densified. Additional drain rock, as directed by the City Engineer over the amount required by the plans or specifications as part of City Capital Improvement Projects, shall be paid for as provided in the Proposal or the Special Provisions of the Contract. If the necessity for such additional drain rock material has been caused by an act or failure to act on the part of the Contractor, or is required for the control of ground water, the Contractor shall bear

the expense of the additional excavation and bedding. Drain rock material shall conform to Section 12.09 "BACKFILL MATERIALS."

Pipe bedding material shall first be placed so that the pipe is supported for the full length of the barrel with full bearing on the bottom segment of the pipe. Holes shall be excavated to accommodate bells or couplings so that no part of the load is supported by the pipe bells or couplings.

Pipe Bedding material shall be compacted to a relative density of ninety (90) percent. Compaction shall be by mechanical, pneumatic, or vibratory compaction equipment approved by the City Engineer. Pipe Bedding material shall meet the specifications listed in this section under 12.09 "BACKFILL MATERIALS."

When water is encountered, the trench shall be kept dry until placing of the pipe bedding material and laying and jointing of the pipe has been completed, inspected, and approved. The Contractor shall place a minimum of six (6) inch pervious material or de-water the trench in a manner which has received prior approval of the City Engineer.

For water main installations, if drain rock is placed in the trench to maintain a firm and stable base and maintain the ground water level below pipe laying operations, filter fabric shall be used between pipe bedding and drain rock. City Engineer may require a trench dam in the trench at six hundred (600) foot intervals as part of the pipe installation and initial backfill.

## **12.06 BACKFILL**

For pipes sixteen (16) inches in diameter or greater, initial backfill placed between the pipe bedding and the springline of the pipe shall be placed in layers not exceeding eight (8) inches in depth.

Backfill for cast-in-place structures such as, but not limited to, manholes, transition structures, junction structures, vaults, valve boxes and reinforced concrete box conduits shall start at the surface upon which the base of the structure rests.

In areas of previously undeveloped land (new construction), finish and select backfill may be "native material" provided all organic material, rubbish, debris, large rocks, clay chunks, and other objectionable materials are first removed. When satisfactory compaction of the native material cannot be obtained, "Class II three quarter (3/4) inch AB" shall be required.

Except where the pipe must remain exposed for force main leakage tests and subject to the provisions herein, the Contractor shall proceed as soon as possible with backfilling operations. Care shall be exercised so that the pipe will not be damaged or displaced during backfilling operations.

- A. CAST-IN-PLACE STRUCTURES - The Contractor shall not place backfill against or over the top of any cast-in-place structures for a period of ten (10) days. Following the expiration of the ten (10) day period, backfill shall not be placed unless the concrete has attained a compressive strength equal to or greater than eighty-five (85) percent of the specified design strength.
- B. VOIDS - Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, the voids remaining after the removal of the boulders shall be backfilled as specified herein, or as otherwise approved by the City Engineer.

Where the void is in the side or bottom of the trench or foundation base of appurtenant structures, it shall be backfilled with suitable material and compacted as approved by the City Engineer.

It shall be understood that the removal of all boulders or other interfering objects and the backfilling of voids left by such removals shall be at the expense of the Contractor and no additional payment for the cost of such work will be made. The cost of such work shall be included in the prices bid for the various items of work.

#### **12.07 COMPACTION METHODS**

- A. MECHANICALLY COMPACTED BACKFILL - Backfill shall be mechanically compacted by means of tamping rollers, sheepsfoot rollers, pneumatic tire rollers, vibrating rollers, or other mechanical tampers. Jetting shall not be allowed, except where written prior approval has been obtained from the City Engineer.
- B. PERMISSION TO USE SPECIFIC compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will achieve the required compaction results or will not result in damage to adjacent ground, existing improvements, or improvements installed under the contract. The Contractor shall make his own determination in this regard.
- C. MECHANICALLY COMPACTED BACKFILL shall be placed in horizontal layers in depth not to exceed eight (8) inches. Each layer shall be evenly spread, moistened (or dried, if necessary), and then tamped or rolled until the specified relative compaction has been attained throughout the entire depth of the layer.

#### **12.08 BACKFILL PLACEMENT REQUIREMENTS**

- A. METHOD "A" - Method "A" is to be used within existing streets or after acceptance of the subgrade in a new street by the City Engineer. Any further excavation on a new street after subgrade acceptance shall be considered as work in an existing street.

The select backfill zone shall be mechanically compacted to a minimum relative compaction of ninety (90) percent. The finish backfill zone shall contain Class II

Aggregate Base mechanically compacted to a minimum relative compaction of ninety-five (95) percent. A temporary layer (two (2) inch minimum) of asphalt cutback shall be placed to grade on top of the finish backfill. This temporary cutback shall be maintained by the Contractor until permanent paving is installed.

- B. METHOD "B" - Method "B" is to be used within the public right-of-way street areas in previously undeveloped land (new construction.) Backfill shall be as specified in Section 12.06, "BACKFILL," above.

When native material is used as backfill, the area of the trench between the initial backfill zone and eighteen (18) inches below the bottom of the street structural section shall be mechanically compacted to a minimum relative compaction of ninety (90) percent. The minimum relative compaction shall be ninety-five (95) percent in the top eighteen (18) inches.

- C. METHOD "C" - Method "C" is to be used in unimproved or non-street right-of-way areas. Both select and finish backfill areas shall be screened native material. Compaction shall be done mechanically in uniform lifts so as to attain a minimum relative compaction of ninety (90) percent.
- D. ALTERNATE BACKFILL - Alternate methods and materials may be used upon approval of the City Engineer.

**12.09 BACKFILL MATERIALS**

- A. PIPE BEDDING AND INITIAL backfill shall conform to ASTM D448 #67. Storm drain and sewer piping ONLY - Crushed Rock

Sieve Size	% Passing
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
#4	0-10
#8	0-5

Water piping ONLY - Sand

Sieve Size	% Passing
1/2inch	100

Sand Equivalent to be 50 min.

- B. BACKFILL - Class AB (All Methods) or Native Material (Methods B & C only).
- C. DRAIN ROCK - Washed coarse crushed aggregate conforming to one of the following grading: 1 inch. (For stabilization ONLY)

Sieve Size	% Passing
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2 inch	100
1-1/2 inch	90-100
1 inch	20-55
3/4 inch	0-15
3/8 inch	0-5

The percentage composition by weight in place shall conform to the gradings previously mentioned as determined by Test Method No. California 202. Sand equivalent for backfill material shall be as determined by Test Method No. California 217. Materials, as delivered, shall be of uniform mixture and shall be free of organic matter and refuse.

#### **12.10 MEASUREMENT AND PAYMENT**

Payment for utility trenching, dewatering, installation, and backfill shall be included in the contract price for the utility being installed and no additional compensation will be made.