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## **SECTION 37 – BORING AND JACKING**

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### **37-1 GENERAL**

At locations shown or specified in the Contract, conductor pipe and associated carrier pipe shall be jacked into place between the limits shown or specified. All boring and jacking operations shall comply with Cal OSHA Tunnel Safety Orders.

The Contractor shall provide a boring and jacking plan to the City prior to beginning the boring and jacking operations. The boring and jacking plan shall describe the equipment, method, and construction sequence for boring and jacking. The Plan shall identify the location of all potential conflicting public and private utilities and address any conflicts with their systems. The Plan shall also identify the location of nearby trees and address any conflicts with their root systems. Work associated with boring and jacking shall not begin until the City has reviewed the Contractor's boring and jacking plan.

Excavation of boring and receiving pits shall be the minimum size necessary to complete the Work. Shoring and bracing for the boring and receiving pits shall conform to the requirements in Section 19-1.06, "Shoring and Bracing", of these Specifications. Unless otherwise specified in the Special Provisions, backfill of the area excavated for the boring operation shall conform to the requirements for structure excavation in Section 18-3, "Structure Excavation and Backfill", of these Specifications.

Unless otherwise specified in the Special Provisions, the Contractor may elect to either jack reinforced concrete pipe, or reinforced concrete sewer pipe, directly or place it in a conductor in conformance with these Specifications.

### **37-2 DIRECT JACKING REINFORCED CONCRETE PIPE**

Reinforced concrete pipe may be jacked directly. Only pipe using double-rubber gasket, fiberglass reinforced collar, or approved equal type joints may be jacked directly. Guide rails shall be accurately set to line and grade to insure installation within permitted tolerances. Unless otherwise shown or specified in the Contract, the maximum length of direct jacking shall be one hundred feet (100'). The diameter of the bored hole shall be not more than one-tenth foot (0.1') greater than the outside diameter of the reinforced concrete pipe.

### **37-3 INSTALLATION OF CONDUCTOR PIPE**

The diameter of the bored hole shall be not more than one-tenth foot (0.1') greater than the outside diameter of the conductor pipe. Guide rails shall be accurately set to line and grade to insure installation of the conductor pipe within permitted tolerances. The conductor pipe diameter shall be sufficient to allow adjustment of line and grade of the carrier pipe to meet allowable tolerances and to allow sand to be placed between the conductor pipe and the carrier pipe. Conductor pipe sizes shall be as shown or specified in the Contract, but in no case shall the inside diameter of the conductor pipe be less than six inches (6") greater than the outside diameter of the carrier pipe. In place elevations are to be recorded on the conductor pipe and submitted to the City in writing.

### **37-4 INSTALLING CARRIER PIPE INSIDE CONDUCTOR PIPE**

Except for water pipe, carrier pipe having any part of a joint larger in diameter than the barrel of the pipe shall be fitted with two (2) twenty-four-inch (24") long polyurethane skids. The polyurethane skids shall be attached to the carrier pipe as recommended by the manufacturer. The

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polyurethane skids shall be located near the center of each carrier pipe section, and shall be large enough to prevent any part of a joint from bearing on the conductor pipe.

Each joint of carrier pipe for water shall be strapped according to the manufacturer's recommendations to two (2) pairs of twenty-four-inch (24") long polyurethane skids. The polyurethane skids shall be located at approximately one-fifth (1/5) of the pipe length from each end of each carrier pipe section.

Carrier pipe with joints not larger than the pipe barrel shall be slid into place on two (2) polyurethane skids which have been securely fastened to the invert of the conductor pipe, or strapped to the barrel of the carrier pipe as specified above.

Carrier pipe sections shall be joined outside the conductor pipe and then slid into place. The space between the carrier pipe and the conductor pipe shall be completely filled with clean, dry sand. The method of placing sand shall be as approved by the City. Except for water pipe, necessary adjustments in grade shall be made by adjusting the height of the skids. Adjustment in grades for water pipe shall be as shown or specified in the Contract, or directed by City.

### **37-5 VOIDS**

When material tends to cave in from outside the permitted diameter of the bored hole, a shield shall be used ahead of the first section of conductor pipe or the face of excavation shall not extend beyond the end of pipe more than one and one-half feet (1-1/2'), unless permitted by the City. The shield shall cover the upper two-thirds (2/3) of the conductor pipe and project not more than one-half inch (1/2") beyond the conductor pipe's outer surface. Excavation shall not project beyond the shield.

Voids larger than those permitted by these Specifications shall be filled with sand or mortar, as directed by the City.

To assist in the detection of voids, a settlement monitoring grid will be established by the City. A minimum number of monitoring points will be quarter stations along the centerline of the pipe alignment plus wing points twenty-five feet (25') on either side of the centerline points. The Contractor shall run levels over these points, and record their elevations, before either the boring or receiving pit is constructed, and subsequently each day that material is removed from the excavation. A final set of elevations shall be recorded two (2) weeks after the conductor pipe is filled with sand and the bulkheads are in place. A copy of the elevation records shall be provided to the City at the end of each day. Any settlement over one-quarter-inch (1/4") shall be corrected by the Contractor to the satisfaction of the City, at the Contractor's expense.

### **37-6 TOLERANCES**

The maximum deviation of conductor pipe from the line and grade shown on the Plans shall be such that line and grade of the carrier pipe can be adjusted within the conductor pipe and maintain the line and grade along its full length.

Unless otherwise shown or specified in the Contract, directly jacked reinforced concrete pipe shall not deviate more than three inches (3") per one hundred feet (100') from the line and grade shown on the Plans.

### **37-7 DRY BORING UNDER CURB, GUTTER AND SIDEWALK**

Unless otherwise specified in the Special Provisions, portions of sanitary sewers, service

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sewers, drainage lines, irrigation lines, water mains, and services that pass beneath curbs, gutters, sidewalks, and other obstructions may be installed by dry boring. For such locations, the bore shall begin at the edge of the street pavement, or as directed by City, and continue to six inches (6") beyond the property line.

### **37-8 WET BORING OF SMALL DIAMETER PIPELINES**

When specified in the Special Provisions, pipelines that are six inches (6") and smaller may be installed by wet boring. Pipe shall be either ductile iron pipe conforming to Section 50-25, "Ductile Iron Pipe (DIP), and Cast Iron Pipe and Ductile Iron Fittings", of these Specifications or polyvinyl chloride (PVC) pressure Class 200 pipe conforming to the requirements of AWWA Standard C900.

If the diameter of the boring hole is more than one-tenth of a foot (0.1') greater than the outside diameter of the pipe to be installed, the void shall be filled with sand or mortar, as directed by the City.

### **37-9 MEASUREMENT AND PAYMENT**

Boring and jacking will be measured by the unit for each location for the size and type of pipe to be placed by boring and jacking as designated in the Contract.

The unit price paid for boring and jacking for each location for the size and type pipe includes full compensation for furnishing all labor, materials (including conductor pipe when specified), tools, equipment, and incidentals, and for doing all the work involved in boring and jacking pipe, complete in place, including the excavation and backfill, as shown or specified in the Contract, as specified in these Specifications, and directed by the City.