

SECTION 02340 - BORING AND JACKING

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing bored or jacked steel casing and carrier piping installation within the steel casing, complete and in place.
- B. In the performance of the work, the CONTRACTOR shall comply with the lawful requirements of the affected railway companies, public agencies, and owners of public utilities or other facilities respecting the safeguarding of traffic and improvements which might be endangered by the boring and jacking operations. The approach trenches in public streets will not be permitted to remain open for extended periods of time.
- C. If the CONTRACTOR is not ready to place the pipe in the casing at the time of completion of boring and jacking operations, the ends shall be bulkheaded, and the approach trenches in public streets shall be backfilled, temporary surfacing placed thereon, and the affected portion of the street reopened to traffic. For short (overnight) duration, the trenches may be securely covered with armored plates to allow for uninterrupted traffic.
- D. The CONTRACTOR shall be responsible for maintaining the specified line and grade, and for preventing settlement of overlying structures, or other damage due to the boring and jacking operations.

1.2 RELATED SECTIONS

- A. The WORK of the following Sections also apply to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 02200 Earthwork
 - 2. Section 02240 Chemical Grouting of Soils
 - 3. Section 02310 Tunnel Groundwater Control
 - 4. Section 02390 Sheet Piles
 - 5. Section 03300 Cast-in-Place Structural Concrete
 - 6. Section 03310 Cast-in-Place Sitework Concrete

1.3 STANDARD SPECIFICATIONS

- A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the Standard Specifications for Public Works Construction (SSPWC), as specified in Section 01090 - REFERENCE STANDARDS.

1.4 SPECIFICATIONS AND STANDARDS

- A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. ASTM A 283 Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes, and Bars.
2. ANSI/AWS D1.1 Structural Welding Code.

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01300:

1. Submittals for jacking or boring operation shall be in accordance with SSPWC, Section 306-2.1 unless indicated otherwise.
2. The CONTRACTOR'S attention is directed to the provisions for "Shoring and Bracing Drawings" in Section 6705 of the California Labor Code. If such plan varies from the shoring system standards established in the Construction Safety Orders of the State of California, such alternative systems plans shall be prepared by a civil or structural engineer licensed in the State of California.
3. Casing installation schedules which include schedules of excavation, pipeline installation, and backfill operations.
4. Material list including diameter, thickness, and class of steel casing.
5. Detailed locations and sizes of all boring or jacking and receiving pits.
6. Shop drawings of casing insulators (spacers) and end seals including manufacturers' catalog information.
7. Permits associated with the boring or jacking operations.
8. Pressure concrete mix design and bracing plans to prevent the carrier pipe from shifting or floating in accordance with SSPWC Section 306-2.3.

B. **Certifications:** The CONTRACTOR shall furnish a certification of compliance for all pipe and other products or materials furnished under this Section of the Specifications and the following supplemental requirements:

1. Physical and chemical properties of all steel.

1.6 QUALIFICATIONS

A. All welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the type of materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the casing or pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. The CONTRACTOR shall furnish all material and bear the expense of qualifying welders.

1.7 SAFETY

NTS: In California all proposed tunnels and bores 30-in diameter or larger are required to be classified as to their potential of encountering explosive or flammable gases. A preliminary classification must be obtained from the Mine Safety Training Unit of Cal OSHA prior to bidding so that the CONTRACTOR will be aware of the State requirements. Information regarding the classification requirement may be obtained by calling the Mine Safety Training Unit at (916) 920-7022 in Sacramento.

- A. [The OWNER has obtained from the Division of Occupational Safety and Health Administration a preliminary gas classification for each bore, as follows: []. It shall be the CONTRACTOR's responsibility to see that the WORK is done in conformance with all applicable federal, state, and local safety requirements.]

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Steel casings shall be in accordance with SSPWC Section 306-2.3 subject to the following requirements. The casing shall be of the diameter indicated and shall be furnished complete with welded joint ends and pressure grout couplings as indicated. The CONTRACTOR may select a greater diameter or thickness for the method of work and loadings involved, site conditions, and possible interferences at no additional cost to the OWNER.

2.2 MATERIALS

- A. **Steel Casing:** The steel casing pipe shall be in accordance with ASTM A283, Grade C, unless otherwise indicated. The minimum diameter shall be as indicated. The CONTRACTOR shall provide 2-inch grout connections regularly spaced at 5 feet on center alternating at 30 degrees from plumb each side of the vertical centerline. Casing section joints shall be butt welded, lap welded, or welded using butt straps in the field. Each end of the casing for butt welding shall be prepared by providing 1/4-inch by 45-degree chamfer on the outside edges.
- B. **Grout:** Grout shall consist of one part portland cement, three parts sand and the minimum amount of water necessary to obtain the desired consistency; and, all grout mixtures shall contain 2 percent of bentonite by weight of the cement. Portland cement, water and sand shall conform to the applicable requirements of the Specification Section [03300] [03310], except that sand to be used shall be of such fineness that 100 percent will pass a Standard No. 8 sieve and at least 45 percent, by weight, will pass a Standard No. 40 sieve. Bentonite shall be a commercial-processed powdered bentonite, Wyoming type.
- C. **Grout Connections:** The CONTRACTOR shall provide grout connections on the interior of the steel casing pipe as specified. Longitudinal spacing between the grout connections may be decreased to provide more frequent grouting, but in no case shall the spacings indicated be exceeded.

- D. **Casing Spacers:** Pipe casing spacers shall be bolt-on type bands. The bands shall be [12] inch wide and shall be made of [two] [three] sections of [14] [12] gauge steel coated with fusion bonded [epoxy] [polyvinyl chloride]. The thickness of fusion bonded coating shall be at least [10] [15] [] mils. The bands shall be lined with a 0.09 inch thick PVC ribbed liner having a hardness of Durometer "A" 85-90. The runners shall be made of at least 2-inch wide fiberglass reinforced plastic. Bolts, studs, nuts and washers shall be cadmium plated.
- E. **End Seals:** End seals shall be made of synthetic rubber. Banding straps shall be made of stainless steel.

2.3 MANUFACTURERS

- A. Products of the type indicated shall be manufactured by one of the following (or equal):
 - 1. Casing Spacers: Pipeline Seal and Insulator Inc. Model C12G-2, Advance Products & Systems Inc. Model S/12.
 - 2. End Seals: Pipeline Seal and Insulator Inc. Model [S] [C] [W], Advance Products & Systems Inc. Model [AC] [AW].
- B. Bentonite shall be IMACCO-Gel or Black Hills or equal.

PART 3 -- EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall give the CONSTRUCTION MANAGER a minimum of [3] days advance notice of the start of an excavation or boring operations.
- B. All work shall be performed in the presence of the CONSTRUCTION MANAGER, unless the CONSTRUCTION MANAGER has granted prior approval to perform such work in its absence.
- C. All welding procedures used to fabricate steel casings shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or special welds for pipe cylinders, casing joint welds, reinforcing plates and grout coupling connections.
- [D. No exterior or interior joints of the carrier pipe shall have mortar grout applied over a seam until the seam has cooled. Exterior and interior joints of the carrier pipe shall be mortar coated and lined in the field, in accordance with the requirements of Section []].

3.2 INSTALLATION OF STEEL CASING

- A. **Jacking Head:** A steel jacking head shall be fitted to the lead section of the casing in such a manner that it extends around the entire outer surface of the steel casing and projects at least 18 inches beyond the driving end of the casing. The jacking head shall not protrude more than 1/2-inch outside of the outer casing surface. The head shall be securely anchored to prevent any wobble or alignment variation during the boring or jacking operations. To minimize voids outside the casing, excavation shall be carried out entirely within the jacking head and not in advance of the head. Excavated materials shall be removed from the casing as the boring or jacking operation progresses and no accumulation of excavated materials within the casing shall be permitted.
- B. **Jacking Pit:** The excavations for the boring or jacking operations shall be adequately shored to safeguard existing substructures and surface improvements and to ensure against ground movement in the vicinity of the jack supports. Heavy guide timber, structural steel, or concrete cradles of sufficient length shall be provided to assure accurate control of boring or jacking alignment. The CONTRACTOR shall provide adequate space within the excavation to permit the insertion of the lengths of casing to be bored or jacked. Timbers and structural steel sections shall be anchored to ensure action of the jacks in line with the axis of the casing. A bearing block, consisting of a timber or structural steel framework, shall be constructed between the jacks and the end of the casing to provide uniform end bearing over the perimeter of the casing and distribute the jacking pressure evenly.
- C. **Control of Alignment and Grade:** The CONTRACTOR shall control the application of the jacking pressure and excavation of materials ahead of the casing as it advances to prevent the casing from becoming earthbound or deviating from the required line and grade. The CONTRACTOR shall restrict the excavation of the materials to the least clearance necessary to prevent binding in order to avoid loss of ground and consequent settlement or possible damage to overlying structures. Allowable grade deviations in horizontal and vertical alignments shall be no greater than [] feet per 100 feet in any direction over the length of the jacking or boring to a maximum total resultant deviation of [] feet.
- D. **Grouting:** Immediately after completion of the boring or jacking operations, the CONTRACTOR shall inject grout through the grout connections in such a manner as to completely fill all voids outside the casing pipe resulting from the boring or jacking operations. Grout pressure shall be controlled so as to avoid deformation of the steel casing and avoid movement of the surrounding ground. After completion of the grouting operations, the CONTRACTOR shall close the grout connections with galvanized steel threaded plugs.
- E. **Installation:** The installation of the casing shall be in accordance with the SSPWC Section 306-2.1 and subject to the approval of the agency having jurisdiction over the area containing the boring or jacking operations.

3.3 INSTALLATION OF CARRIER PIPE

- A. **Joints:** All joints of the carrier pipe within the casing shall be in accordance with Section [].
- B. **Application of Mortar Lining and Coating to Joints:** Application of mortar to the interior and exterior joints of mortar lined and coated pipes shall be performed in accordance with the requirements of Section [].
- C. **Installation of Pipe:** The end seals shall be pulled on (in case of pull-on type of seals) and the casing spacers shall be installed over the carrier pipe at the proper location, in accordance with the casing spacers manufacturer's instructions. Care shall be taken not to damage the carrier pipe coating or the inner coating of casing pipe while installing the carrier pipe. The position of the runners in the casing shall be as per manufacturer's recommendations. The clearance between the carrier pipe and casing shall be as indicated and shall be uniform throughout the casing length.
- D. **Testing of the Carrier Pipe:** Testing of the carrier pipe shall be completed prior to strapping the end seals. Testing shall be performed in accordance with Section [].
- E. **End Seals:** After the carrier pipe has been tested, the end seals shall be strapped by stainless steel bands in accordance with manufacturer's instructions.
- F. **Closing of Pits:** After jacking equipment and excavated materials from the boring or jacking operations have been removed from the jacking pit, the CONTRACTOR shall prepare the bottom of the jacking pit as a pipe foundation. The CONTRACTOR shall remove all loose and disturbed materials below pipe grade to undisturbed earth and recompact the material in accordance with the Specification Section 02200.

** END OF SECTION **