

SECTION 16476

JACKING, BORING, OR TUNNELING PIPE OR BOX

PART 1 DESCRIPTION

- A. Furnish and install pipe or box by jacking, boring, or tunneling.

PART 2 MATERIALS

- A. Use the following types of pipe or box:
  1. corrugated metal pipe meeting Item 02611, "Steel Pipe and Fittings," of the size, type, design, and dimension shown on the plans;
  2. reinforced concrete pipe meeting the special requirements for jacking, boring, or tunneling of Item 02615, "Reinforced Concrete Pipe," of the size, strength, and dimension shown on the plans;
  3. reinforced concrete box meeting Item 02617, "Precast Reinforced Concrete Box Sewers," of the size and type shown on the plans; or
  4. other types specified by the plans.

PART 3 CONSTRUCTION

- A. Excavate suitable shafts or trenches for conducting the jacking, boring, or tunneling operations and for placing end joints of the pipe or box if the grade at the jacking, boring, or tunneling end is below the ground surface. Protect excavations deeper than 5 ft. as specified in Item 02227, "Excavation and Backfill for Utilities."
- B. Install pipe or box so there is no interference with the operation of street, highway, railroad, or other facility and no embankment or structure is weakened or damaged.
- C. Repair any pipe or box damaged in jacking, boring, or tunneling. Remove and replace any pipe or box damaged beyond repair at the Contractor's expense.
- D. Immediately after installation of pipe or box, backfill shafts or trenches excavated to facilitate jacking, boring, or tunneling.

3.01 JACKING

- A. Provide jacks suitable for forcing the pipe or box through the embankment. Use even pressure to all jacks during operation. Provide a suitable jacking head and suitable bracing between the jacks and the jacking head to apply uniform pressure around the ring of the pipe or circumference of the box. Use joint cushioning of plywood or other approved material. For plywood cushioning material, use 1/2 in. minimum thickness

for pipe diameter 30 in. or less, and use 3/4 in. minimum thickness for pipe diameter greater than 30 in. Use 3/4 in. minimum thickness for all boxes. Use cushioning rings of single or multiple pieces. Provide a suitable jacking frame or backstop. Set the pipe or box to be jacked on guides that support the section of the pipe or box, and direct it on the proper line and grade. Place the entire jacking assembly in line with the direction and grade of the pipe or box. In general, excavate the embankment material just ahead of the pipe or box, remove the material through the pipe or box, and force the pipe or box through the embankment with jacks into the space provided.

- B. Furnish a plan showing the proposed method of jacking for approval. Include the design for the jacking head, jacking support or backstop, arrangement and position of jacks, and guides in the plan.
- C. Ensure that excavation for the underside of the pipe for at least 1/3 of the circumference of the pipe conforms to the contour and grade of the pipe. Ensure that the excavation for the bottom slab of the box conforms to the grade of the box. If desired, over excavate to provide not more than 2 in. of clearance for the upper portion of the pipe or box. Taper this clearance to zero at the point where the excavation conforms to the contour of the pipe or box. Pressure-grout any over excavation of more than 1 in.
- D. The distance that the excavation extends beyond the end of the pipe or box must not exceed 2 ft. Decrease this distance as necessary to maintain stability of the material being excavated.
- E. Jack the pipe or box from the low or downstream end. The final position of the pipe or box must not vary from the line and grade shown on the plans by more than 1 in. in 10 ft. Variation must be regular and in 1 direction, and the final flow line must be in the direction shown on the plans.
- F. If desired, use a cutting edge of steel plate around the head end of the pipe or box extending a short distance beyond the end.

### 3.02 BORING

- A. Bore from a shaft in an approved location provided for the boring equipment and workmen.
- B. Dispose of excavated material using a method approved by the Owner's Representative. Use water or other fluids in connection with the boring operation only as necessary to lubricate cuttings; do not use jetting.
- C. In unconsolidated soil formations, use a gel-forming colloidal drilling fluid consisting of high-grade, carefully processed bentonite to consolidate cuttings of the bit, seal the walls of the hole, and furnish lubrication for subsequent removal of cuttings and immediate installation of the pipe.

- D. Allowable variations from line and grade are specified in Section 16476, Part 3, 3.01 “Jacking.” Pressure-grout any over excavation of more than 1 in.
- E. Use a pilot hole or auger method for the boring.
  - 1. Pilot Hole Method
    - a. Bore a 2 in. pilot hole the entire length of the crossing, and check it for line and grade on the opposite end of the bore from the work shaft. This pilot hole will serve as centerline for the larger diameter hole to be bored.
  - 2. Auger Method
    - a. Use a steel encasement pipe of the appropriate diameter equipped with a cutter head to mechanically perform the excavation. Use augers of sufficient diameter to convey the excavated material to the work shaft.

### 3.03 TUNNELING

- A. Use an approved tunneling method where the characteristics of the soil, the size of the proposed pipe, or the use of monolithic pipe would make the use of tunneling more satisfactory than jacking or boring or when shown on the plans.
- B. When tunneling is permitted, ensure that the lining of the tunnel is of sufficient strength to support the overburden. Submit the proposed liner method for approval. Approval does not relieve the Contractor of the responsibility for the adequacy of the liner method.
- C. Pressure-grout the space between the liner plate and the limits of excavation.

### 3.04 JOINTS

- A. If corrugated metal pipe is used, make joints by field bolting or by connecting bands, whichever is feasible. If reinforced concrete pipe is used, make the joints in accordance with Item 02615, “Reinforced Concrete Pipe.” If reinforced concrete box is used, make the joints in accordance with 02617, “Precast Reinforced Concrete Box Sewers.”

## PART 4 MEASUREMENT

- A. This Item will be measured by the foot between the ends of the pipe or box along the flow line.
- B. This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal. Additional measurements or calculations will be made if adjustments of quantities are required.

PART 5 PAYMENT

- A. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Jacking, Boring, or Tunneling Pipe" of the type, size, and class specified; or "Jacking, Boring, or Tunneling Pipe" of the type, size, and design specified; or "Jacking or Tunneling Box Culvert" of the size specified.
- B. This price is full compensation for excavation, grouting, backfilling, and disposal of surplus material; furnishing pipe, box, and pipe liner materials required for tunnel operations; preparation, hauling, and installing of pipe, box, and pipe liner materials; and materials, tools, equipment, labor, and incidentals.
- C. Protection methods for open excavations deeper than 5 ft. will be measured and paid for as required under Item 02227, "Excavation and Backfill for Utilities."

END OF SECTION