

## SECTION 02224

### PIPE BORING AND JACKING

#### PART 1 GENERAL

##### 1.01 SUMMARY

- A. This section addresses casing pipe materials and installation, carrier pipe installation, and tunneling requirements for subsurface crossings.
- B. Related Work Specified Elsewhere
  - 1. Trenching, backfill, and compaction: Section 02221.
  - 2. Water distribution systems: City of Loveland Water/Wastewater Standards.
  - 3. Sanitary sewer systems: City of Loveland Water/Wastewater Standards.
  - 4. Concrete storm pipe: Section 02615.
- C. Measurement and Payment Procedures
  - 1. For public funded capital improvement projects, measurement and payment procedures will be determined on a project by project basis.
  - 2. For privately funded development projects, Owner will determine measurement and payment requirements.

##### 1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

##### 1.03 SUBMITTALS

- A. Boring and Jacking Plan of Operations
  - 1. A plan of operations and proposed materials for the installation of piping by boring and jacking techniques shall be submitted.
- B. Tunneling
  - 1. A plan of operations and proposed materials for the installation of piping by tunneling techniques shall be submitted.
  - 2. Structural design computations for the tunnel liner carrier pipe, working shafts, sheeting and shoring, electrical facilities and equipment, ventilating equipment, and communication equipment. The structural design shall be certified by a registered professional engineer in the State of Colorado. Contractor assumes responsibility for adequacy for all of the tunnel design.
- C. Casing Pipe: submit product information including, but not limited to size of pipe, wall thickness of pipe, pipe material and coating, and submit certificate of compliance certifying that the casing pipe meets the applicable specifications.

- D. Carrier Pipe: submit product information including, but not limited to size of pipe, wall thickness of pipe, class of pipe, strength of pipe, pipe material and coating, and submit certificate of compliance certifying that the casing pipe meets the applicable specifications.

#### **1.04 QUALITY ASSURANCE**

- A. See Section 01010-1.08.
- B. Obtain the necessary permits from the appropriate agencies prior to commencing construction.
- C. Obtain the bonds or the indemnity which are required by the permits, for protection against any damage and interference with traffic and service, which are caused by the construction activities.
- D. Warranty
  - 1. Repair all in place surface or underground facilities which are damaged or displaced due to the crossing installation within two years after final project completion.

#### **1.05 PERFORMANCE REQUIREMENTS**

- A. Boring
  - 1. Maximum departure from established grade = 6 inches / 100 feet.
  - 2. Maximum departure from established line = 2 inches / 100 feet.
  - 3. Maximum departure from established line and grade = 6 inches / 100 feet.
- B. Tunneling
  - 1. Maximum departure from established grade = 2 inches / 100 feet.
  - 2. Maximum departure from established line = 2 inches / 100 feet.
  - 3. Maximum departure from established line and grade = 3 inches / 100 feet.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. Casing Pipe
  - 1. Provide welded steel pipe meeting ASTM A53, Grade B. Casing pipe shall be new material direct from the supplier and shall have a minimum yield of 35,000 psi.
  - 2. Minimum wall thickness shall be 0.250 inches for casing pipe with outside diameter of 24 inches or less, shall be 0.375 inches for casing pipe with outside diameter greater than 24 inches and less than or equal to 30 inches, and shall be 0.5 inches for casing pipe 36 inches in outside diameter or greater.
- B. Carrier Pipe
  - 1. Reinforced concrete pipe in accordance with Section 02615
  - 2. Pipe strength class shall be as shown or specified. Pipe strengths shown and specified are based upon the superimposed loads and not upon the loads which may be placed on the pipe as a result of jacking operations.
    - a. Increased pipe strengths shall be provided as necessary to withstand jacking loads.

## **2.02 EQUIPMENT**

### **A. Boring:**

1. Shall remove earth concurrently as the casing progresses.
2. Shall not introduce water into the excavation.
3. Shall not disrupt traffic.
4. Shall not damage or displace the surrounding earth or surface.

### **B. Jacking:**

1. Shall progressively push the designated carrier pipe through the in place casing or through the earth if a casing pipe is not required.

### **C. Tunneling:**

1. Shall be equipped with steering devices to control line and grade.
2. Shall not introduce water into the excavation.
3. Shall not disrupt traffic.
4. Shall not damage or displace the surrounding earth or surface.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Refer to soil borings for subsurface conditions. Provide additional borings as required to verify subsurface conditions at the crossing site.
- B. Excavations of jacking and receiving pits shall be in accordance with Section 02221.

### **3.02 INSTALLATION**

- A. Jacked pipe 36 inches inside diameter or smaller shall be installed in a casing pipe. A casing pipe is not required for jacking pipe greater than 36 inches inside diameter.
- B. Boring:
  1. Extend casing through entire distance bored.
  2. Check grade and alignment after each casing section is installed.
  3. Coordinate operations to provide continuous support to surrounding earth materials.
- C. Jacking:
  1. Progressively push carrier pipe through completed casing. A minimum clearance of at least 2 inches between the inner wall of the casing pipe and the maximum outside diameter of the cased pipe and joints shall be provided.
  2. Strap 2 wooden saddle blocks to each pipe length to provide support at regular intervals.
  3. Center carrier pipe in casing at all times.
  4. Fill annular space between casing and carrier pipe with dry blown in sand.
  5. Seal each end of the casing after the sand has been deposited.
  6. A minimum of 1 foot of grout shall be placed in the void between the inner wall of the casing pipe and the cased pipe at the ends of the casing pipe after placement of sand.

D. Tunneling:

1. Remove and dispose of excavated material as the line is extended.
2. Coordinate operations to provide continuous support to surrounding earth materials.
3. Fill all voids created around liner exterior with cement grout.
4. Continuously maintain line and grade with laser equipment.
5. Check alignment and grade at the beginning and end of each working shift by means other than the laser.
6. Provide immediate correction if deviations in line and/or grade are found.

**END OF SECTION**