

## SECTION 440 STRUCTURAL PLATE PIPE AND PIPE ARCHES

### 440.1 DESCRIPTION

This work consists of furnishing and installing structural plate pipe and pipe arches.

### 440.2 MATERIALS

Structural plate pipe and pipe arches shall conform to Section 990.

### 440.3 CONSTRUCTION REQUIREMENTS

- A. Fabrication:** Plates shall have a two inch (50 mm) lip beyond each end crest therefore the actual length of a given structure will be approximately four inches (100 mm) longer than the nominal length, except when skewed or beveled.

Plates at longitudinal and circumferential seams shall be connected by bolts. Joints shall be staggered so no more than three plates come together at any point.

- B. Erection:** Pipe and pipe arches shall be assembled according to the manufacturer's assembly instructions. Bolts shall not be torqued above 300 foot-pounds (400 Newton-meters).

- C. Installation:** Trenches shall be excavated to a width that allows for thorough compaction of the bedding and backfill material under and around the pipe. Where feasible, trench walls shall be vertical.

The trench bottom shall be firmly compacted for its full length and width.

The foundation for the bedding shall provide a uniform stable support. Removal of unstable material or rock below the bedding grade shall be performed as set forth in Section 421.

The bedding shall consist of an earth or gravel cradle of uniform density, shaped to fit the lower part of the pipe for at least 10 percent of its overall height.

- D. Backfill Above Bedding Grade:** Moisture and density requirements for backfill shall be as specified in Section 120.

Selected embankment material shall be placed along the pipe in layers not exceeding six inches (150 mm) loose depth and compacted with mechanical compactors to the specified density before the successive layers are placed. The width of the berms on each side of the pipe shall be twice as wide as the external diameter of the pipe or 12 feet (3.5 meters), whichever is least.

In trench installations, the backfill width shall be equal to trench width. The backfill shall be brought up evenly on both sides of the pipe for its full length. Backfilling shall

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be continued until the embankment is one foot (300 mm) over the top of the pipe.

**E. Workmanship:** The completed structure shall show careful, finished workmanship in all particulars. Among others, the following defects are specified as constituting poor workmanship:

1. Uneven laps.
2. Elliptical shaping on horizontal axis. (unless specified)
3. Variation from a straight centerline.
4. Ragged edges.
5. Loose, unevenly lined or spaced bolts.
6. Illegible brand.
7. Bruised, scaled or broken spelter coating.
8. Dents or bends in the metal itself.

The presence of one or more defect in any individual culvert plate or in any shipment shall constitute sufficient cause for rejection.

### 440.4 METHOD OF MEASUREMENT

Structural plate pipe and pipe arches will be measured to the nearest 0.1 foot ( 0.1 meter). Measurement of length will be made as follows:

- A. Vertical End Pipe:** Pipe and pipe arches with vertical ends will be measured parallel to the centerline of the structure, from end to end of metal, exclusive of the two inch (50 mm) lip beyond the crest at each end.
- B. Beveled End Pipe:** Pipe and pipe arches with beveled ends will be measured parallel to the centerline of the structure as the average of the end to end lengths of metal at the top and bottom exclusive of the two inches (50 mm) lip beyond the crest at each end.

### 440.5 BASIS OF PAYMENT

The accepted quantities will be paid for at the contract unit price per foot (meter) complete in place.

Payment will be full compensation for necessary bedding operations, cost of selecting and placing backfill, furnishing and installing required granular or other bedding materials and necessary excavation required. Authorized excavation of material below pipe foundation will be paid for as specified in Section 421.5.