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CORRUGATED STRUCTURAL PLATE ARCHES



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SECTION 05124

CORRUGATED STRUCTURAL PLATE ARCHES

PART 1 GENERAL

1.1 SUMMARY (Not Applicable)

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM A 153 | (1982) Zinc Coating (Hot-Dip) on Iron and Steel Hardware |
| ASTM A 449 | (1988) Quenched and Tempered Steel Bolts and Studs |
| ASTM A 563 | (1989a) Carbon and Alloy Steel Nuts |
| ASTM A 761 | (1988) Steel, Galvanized, Corrugated Structural Plates and Fasteners for Pipe, Pipe Arches, and Arches |

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) PUBLICATION

Standard Specifications for Highway Bridges, 14th Edition 1989

GENERAL REQUIREMENTS

Arch magazines are specially waterproofed, corrugated arch plate culvert, or bridge structures, with the ends closed with concrete walls. Non-standard elements shall be as detailed and specified.

SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTAL DESCRIPTIONS:

SD-04 Drawings; GA.

As soon as practicable after contract award and before fabrication or installation of materials, shop drawings shall be submitted for approval. Shop drawings must be submitted before start of work. Shop drawings shall include assembly instruction drawings showing plate erection sequence for staggered joints.

SD-13 Certificates; GA.

Certificates shall be furnished as specified in ASTM A 761.

SD-14 Samples and Descriptive Data; FIO.

One roll of joint gasket tape and descriptive data, including composition, date of manufacture, and manufacturer's name and type number, shall be submitted for information.

STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

## PART 2 PRODUCTS

MATERIALS

### 2.1.1 Corrugated Structural Plate and Accessories

Corrugated structural plate shall conform to ASTM A 761 except as noted otherwise in this specification.

### 2.1.2 2-Inch Deep Corrugated Structural Plate and Accessories

2-inch deep corrugated plate shall conform to ASTM A 761 except the required coated thickness shall be 1 gauge (0.280 inch). Accessories include assembly bolts and nuts, headwall anchorage fasteners, and bearing channels with anchors.

### 2.1.3 5.5-Inch Deep Corrugated Structural Plate and Accessories

5.5-inch deep corrugated structural plate shall conform to the chemical, mechanical, and coating requirement of ASTM A 761 except the required coated thickness shall be 1 gauge (0.280 inch). The maximim tolerance on the nominal 15-inch pitch shall be 15.5 inches. The minimum tolerance on the nominal 5.5-inch depth shall be 5.23 inches. The minimum tolerance on the nominal 3-inch inside crest radius shall be 2.67 inches. Accessories for 5.5-inch deep arch include assembly bolts and nuts, headwall anchorage fasteners, and bearing channels with anchors. Assembly bolts and nuts shall be 7/8-inch diameter meeting ASTM A 449 and ASTM A 563, respectively, and shall have heavy hex geometry. They shall be hot-dip galvanized per ASTM A 153.

JOINT GASKET TAPE

Joint gasket tape shall be a butyl-rubber or elastomeric-based pressure-sensitive tape which, when applied at specified thickness between two clean, dry surfaces, and under conditions of pressure which will be encountered in the use specified will seal the joint from water, will be weather resistant, and will withstand temperature ranges from minus 30 degrees F to 200 degrees F without loss of adhesion, without slipping, and with properties allowing the compound to move with the expansion and

contraction of the structure. The tape may contain a cloth or fiber scrim insert and may be an extruded preformed type. Tape shall be 3/16-inch thick by a minimum of 4-inches wide and shall be supplied in rolls with a removable paper cloth backing on the tape.

2.3 SEALANT

Sealant shall be as specified in Section 07120 FLUID-APPLIED WATERPROOFING.

CONCRETE AND REINFORCING STEEL

Concrete and reinforcing steel shall conform to Section 03300 CONCRETE FOR BUILDING CONSTRUCTION.

PART 3 EXECUTION

ASSEMBLY OF STRUCTURAL PLATES

Assembly of structural plates shall be in accordance with instructions furnished by the manufacturer. The instructions shall show the position of each plate and the order of assembly. For steel arches consisting of 2-inch deep corrugated plates, the plate sections shall be connected with 3/4-inch galvanized bolts is two staggered rows of 4 bolts per linear foot of longitudinal seam and spaced not more than 12 inches in one row for each circumferential joint. For steel arches consisting of 5-1/2-inch deep corrugated plates, the plate sections shall be connected with 7/8-inch galvanized bolts in three in-line rows with a bolt spacing of 7-1/2 inches in the longitudinal seam and spaced not more than 16 inches in one row for each circumferential joint. Gasket tape shall be applied at all laps.

3.1.1 Joint Gasket Tape

3.1.1.1 Preparation of Surfaces

Metal surfaces to receive joint gasket tape shall be clean and dry. All oil, grease, dirt, loose rust, loose mill scale, and other foreign substances shall be removed. The removal of oil or grease shall be accomplished in a manner that will not leave a greasy residue. Clean cloths and clean fluids shall be used as required.

3.1.1.2 Application

All bolted joints in the structural plate shall be sealed with joint gasket tape as indicated. Tape shall be placed on one plate with removable backing exposed. Tape shall not be stretched, and contours of the corrugations shall be followed in application of tape. Tape shall have butt joints at splices. As many thicknesses of tape as required to fill all voids shall be used at triple laps of the structural plates and at all other laps requiring additional gasket material to make waterproof joints. Tape shall be stored at ambient temperatures of less than 100 degrees F and shall be handled and stored in a manner which will not deform the tape as received from the manufacturer.

3.1.1.3 Bolt Holes in Gasketing Tape

Make bolt holes in the gasketing tape after it has been placed in position and the liner paper has been removed but before the lapped adjacent plates are positioned. Bolt holes shall be punched in the tape with either a cold or heated spud wrench. Sharpening the end of the spud wrench or heating the wrench to a maximim temperature of 275 degrees F will facilitate punching the holes and minimize the possibility of distorting the tape in the critical areas around the bolts. Trimming the bolt holes with a knife will not be allowed.

ERECTION

Arch shape shall be maintained during erection before backfilling as per manufacturer's requirements and in accordance with AASHTO Standard Specification for Highway Bridges. The structure will require tight bolting each segment of the periphery before adding the next segment. Segments of the periphery are identified as constant radius arcs, commonly referred to as: sides, corners or top. Segments may be erected in place one plate at a time or pre-assembled and placed or hung as single units. Whichever method is used, tighten the bolt in the segment with the segment in the proper design shape (curvature) before adding more plates above it. Proper curvature of the segment is obtained by checking the chord distance of the segment in the pre-assembled units. In placing pre-assembled units, or individual plates, tighten the seam between said unit and the previously placed plate only when the chord distance across the structure between the top of the same segments or plates being placed in that ring is correct. Bolts shall be placed so that the heads are outside the structure and all nuts are inside.

SEALANT

Sealant shall be placed as recommended by the manufacturer in all exterior lapped joints and under all bolt heads, as indicated.

3.4 BOLTING

After sealant has been applied, the tightening of nuts shall be started. Uniform pressure shall be maintained along all bolt lines as the tightening of the nuts progresses. The nuts shall be tightened to a torque of 150-300 foot-pounds and when seam sealant is used, retighten to these limits after 24 hours or as otherwise specified by the manufacturer. Tightening shall commence at the middle os the edges of sheets and progress outward in opposite directions to the corners of sheets. Bolts on both sides of the structure shall be tightened in the same stages to avoid "walking" toward the loose side and rifling or twisting of the barrel. If impact wrenches are used, frequent checks shall be made with a torque wrench to insure proper tightness. After all nuts are tight, the tightness of one out of every 20 bolts shall be tested with a torque wrench in the presence of the Contracting Officer. If 25 percent of the bolts tested are found to not be tightened to the specified torque, then all bolts shall be retightened.

-- End of Section