



Designation: B789/B789M – 16 (Reapproved 2021)

Standard Practice for Installing Corrugated Aluminum Structural Plate Pipe for Culverts and Sewers¹

This standard is issued under the fixed designation B789/B789M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers procedures, soils, and soil placement for the proper installation of corrugated aluminum structural plate culverts and sewers in either trench or embankment installations. A typical trench installation is shown in Fig. 1, and a typical embankment (projection) installation is shown in Fig. 2. Structural plate structures as described herein are those structures factory fabricated in plate form and bolted together on site to provide the required shape, size, and length of structure. This practice applies to structures designed in accordance with Practice B790/B790M.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

B746/B746M Specification for Corrugated Aluminum Alloy

¹ This practice is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.08 on Corrugated Aluminum Pipe and Corrugated Aluminum Structural Plate.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches

B790/B790M Practice for Structural Design of Corrugated Aluminum Pipe, Pipe-Arches, and Arches for Culverts, Storm Sewers, and Other Buried Conduits

D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))

D1556/D1556M Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method

D1557 Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))

D2167 Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

D2487 Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

D2937 Test Method for Density of Soil in Place by the Drive-Cylinder Method

D6938 Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *arch*, *n*—segment of a circular shape spanning an open invert between the footings on which it rests.

3.1.2 *bedding*, *n*—earth or other material on which a pipe is supported.

3.1.3 *haunch*, *n*—portion of the pipe cross section between the maximum horizontal dimension and the top of the bedding.

3.1.4 *invert*, *n*—lowest point on the pipe cross section; also, the bottom portion of a pipe.

3.1.5 *pipe*, *n*—conduit having a full circular shape; also, in a general context, all structure shapes covered by this specification.

3.1.6 *pipe-arch*, *n*—pipe with an approximate semicircular crown, small-radius corners, and large-radius invert.

3.1.7 *underpass*, *n*—pipe with an approximate semicircular crown, large-radius sides, small-radius corners between sides and invert, and large-radius invert.



excavation must be in compliance with any local, state, and federal codes and safety regulations.

6. Foundation

6.1 The supporting soil beneath the structure must provide a reasonably uniform resistance to the imposed load, both longitudinally and laterally. Sharp variations in the foundation must be avoided. When rock is encountered, it must be excavated and replaced with soil. If the structure is to be placed on a continuous rock foundation, it will be necessary to provide a bedding of soil between the rock and the structure. See Fig. 3.

6.2 Lateral changes in foundation should never be such that the structure is firmly supported while the backfill on either side is not. When soft material is encountered in the foundation and must be removed to maintain the grade on the structure, then it must be removed, usually for a minimum of three structure widths. See Fig. 4. A smaller width of removal can sometimes be used if established by the engineer.

6.3 Performance of buried structures is enhanced by allowing the structure to settle slightly relative to the columns of earth alongside. Therefore, when significant settlement of the overall foundation is expected, it is beneficial to provide a yielding foundation under structural plate structures. A yielding foundation is one that allows the structure to settle vertically by a greater amount than the vertical settlement of the columns of earth alongside. It can usually be obtained by placing beneath the structure a layer of suitable thickness of compressible soil, less densely compacted than the soil alongside. This is particularly important on structures with relatively large-radius invert plates.

6.4 For all structures with relatively small-radius corner plates adjacent to large-radius invert plates (such as pipe-arches or underpass structures), excellent soil support must be

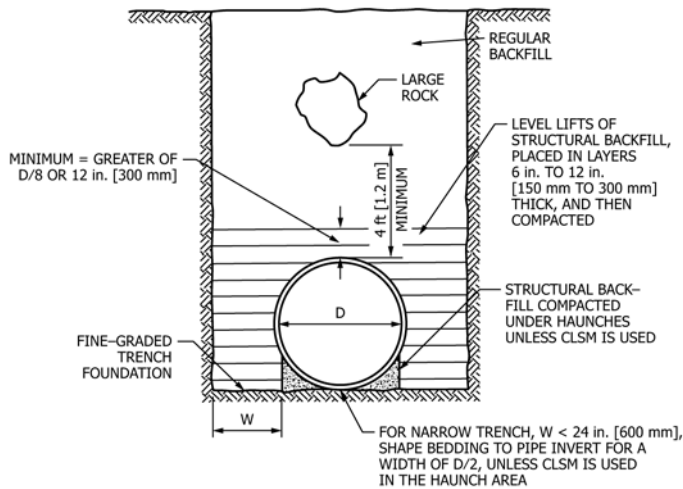


FIG. 1 Typical Trench Installation

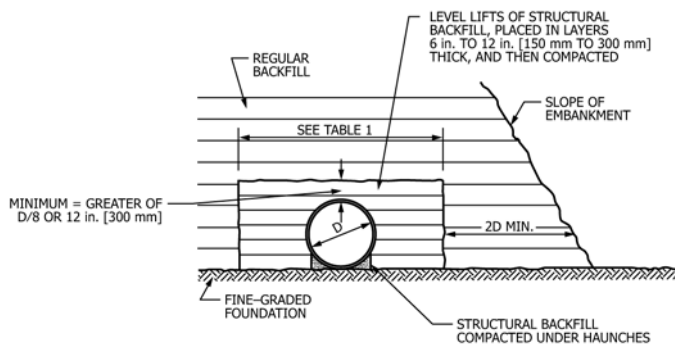


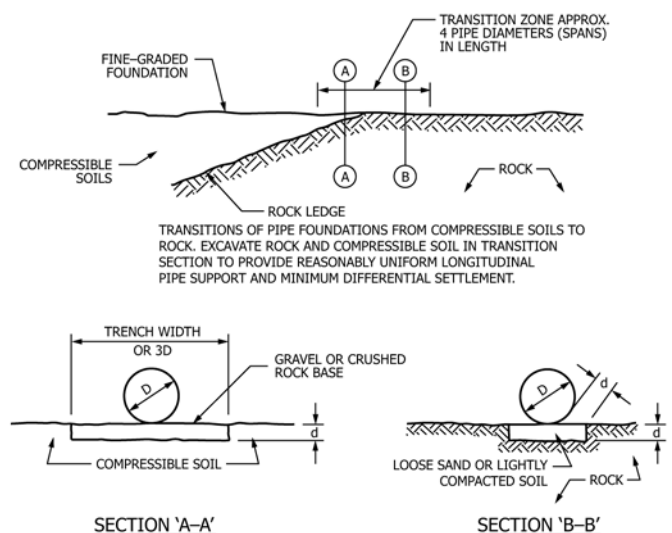
FIG. 2 Typical Embankment (Projection) Installation

4. Significance and Use

4.1 Corrugated aluminum structural plate pipe functions structurally as a flexible ring that is supported by and interacts with the compacted surrounding soil. The soil placed around the structure is thus an integral part of the structural system. It is therefore important to ensure that the soil structure is made up of the acceptable material and well-constructed. Field verification of soil structure acceptability using Test Methods D1556/D1556M, D2167, D6938, or D2937, as applicable, and comparing the results with Test Methods D698 or D1557, in accordance with the specifications for each project, is the most reliable basis for installation of an acceptable structure. The required density and method of measurement are not specified by this practice but must be established in the specifications for each project.

5. Trench Excavation

5.1 To obtain the anticipated structural performance of structural plate structures, it is not necessary to control trench width beyond the minimum necessary for proper assembly of the structure and placement of the structural backfill. However, the soil on each side beyond the excavated trench must be able to support anticipated loads. When a construction situation calls for a relatively wide trench, it may be made as wide as required for its full depth, if so desired. However, trench



NOTE 1—Section B-B is applicable to all continuous rock foundations

FIG. 3 Foundation Transition Zones and Rock Foundations