



Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field- Bolted Pipe, Pipe-Arches, and Arches¹

This standard is issued under the fixed designation A761/A761M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers corrugated steel structural plate, zinc-coated, used in the construction of pipe, pipe-arches, arches, underpasses, and special shapes for field assembly. Appropriate fasteners and accessory materials are also described. The pipe, arches, and other shapes are generally used for drainage purposes, pedestrian and vehicular underpasses, and utility tunnels.

1.2 This specification does not include requirements for bedding, backfill, or the relationship between earth cover load and plate thickness of the pipe. Experience has shown that the successful performance of this product depends upon the proper selection of plate thickness, type of bedding and backfill, manufacture in the plant, and care in the installation. The purchaser must correlate the preceding factors and also the corrosion and abrasion requirements of the field installation with the plate thickness. The structural design of corrugated steel structural plate pipe and the proper installation procedures are described in Practices [A796/A796M](#) and [A807/A807M](#).

1.3 This specification is applicable to orders in either inch-pound units (as A761) or SI units (as A761M). Inch-pound units and SI units are not necessarily equivalent. SI units are shown in brackets in the text, but they are the applicable values when the material is ordered to A761M.

1.4 This specification references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this specification.

1.5 *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 Recom-*

mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 ASTM Standards:²

- [A36/A36M Specification for Carbon Structural Steel](#)
- [A90/A90M Test Method for Weight \[Mass\] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings](#)
- [A123/A123M Specification for Zinc \(Hot-Dip Galvanized\) Coatings on Iron and Steel Products](#)
- [A153/A153M Specification for Zinc Coating \(Hot-Dip\) on Iron and Steel Hardware](#)
- [A307 Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength](#)
- [A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)
- [A449 Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use](#)
- [A563 Specification for Carbon and Alloy Steel Nuts](#)
- [A563M Specification for Carbon and Alloy Steel Nuts \(Metric\)](#)
- [A751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products](#)
- [A754/A754M Test Method for Coating Weight \(Mass\) of Metallic Coatings on Steel by X-Ray Fluorescence](#)
- [A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings](#)
- [A796/A796M Practice for Structural Design of Corrugated Steel Pipe, Pipe-Arches, and Arches for Storm and Sanitary Sewers and Other Buried Applications](#)
- [A807/A807M Practice for Installing Corrugated Steel Structural Plate Pipe for Sewers and Other Applications](#)
- [A902 Terminology Relating to Metallic Coated Steel Products](#)

¹ This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.17 on Corrugated Steel Pipe Specifications.

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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.

*A Summary of Changes section appears at the end of this standard

- B6 Specification for Zinc**
- B695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel**
- E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications**
- E376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy Current (Electromagnetic) Testing Methods**
- F568M Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners (Metric) (Withdrawn 2012)³**
- 2.2 *ANSI Standards*:⁴
- B18.2.1 Square and Hex Bolts and Screws, Inch Series**
- B18.2.2 Square and Hex Nuts**
- B18.2.3.6M Bolts, Metric Heavy Hex**
- B18.2.4.6M Hex Nuts, Heavy, Metric**
- 2.3 *AASHTO Standard*:⁵
- LRFD Bridge Design Specifications**
- 2.4 *American Welding Society Standard*:⁶
- AWS D1.1/D1.1M Structural Welding Code**

3. Terminology

3.1 *Definitions*—See Terminology **A902** for definitions of general terminology relating to metallic-coated steel products.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *arch, n*—a part circle shape spanning an open invert between the footings on which it rests.

3.2.2 *box culvert, n*—a rectangular box with a long-radius crown and short radius corners, and having either a full invert or footings.

3.2.3 *circumferential flange connection, n*—a circumferential seam for structural plate that is connected through a flange along the edge of the plate; circumferential flanges are cold-formed.

3.2.4 *circumferential reinforcing member, n*—a structural section bolted to a structural plate structure, parallel to the corrugations, to provide additional strength or stiffness.

3.2.5 *circumferential seam, n*—a connection seam along the edge of the plate parallel to the corrugation.

3.2.6 *fabricator, n*—the producer of the components for the finished product.

3.2.7 *flat plate, n*—sheet or plate used to fabricate structural plate.

3.2.8 *longitudinal flange connection, n*—a longitudinal seam for structural plate that is connected through a flange along the edge of the plate; longitudinal flanges are welded to structural plate.

3.2.9 *longitudinal seam, n*—a connection seam along the edge of the plate perpendicular to the corrugation.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁵ Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001.

⁶ Available from American Welding Society (AWS), 8669 NW 36 St., #130, Miami, FL 33166-6672, <http://www.aws.org>.

3.2.10 *manufacturer, n*—the producer of the flat plate and accessories.

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

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

3.2.13 *pipe, horizontal ellipse, n*—an elliptically shaped pipe with the horizontal diameter approximately 25 % greater than the nominal diameter.

3.2.14 *pipe, vertically elongated, n*—an elliptically shaped pipe with the vertical diameter up to 10 % greater than the nominal diameter.

3.2.15 *purchaser, n*—the person or agency that purchases the finished pipe structure.

3.2.16 *special shape, n*—a shape, other than described elsewhere in this section, suitable for fabrication with structural plate.

3.2.17 *structural plate, n*—a corrugated and curved plate which is field assembled with other structural plates to form the required structure.

3.2.18 *vehicular underpass, n*—a high arch shape with an approximate semicircular crown, large-radius sides, small-radius corners between sides and invert, and large-radius invert.

4. Connection Classification

4.1 *Lapped Connections*—The corrugated steel structural plate shall be fabricated with any of the corrugations in **6.2** with bolted lap seams in both circumferential and longitudinal directions. See **Fig. 1**.

4.2 *Flange Connections*—The corrugated steel structural plate shall be fabricated with 15 by 5 1/2-in. [380 by 140-mm] corrugations with bolted flange seams in both circumferential and longitudinal directions, oriented such that after curving, all flanges are on the inside of the structure. See **Figs. 2-4**. For arch anchorage plates, the longitudinal flange along the bottom edge may be omitted and bolt hole patterns furnished the same as that for structural plate with lapped connections.

5. Ordering Information

5.1 Orders for material under this specification shall include the following information as necessary to adequately describe the desired product:

5.1.1 Name of material (corrugated steel structural plate and accessories),

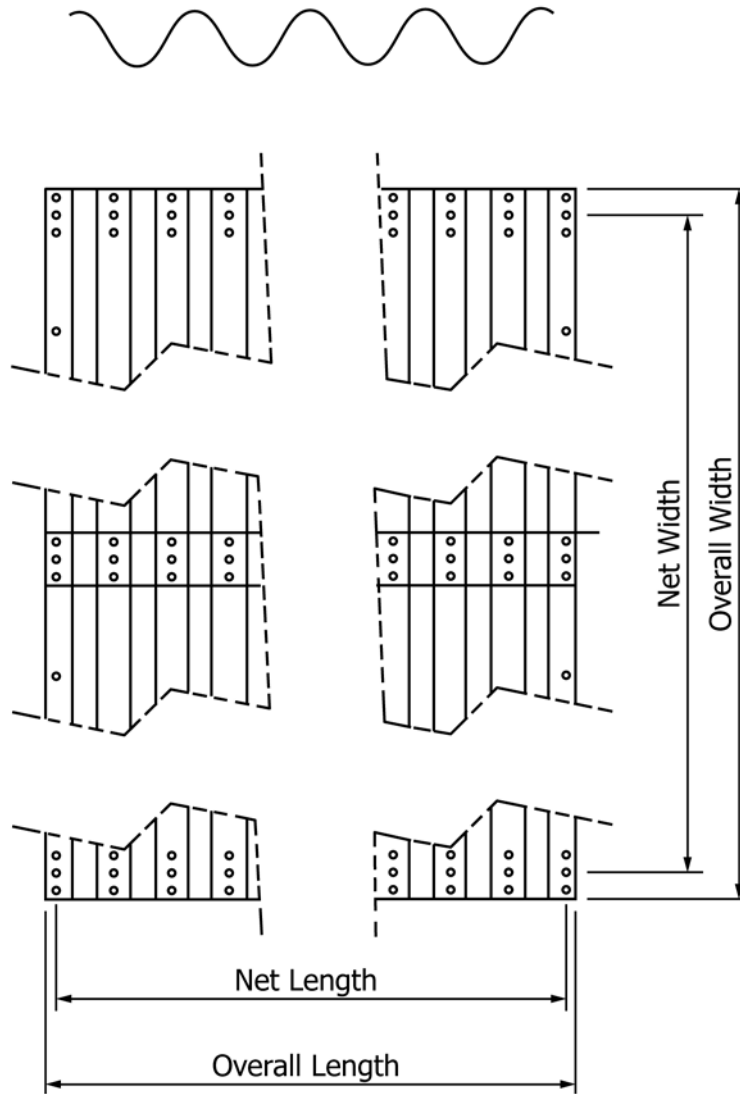
5.1.2 Description of structure (see Section 3),

5.1.3 Number of structures,

5.1.4 ASTM designation and year of issue, as A761— ___ for inch-pound units or A761M — ___ for SI units.

5.1.5 Type of connections if other than lapped (see Section 4),

5.1.6 Dimensions of structure (diameter or span and rise, and length, and so forth) (see **9.2** and **Note 7**),



Note: Seam Hole Pattern Varies With Corrugation Profiles

FIG. 1 Layout of Structural Plate with Lapped Connections

5.1.7 Thickness of plate (see 9.1), and for the 6 by 2-in. [150 by 50-mm] corrugation, the type of steel in accordance with 6.1.3 and Table 1,

5.1.8 Description of corrugations (see 7.2),

5.1.9 End treatment (bevel, skew, grade or slope corrections, or other special provision if required by the project plans or specifications),

5.1.10 Seam bolt size and number per corrugation, if different than the minimums specified (see 7.4 and Tables 2-4),

5.1.11 Special requirements (including reinforcement locations, shapes, and thicknesses), if required, and

5.1.12 Flat plate minimum elongation in 2 in. [50] if a value greater than that listed in Table 1 is required.

5.1.13 Certification, if required (see 13.1).

NOTE 1—Typical ordering descriptions are as follows: (1) Structural plates and fasteners for two corrugated steel structural plate pipes with lapped connections, in accordance with ASTM A761 - ____, 180-in.

diameter, 0.168-in. plate thickness, 6 by 2-in. corrugations, each 140-ft nominal centerline length with end treatment as shown on plans; (2) Structural plates and fasteners for one corrugated steel structural plate pipe-arch with lapped connections, in accordance with ASTM A761M - ____, 3860-mm span by 2460-mm rise, 5.54-mm plate thickness, 150 by 50-mm corrugations, 27.0-m nominal centerline length with square ends, longitudinal seams with four M20 bolts per corrugation.

6. Materials

6.1 Flat Plate:

6.1.1 *Manufacture*—The base steel shall be made by any of the following processes: open-hearth, basic-oxygen, or electric-furnace.

6.1.2 *Chemical Composition*—The base metal heat analysis shall conform to the chemical requirements of Table 6. The requirements of this specification shall be met in continuous mass production during which the manufacturer has made