
Standard Specification for

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

AASHTO Designation: M 167M/M 167-24^{1,2}

Technically Revised: 2024

Editorially Revised: 2024

Technical Subcommittee: 4b, Flexible and Metallic Pipe

ASTM Designation: A761/A761M-18



**American Association of State Highway and Transportation Officials
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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 on 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 above 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 *AASHTO LRFD Bridge Design Specifications*, Section 12 and *AASHTO LRFD Bridge Construction Specifications*, Section 26, respectively.
- 1.3.

The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the inch-pound 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 specification.

2. REFERENCED DOCUMENTS
- 2.1.

AASHTO Standards:

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M 111M/M 111, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

■

M 232M/M 232, Zinc Coating (Hot-Dip) on Iron and Steel Hardware

■

T 65M/T 65, Mass [Weight] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings

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T 244, Mechanical Testing of Steel Products

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AASHTO LRFD Bridge Design Specifications

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AASHTO LRFD Bridge Construction Specifications

2.2.

ASTM Standards:

- A36/A36M, Standard Specification for Carbon Structural Steel
- A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 psi Tensile Strength
- A449, Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
- A563, Standard Specification for Carbon and Alloy Steel Nuts
- A563M, Standard Specification for Carbon and Alloy Steel Nuts (Metric)
- A751, Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- A754/A754M, Standard Test Method for Coating Weight (Mass) of Metallic Coatings on Steel by X-Ray Fluorescence
- A780/A780M, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- A902, Standard Terminology Relating to Metallic Coated Products
- B6, Standard Specification for Zinc
- E29, Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E376, Standard Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Testing Methods
- F568M, Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners (withdrawn 2012; the last approved version of this standard is available from <https://www.astm.org>)

2.3.

American National Standards:

- 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

2.4.

American Welding Society Standard:

- AWS D1.1/D1.1M, Structural Welding Code

3. TERMINOLOGY

3.1.

Definitions—See ASTM A902 for definitions of general terminology related to metallic-coated steel products.

3.2.

Descriptions of Terms Specific to This Standard:

3.2.1.

arch—a partial circle shape spanning an open invert between the footings on which it rests.

3.2.2.

box culvert—a rectangular box with a long-radius crown and either short-radius corners or welded corners. It can be with full invert or with footings.

3.2.3.

circumferential flange connection—a circumferential seam for structural plate that is connected through a flange along the edge of the plate. Circumferential flanges are cold-formed.

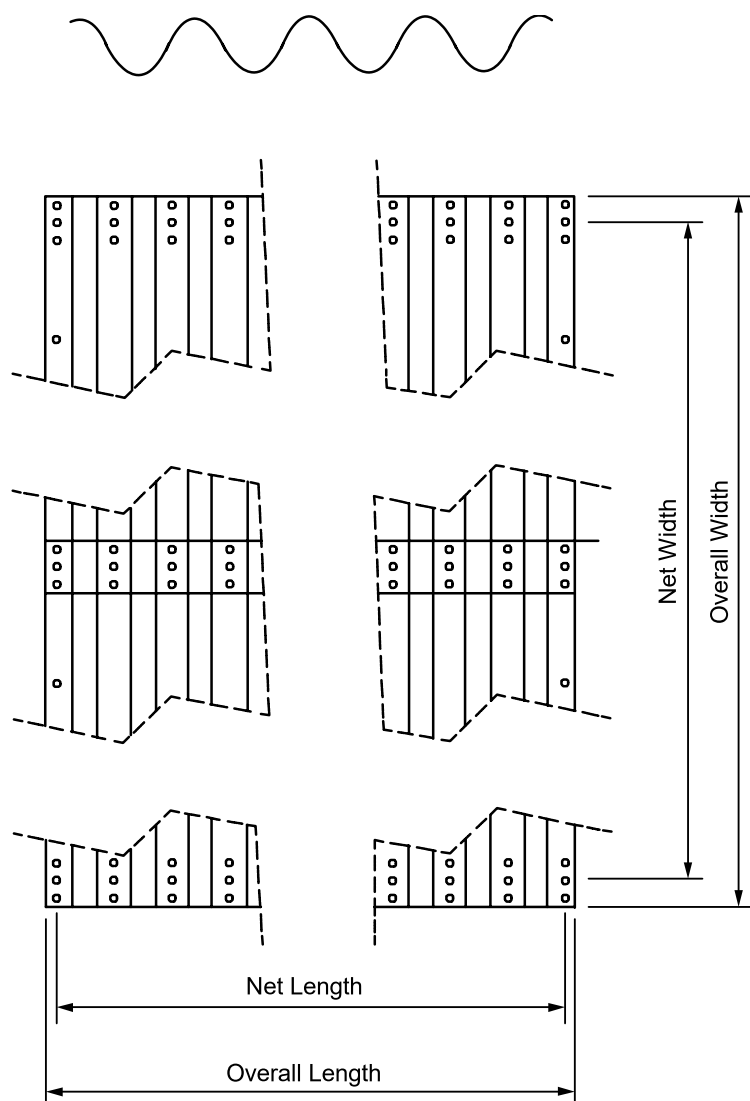
3.2.4.

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

- 3.2.5. *circumferential seam*—a connection seam along the edge of the plate parallel to the corrugations.
- 3.2.6. *fabricator*—the producer of the components for the finished product.
- 3.2.7. *flat plate*—sheet or plate used to fabricate structural plate.
- 3.2.8. *longitudinal flange connection*—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*—a connection seam along the edge of the plate perpendicular to the corrugations.
- 3.2.10. *manufacturer*—the producer of the flat plate and accessories.
- 3.2.11. *pipe*—a conduit having full circular shape; also, in a general context, all structural shapes covered by this specification.
- 3.2.12. *pipe-arch*—an arch shape with an approximate semicircular crown, small-radius corners, and large-radius invert.
- 3.2.13. *pipe, horizontal ellipse*—an elliptically shaped pipe with the horizontal diameter approximately 25 percent greater than the nominal diameter.
- 3.2.14. *pipe, vertically elongated*—an elliptically shaped pipe with the vertical diameter up to 10 percent greater than the nominal diameter.
- 3.2.15. *purchaser*—the purchaser of the finished product.
- 3.2.16. *special shape*—a shape, other than described elsewhere in this section, suitable for fabrication with structural plate.
- 3.2.17. *structural plate*—a corrugated and curved plate that is field assembled with other structural plates to form the required structure.
- 3.2.18. *vehicular underpass*—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 Section 7.2 with bolted lap seams in both circumferential and longitudinal directions. See Figure 1.



Note: Seam hole pattern varies with corrugation profiles.

Figure 1—Layout of Structural Plate with Lapped Connections

- 4.2. *Flange Connections*—The corrugated steel structural plate shall be fabricated with 380 by 140 mm [15 by 5½ in.] 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 Figures 2–4. For arch anchorage plates, the longitudinal flange along the bottom edge may be omitted and bolt patterns furnished the same as that for structural plate with lapped connections.

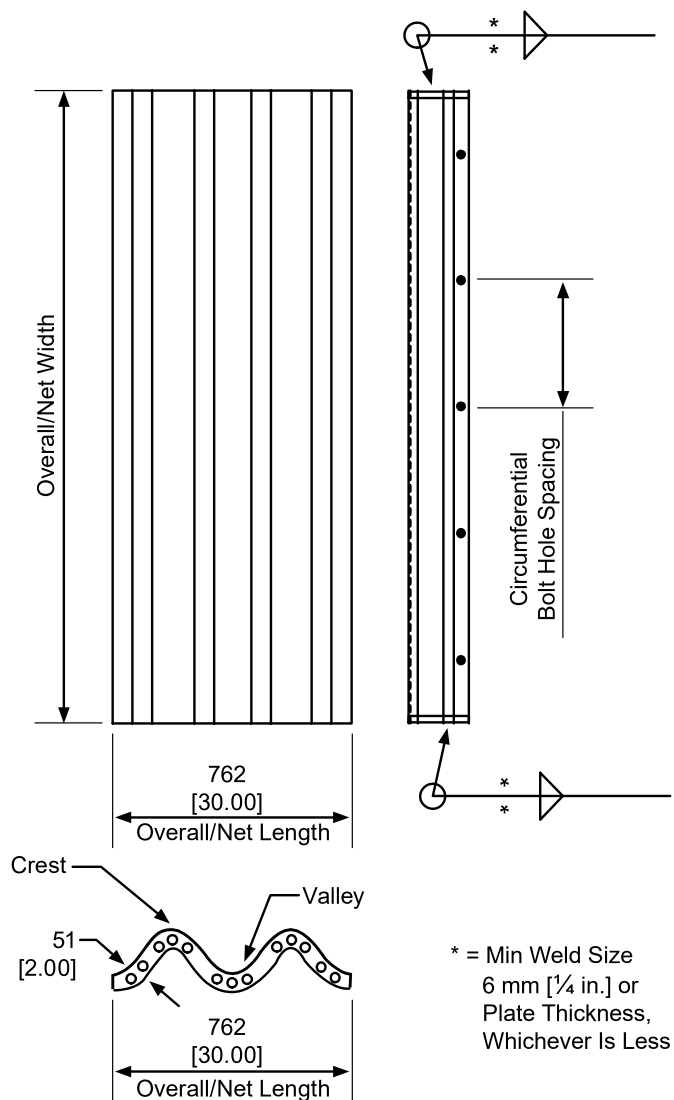


Figure 2—Layout of Structural Plate with Flange Connections

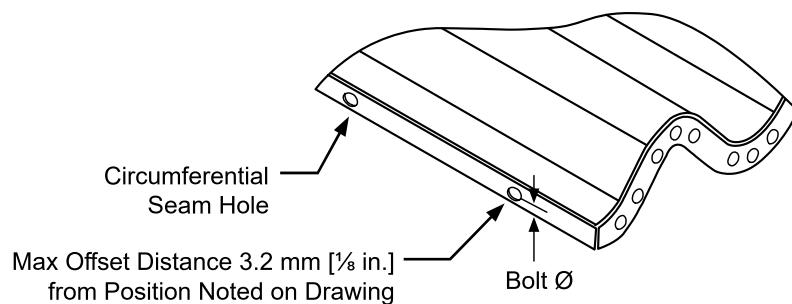


Figure 3—Details of Structural Plate with Flange Connections