



Designation: A769/A769M – 05

Standard Specification for Carbon and High-Strength Electric Resistance Forge- Welded Steel Structural Shapes¹

This standard is issued under the fixed designation A769/A769M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This specification covers carbon and high-strength steel shapes of structural quality manufactured by the electric-resistance forge-welding process from coils.

1.2 The size range covered is described in nominal dimensions for columns, beams, and tees.

	Size Range, in. (mm)
Web thickness	0.060 to 0.375 [1.5 to 10]
Flange thickness	0.060 to 0.500 [1.5 to 12.7]
Overall depth	2.00 to 24.00 [50 to 600]
Flange width	0.50 to 12.00 [12.7 to 300]

1.3 These shapes are intended for two classes of application:

1.3.1 *Class 1*—General structural use where static loading predominates.

1.3.2 *Class 2*—Structural use where fatigue loading occurs and is a principal design consideration.

NOTE 1—**Caution**—Because of the absence of smooth, integral, large radius fillets at the junctions of the webs and the flanges (see Fig. 1), fatigue limits of resistance forge-welded shapes in torsion, lateral loading, and flexure are usually lower than those for hot-rolled shapes of similar size and material. Users should consult shape manufacturers for recommended values of fatigue limits for each specific use, material, and size in cases where dynamic loading is a principal design consideration.

1.4 When the steel is to be welded, it is presupposed that a welding procedure suitable for the grade of steel and intended use or service will be utilized. See Appendix X3 of Specification A6/A6M for information on weldability.

1.5 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 must be used independently of the other. Combining values from the two systems may result in nonconformance with this specification.

¹ This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.02 on Structural Steel for Bridges, Buildings, Rolling Stock and Ships.

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1.6 The following safety hazards caveat pertains only to the test methods portion, Section 10, of this specification: *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

A6/A6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A568/A568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment

2.2 American Welding Society Standard:

AWS Specification D1.1 Structural Welding Code³

3. Ordering Information

3.1 Orders for material under this specification should include the following, as required, to describe the desired material adequately:

- 3.1.1 Quantity (total number of feet (metres) or lengths),
- 3.2 ASTM designation and year of issue, grade, and class,
- 3.3 Shape and size,
- 3.4 Length of each piece,
- 3.5 Information on intended application,
- 3.6 Other special requirements, and
- 3.7 Required certification and test reports.

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.

³ Available from American Welding Society, 550 N. W. LaJeune Rd., Miami, FL 33135.

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

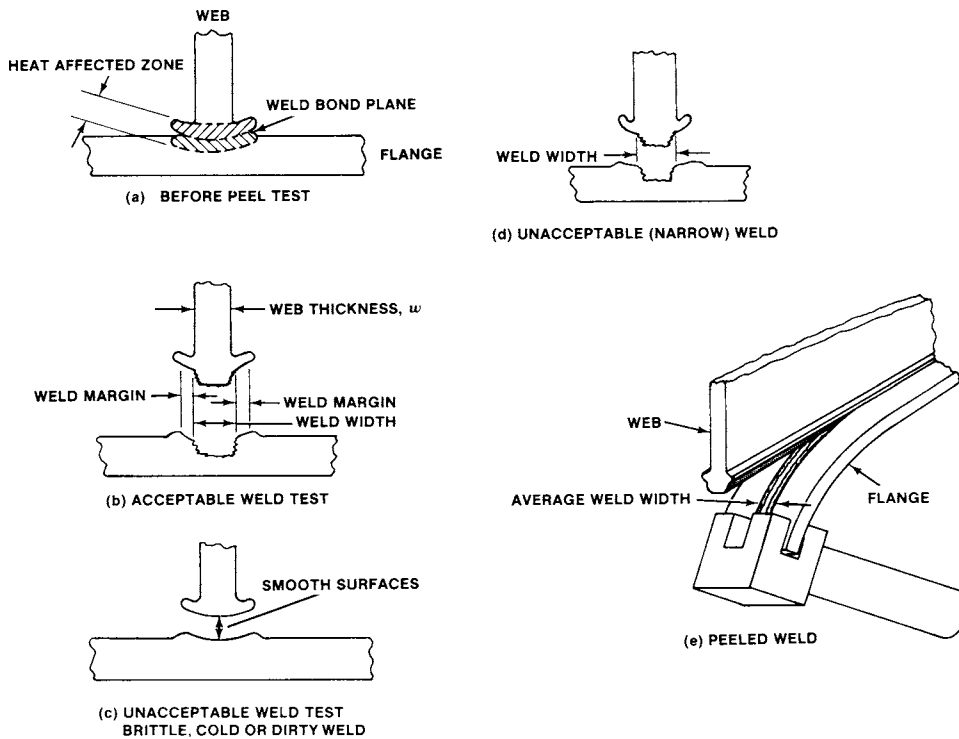


FIG. 1 Appearance of Peel Test Criteria

4. Materials and Manufacture

4.1 The shapes shall be manufactured from coils by the electric-resistance forge-welding process. All components of a shape shall be furnished to the same grade unless otherwise specified.

4.2 For Class 1 shapes the average width of weld at the joint to the flange shall be more than 110 % of the nominal web thickness (see Fig. 1(b)). The acceptability of coil-splice welds in webs and flanges shall be subject to negotiation between the purchaser and the manufacturer.

4.3 For Class 2 shapes the average width of weld at the joint to the flange shall be more than 130 % of the nominal web thickness (see Fig. 1(b)). Coil-splice welds shall not be permitted.

4.4 Flash caused by welding will not be removed unless indicated on the purchase order.

5. Chemical Composition

5.1 An analysis of each heat of steel shall be made by the steel manufacturer. The chemical composition thus determined shall conform to the requirements of Table 1, subject to the product analysis tolerances in Specification A6/A6M for plate steels or Specification A568/A568M for sheet steels. Heat analysis reports shall be furnished by the shape manufacturer upon request.

5.2 The steel supplier, shape manufacturer, and the shape purchaser shall establish a chemical composition, which will assure the purchaser of the desired properties while providing the shape manufacturer with material that is weldable by the electric-resistance welding process.

TABLE 1 Chemical Requirements^A

General Limitations, %	
Carbon	0.26 max
Manganese	0.30 min to 1.65 max
Phosphorus	0.04 max
Sulfur	0.05 max
Silicon	0.60 max

^AThe choice and use of alloying elements (combined with carbon, manganese, phosphorus, and sulfur within the limits prescribed) to provide the specified mechanical properties, or to enhance the atmospheric corrosion resistance, or both, may vary with manufacturer and thickness of material. Elements commonly added include: boron, chromium, copper, molybdenum, nickel, silicon, vanadium, titanium, zirconium, and columbium. The heat analysis, including the alloying elements intentionally added, shall be reported to the purchaser. Permitted variations in product analysis shall be within the limits established in Table B of Specification A6/A6M.

6. Tension Test

6.1 The material as represented by the test specimen shall conform to the requirements of tensile properties prescribed in Table 2.

6.2 The shape manufacturer shall furnish, upon request, test reports of tensile properties determined in accordance with Sections 8, 9, and 10.

7. Permissible Variations in Dimensions

7.1 Unless otherwise agreed upon by the shape manufacturer and the purchaser, dimensional variations shall conform to Specification A6/A6M (13.3 and Tables 16 to Tables 24 inclusive) for shapes of similar dimensions. Thicknesses of the shape components shall be based on nominal thicknesses conforming to Specification A6/A6M (Table 1, plate) or Specification A568/A568M (Tables 4 and Tables 5, sheet). Nominal thickness shall be defined as the minimum thickness specified plus one half the allowable thickness tolerance as