
Supplement No. 1 to the Specification for Structural Steel Buildings

Allowable Stress Design and Plastic Design
(June 1, 1989)

Approved by the
AISC Committee on Specifications and
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Documents

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PREAMBLE TO

Supplement No. 1 to the *Specification for Structural Steel Buildings*, *Allowable Stress Design and Plastic Design* (June 1, 1989)

Since 1923, the American Institute of Steel Construction has published and maintained the Specification for Structural Steel Buildings based on the Allowable Stress Design (ASD) method. In 1989, the Institute published its ninth and latest edition of the ASD Specification. The Institute introduced the first edition of the *Load and Resistance Factor Design Specification* (LRFD) in 1986, based on the latest steel design and construction research and technology. Subsequently, there has been a 2nd and 3rd edition of that specification in 1993 and 1999, respectively. The 1989 ASD Specification has remained in effect as an alternative design method to LRFD.

In 2000, the Board of Directors of the American Institute of Steel Construction directed the AISC Committee on Specifications to unify ASD and LRFD into a single specification in order to provide a more efficient and cost effective design, fabrication, and construction methodology for the steel industry in the United States.

Supplement No. 1 to the *Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design* (ASD Specification), (dated June 1, 1989) is a limited supplement in anticipation of a complete integration of ASD with LRFD criteria within a single AISC Specification in the near future. For provisions that have evolved since 1989 for all aspects of the design of structural steel buildings, such as shear lag, stability bracing, flanges and webs under concentrated forces, evaluation of existing structures, and fatigue criteria see the 1999 *Load and Resistance Factor Design Specification for Structural Steel Buildings*. Note that the two design methods are not intended to be used simultaneously in the design of the same structure.

This Supplement includes the following: updated code and specification references, such as the current AISC provisions for seismic design, the RCSC Specification, ASCE 7, AWS D1.1, ASTM A913 and A992; new filler metal toughness and shape material toughness criteria for certain conditions; and expanded structural analysis requirements that are all consistent with prevailing steel design requirements. This supplement is not intended to provide a complete metric conversion. Metric standards are only included when designated as such by other organizations such as ASTM or AWS.

This Supplement also deletes all explicit loading requirements, other than by reference to the governing building code and ASCE 7, and removes the separate 1/3 stress increase allowance. The latter effect is more properly included within the current service load combination requirements of ASCE 7.

Supplement No. 1 to the Specification For Structural Steel Buildings, Allowable Stress Design and Plastic Design (June 1, 1989)

December 17, 2001

I. Chapter A

Replace Chapter A with the following:

CHAPTER A GENERAL PROVISIONS

A1. SCOPE

The *Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design* is intended as an alternate to the *Load and Resistance Factor Design Specification for Structural Steel Buildings*.

This Specification includes the list of symbols, the glossary, and the appendices. The tables of numerical values are provided for design convenience.

Seismic design of buildings shall comply with the AISC *Seismic Provisions for Structural Steel Buildings*, *Seismic Provisions Supplement No. 2*, and with this Specification.

Single angle members shall comply with the *Specification for Allowable Stress Design of Single-Angle Members* and with this Specification.

Design of nuclear structures shall comply with the *Specification for the Design, Fabrication and Erection of Steel Safety Related Structures for Nuclear Facilities* and with this Specification.

Design of structural joints shall comply with the *Specification for Structural Joints Using ASTM A325 or A490 Bolts* (Research Council on Structural Connections) and the *Structural Welding Code-Steel* (AWS D1.1) and with this Specification.

As used in this Specification, the term *structural steel* refers to the steel elements of the structural steel frame essential to the support of the design loads. Such elements are enumerated in Section 2.1 of the *AISC Code of Standard Practice for Steel Buildings and Bridges*. For the design of cold-formed steel structural members, whose profiles contain rounded corners and slender flat elements, the provisions of the American Iron and Steel Institute *Specification for the Design of Cold-Formed Steel Structural Members* are recommended.

A2. TYPES OF CONSTRUCTION

Three basic types of construction and associated design assumptions are permissible under the respective conditions stated herein, and each will govern in a specific manner the size of members and the types and strength of their connections:

Type 1, commonly designated as “rigid-frame” (continuous frame), assumes that beam-to-column connections have sufficient rigidity to hold virtually unchanged the original angles between intersecting members.

Type 2, commonly designated as “simple framing” (unrestrained, free-ended) assumes that, insofar as gravity loading is concerned, ends of beams and girders are connected for shear only and are free to rotate under gravity load.

Type 3, commonly designated as “semi-rigid framing” (partially restrained), assumes that the connections of beams and girders possess a dependable and known moment capacity intermediate in degree between the rigidity of Type 1 and the flexibility of Type 2.

The design of all connections shall be consistent with the assumptions as to type of construction called for on the design drawings.

Type 1 construction is unconditionally permitted under this Specification. Two different methods of design are recognized. Within the limitations laid down in Sect. N1, members of continuous frames or continuous portions of frames may be proportioned, on the basis of their maximum predictable strength, to resist the specified design loads multiplied by the prescribed load factors. Otherwise, Type 1 construction shall be designed, within the limitations of Chapters A through M, to resist the stresses produced by the specified design loads, assuming moment distribution in accordance with elastic theory.

Type 2 construction is permitted under this Specification, subject to the stipulations of the following paragraph, wherever applicable.

In buildings designed as Type 2 construction (i.e., with beam-to-column connections other than wind connections assumed flexible under gravity loading) the wind moments may be distributed among selected joints of the frame, provided:

1. Connections and connected members have adequate capacity to resist wind moments.
2. Girders are adequate to carry full gravity load as “simple beams.”
3. Connections have adequate inelastic rotation capacity to avoid overstress of the fasteners or welds under combined gravity and wind loading.

Type 3 (semi-rigid) construction is permitted upon evidence the connections to be used are capable of furnishing, as a minimum, a predictable proportion of full end restraint. The proportioning of main members joined by such connections shall be predicated upon no greater degree of end restraint than this minimum.

Types 2 and 3 construction may necessitate some inelastic, but self-limiting, deformation of a structural steel part.

A 3. MATERIAL

1. Structural Steel

a. ASTM Designations

Material conforming to one of the following standard specifications is approved for use under this Specification:

Carbon Structural Steel, ASTM A36/A36M
 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless Steel Pipe, ASTM A53/A53M, Gr. B
 High-Strength Low-Alloy Structural Steel, ASTM A242/A242M
 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, ASTM A500
 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing, ASTM A501
 High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding, ASTM A514/A514M
 High-Strength Carbon-Manganese Steel of Structural Quality, ASTM A529/A529M
 High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality, ASTM A572/A572M
 High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4-in. (100 mm) Thick, ASTM A588/A588M
 Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance, ASTM A606
 Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing, ASTM A618
 Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates and Bars and Quenched-and-Tempered Alloy Structural Steel Plates for Bridges, ASTM A709/A709M
 Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in. (100 mm) Thick, ASTM A852/A852M
 High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST), ASTM A913/A913M
 Steel for Structural Shapes for Use in Building Framing, ASTM A992/ A992M
 Structural Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, ASTM A1011

Certified mill test reports or certified reports of tests made by the fabricator or a testing laboratory in accordance with ASTM A6/A6M, *Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling* or A568/A568M, *Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for* as applicable, and the governing specification shall constitute suffi-

cient evidence of conformity with one of the above ASTM standards. Additionally, the fabricator shall, if requested, provide an affidavit stating the structural steel furnished meets the requirements of the grade specified.

b. Unidentified Steel

Unidentified steel, if surface conditions are acceptable according to criteria contained in ASTM A6/A6M, is permitted to be used for unimportant members or details, where the precise physical properties and weldability of the steel would not affect the strength of the structure.

c. Heavy Shapes

For ASTM A6/A6M Group 4 and 5 rolled shapes to be used as members subject to primary tensile stresses due to tension or flexure, toughness need not be specified if splices are made by bolting. If such members are spliced using complete-joint-penetration groove welds, the steel shall be specified in the contract documents to be supplied with Charpy V-Notch (CVN) impact testing in accordance with ASTM A6/A6M, Supplementary Requirement S5. The impact test shall meet a minimum average value of 20 ft-lbs. absorbed energy at +70°F and shall be conducted by the producer in accordance with ASTM A673/A673M, with the following exceptions:

- (1) The center longitudinal axis of the specimens shall be located as near as practical to midway between the inner flange surface and the center of the flange thickness at the intersection with the web mid-thickness.
- (2) For shapes produced from ingots, tests shall be conducted on material selected from a location representing the top of each ingot or part of an ingot used to produce the product represented by these tests.

For plates exceeding 2-in. thick used for built-up cross-sections with bolted splices and subject to primary tensile stresses due to tension or flexure, material toughness need not be specified. If such cross-sections are spliced using complete-joint-penetration welds, the steel shall be specified in the contract documents to be supplied with Charpy V-Notch testing in accordance with ASTM A6/A6M, Supplementary Requirement S5 for the Charpy V-Notch Impact Test for Structural Shapes: Alternate Core Location. The impact test shall be conducted by the producer in accordance with ASTM A673/A673M,