

Errata List, September 4, 2001

AISC Load and Resistance Factor Design Specification for Structural Steel Buildings, December 27, 1999

The following editorial corrections have been made in the First Revision, September 4, 2001. To facilitate the incorporation of these corrections, this booklet has been constructed using copies of the revised pages, with corrections noted. The user may find it convenient in some cases to hand-write a correction; in others, a cut-and-paste approach may be more efficient.

Load and Resistance Factor Design Specification for Structural Steel Buildings

December 27, 1999

Supersedes the *Load and Resistance Factor Design Specification
for Structural Steel Buildings* dated
December 1, 1993 and all previous versions.

Prepared by the
American Institute of Steel Construction, Inc.
Under the Direction of the
AISC Committee on Specifications and approved by
the AISC Board of Directors.



AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.
One East Wacker Drive, Suite 3100
Chicago, Illinois 60601-2001

Cold-Formed Welded and Seamless High-Strength, Low-Alloy Structural Tubing with Improved Atmospheric Corrosion Resistance, ASTM A847

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

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, shall constitute sufficient evidence of conformity with one of the above ASTM standards. If requested, the fabricator shall provide an affidavit stating that the structural steel furnished meets the requirements of the grade specified.

1b. 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.

1c. 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. (27 J) absorbed energy at +70°F (+21°C) and shall be conducted 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) Tests shall be conducted by the producer 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 two-in. (50 mm) 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. The impact test shall be conducted by the producer in accordance with ASTM A673/A673M, Frequency P, and shall meet a minimum average value of 20 ft-lbs. (27 J) absorbed energy at +70°F (+21°C).

The above supplementary requirements also apply when complete-joint-penetra-

TABLE B5.1 (cont.)
Limiting Width-Thickness Ratios for
Compression Elements

Description of Element		Width Thickness Ratio	Limiting Width-Thickness Ratios	
			λ_p (compact)	λ_r (noncompact)
Stiffened Elements	Flanges of rectangular box and hollow structural sections of uniform thickness subject to bending or compression; flange cover plates and diaphragm plates between lines of fasteners or welds for uniform compression for plastic analysis	b / t	$1.12\sqrt{E / F_y}$ $0.939\sqrt{E / F_y}$	$1.40\sqrt{E / F_y}$ -
	Unsupported width of cover plates perforated with a succession of access holes [b]	b / t	NA	$1.86\sqrt{E / F_y}$
	Webs in flexural compression [a]	h / t_w	$3.76\sqrt{E / F_y}$ [c], [g]	$5.70\sqrt{E / F_y}$ [h]
	Webs in combined flexural and axial compression	h / t_w	for $P_u / \phi_b P_y \leq 0.125$ [c],[g] $3.76\sqrt{\frac{E}{F_y} \left(1 - \frac{2.75 P_u}{\phi_b P_y} \right)}$ for $P_u / \phi_b P_y > 0.125$ [c][g] $1.12\sqrt{\frac{E}{F_y} \left(2.33 - \frac{P_u}{\phi_b P_y} \right)}$ $\geq 1.49\sqrt{\frac{E}{F_y}}$	[h] $5.70\sqrt{\frac{E}{F_y} \left(1 - 0.74 \frac{P_u}{\phi_b P_y} \right)}$
	All other uniformly compressed stiffened elements, i.e., supported along two edges	b / t h / t_w	NA	$1.49\sqrt{E / F_y}$
	Circular hollow sections In axial compression In flexure	D / t	NA [d] $0.07E / F_y$	$0.11E / F_y$ $0.31E / F_y$

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[a] For hybrid beams, use the yield strength of the flange F_{yf} instead of F_y .

[b] Assumes net area of plate at widest hole.

[c] Assumes an inelastic rotation capacity of 3 radians. For structures in zones of high seismicity, a greater rotation capacity may be required.

[d] For plastic design use $0.045E/F_y$.

[e] F_L = smaller of $(F_y - F_r)$ or F_{yw} , ksi (MPa)
 F_r = compressive residual stress in flange
= 10 ksi (69 MPa) for rolled shapes
= 16.5 ksi (114 MPa) for welded shapes

[f] $k_c = \frac{4}{\sqrt{h / t_w}}$ and $0.35 \leq k_c \leq 0.763$

[g] For members with unequal flanges, use h_p instead of h when comparing to λ_p .

[h] For members with unequal flanges, see Appendix B5.1.

Assumes an inelastic ductility ratio (ratio of strain at fracture to strain at yield) of 3. When the seismic response modification factor R is taken greater than 3, a greater rotation capacity may be required.

2. Doubly and Singly Symmetric Members in Flexure and Compression

The interaction of flexure and compression in symmetric shapes shall be limited by Equations H1-1a and H1-1b

where

P_u = required compressive strength, kips (N)

P_n = nominal compressive strength determined in accordance with Section E2, kips (N)

ϕ = ϕ_c = resistance factor for compression = 0.85 (see Section E2)

ϕ_b = resistance factor for flexure = 0.90

H2. UNSYMMETRIC MEMBERS AND MEMBERS UNDER TORSION AND COMBINED TORSION, FLEXURE, SHEAR, AND/OR AXIAL FORCE

The design strength, $\phi[F_n]$ of the member shall equal or exceed the required strength expressed in terms of the normal stress f_{un} or the shear stress f_{uv} , determined by elastic analysis for the factored loads:

(a) For the limit state of yielding under normal stress:

$$f_{un} \leq \phi[F_n] \quad (\text{H2-1})$$

$$\phi = 0.90$$

$$F_n = F_y$$

(b) For the limit state of yielding under shear stress:

$$f_{uv} \leq 0.6\phi[F_n] \quad (\text{H2-2})$$

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$$\phi = 0.90$$

$$F_n = F_y$$

(c) For the limit state of buckling:

$$f_{un} \text{ or } f_{uv} \leq \phi[F_n] \text{ as applicable} \quad (\text{H2-3})$$

$$\phi_c = 0.85$$

$$F_n = F_c$$

Some constrained local yielding is permitted adjacent to areas which remain elastic.

H3. ALTERNATIVE INTERACTION EQUATIONS FOR MEMBERS UNDER COMBINED STRESS

See Appendix H3.

TABLE J2.1 Effective Throat Thickness of Partial-Joint-Penetration Groove Welds			
Welding Process	Welding Position	Included Angle at Root of Groove	Effective Throat Thickness
Shielded metal arc Submerged arc	All	J or U joint	Depth of chamfer
Gas metal arc		Bevel or V joint $\geq 60^\circ$	
Flux-cored arc		Bevel or V joint $< 60^\circ$ but $\geq 45^\circ$	Depth of chamfer Minus $\frac{1}{8}$ -in. (3 mm)

TABLE J2.2 Effective Throat Thickness of Flare Groove Welds		
Type of Weld	Radius (<i>R</i>) of Bar or Bend	Effective Throat Thickness
Flare bevel groove	All	$\frac{5}{16}R$
Flare V-groove	All	$\frac{1}{2}R$ [a]
[a] Use $\frac{3}{8}R$ for Gas Metal Arc Welding (except short circuiting transfer process) when $R \geq 1$ in. (25 mm)		

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TABLE J2.3 Minimum Effective Throat Thickness of Partial-Joint-Penetration Groove Welds	
Material Thickness of Thicker Part Joined, in. (mm)	Minimum Effective Throat Thickness [a], in. (mm)
To $\frac{1}{4}$ (6) inclusive Over $\frac{1}{4}$ (6) to $\frac{1}{2}$ (13) Over $\frac{1}{2}$ (13) to $\frac{3}{4}$ (19) Over $\frac{3}{4}$ (19) to $1\frac{1}{2}$ (38) Over $1\frac{1}{2}$ (38) to $2\frac{1}{4}$ (57) Over $2\frac{1}{4}$ (57) to 6 (150) Over 6 (150)	$\frac{1}{8}$ (3) $\frac{3}{16}$ (5) $\frac{1}{4}$ (6) $\frac{5}{16}$ (8) $\frac{3}{8}$ (10) $\frac{1}{2}$ (13) $\frac{5}{8}$ (16)
[a] See Table J2.1	

exception, particular care shall be taken to provide sufficient preheat for soundness of the weld.

2. Fillet Welds

2a. Effective Area

The effective area of fillet welds shall be as defined in AWS D1.1 Section 2.4.3 and 2.11. The effective throat thickness of a fillet weld shall be the shortest distance from the root of the joint to the face of the diagrammatic weld, except that for fillet welds made by the submerged arc process, the effective throat thickness shall be