



AISI DESIGN TOOL

Design Flowchart for Using
the 2007 Edition of the
North American Cold-Formed
Steel Specification and the
2008 Edition of the AISI
Cold-Formed Steel Design
Manual

2009

The material contained herein has been developed by the American Iron and Steel Institute Committee on Specifications. The organization and the Committee have made a diligent effort to present accurate, reliable, and useful information on cold-formed steel design. The Committees acknowledge and are grateful for the contributions of the numerous researchers, engineers, and others who have contributed to the body of knowledge on the subject.

With anticipated improvements in understanding of the behavior of cold-formed steel and the continuing development of new technology, this material may eventually become dated. It is anticipated that future editions of this flowchart will update this material as new information becomes available, but this cannot be guaranteed.

The materials set forth herein are for general information only. They are not a substitute for competent professional advice. Application of this information to a specific project should be reviewed by a registered professional engineer. Indeed, in most jurisdictions, such review is required by law. Anyone making use of the information set forth herein does so at their own risk and assumes any and all resulting liability arising therefrom.

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Design Flowchart for Using the 2007 Edition of the North American Specification and the 2008 Edition of the AISI Cold-Formed Steel Design Manual

- Overview of *North American Specification for the Design of Cold-Formed Steel Structural Members*, 2007 Edition
- Overview of *AISI Cold-Formed Steel Design Manual*, 2008 Edition
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- Flow Chart II(a), Flexural Strength of Members with an I-, C-, or Z- Section, a Boxed Section or an Angle Bending about the Symmetric Axis
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Overview of North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition

The 2007 edition of the *North American Specification for the Design of Cold-Formed Steel structural Members* has been accepted in the US by ANSI as the American National Standard, accepted in Canada by Canadian Standard Associations, and indorsed by CANACERO in Mexico. The design provisions that are applicable to all three countries are included in Chapters A to G, and Appendices 1 and 2. The provisions applicable to individual country are included in Appendices A (for US and Mexico) and B (for Canada). Table 1 below summaries the contents included in each chapter and appendix. As compared to the 2001 edition of the *North American Cold-Formed Steel Specification*, the major changes are summaries in the Preface of the 2007 *Specification* or in the Technical Bulletin, Volume 16, Number 2, in Fall 2007, published by Wei-Wen Yu Center for Cold-Formed Steel Structures.

Table 1, Summary of the North American Cold-Formed Steel Specification, 2007 Edition

Title/ Applicable to	Content
Chapter A, General Provisions / Applicable to all three countries (except those noted by “☞”)	Provides general design considerations with the following major sections: A1, Scope, Applicability, and Definitions A2, Material A3, Loads A4, Allowable Strength Design A5, Load and Resistance Factor Design A6, Limit States Design A7, Yield Stress and Strength Increase from Cold Work of Forming A8, Serviceability A9, Referenced Documents
Chapter B, Elements / Applicable to all three countries (except those noted by “☞”)	Determines effective width of an element (segment) with consideration of the element's edge support conditions (edge stiffened or unstiffened), stress magnitude, and variation. Once the effective elements are determined, the effective section properties (A_e , S_e , I_e) can be calculated. The major sections included in this chapter are B1, Dimension Limits and Considerations B2, Effective Widths of Stiffened Elements B3, Effective Widths of Unstiffened Elements B4, Effective Widths of Uniformly Compressed Elements with a Simple Lip Edge Stiffener B5, Effective Widths of Stiffened Elements with Single or Multiple Intermediate Stiffeners or Edge Stiffened Elements with Intermediate Stiffener(s)

Continue

Chapter C, Members / Applicable to all three countries (except those noted by “☞”)	Determines the member strengths, provides corresponding safety and resistance factors, and supplies interaction checks. The major sections included in this chapter are C1, Properties of Sections C2, Tension Members C3, Flexural Members C3.1, Bending C3.2, Shear C3.3, Combined Bending and Shear C3.4, Web Crippling C3.5, Combined Bending and Web Crippling C3.6 Combined Bending and Torsional Loading C3.7, Stiffeners C4, Concentrically Loaded Compression Members C4.1, Nominal Strength for Yielding, Flexural, Flexural-Torsional and Torsional Buckling C4.2, Distortional Buckling Strength [Resistance] C5, Combined Axial Load and Bending
Chapter D, Structural Assemblies and Systems/ Applicable to all three countries (except those noted by “☞”)	Provides fastener spacing and strength requirements for built-up sections, general lateral bracing requirements, and provisions for cold-formed steel systems. The major sections included are D1, Built-Up Sections D2, Mixed Systems D3, Lateral and Stability Bracing D4, Cold-Formed Steel Light-Frame Construction D5, Floor, Roof or Wall Steel Diaphragm Construction D6, Metal Roof and Wall Systems
Chapter E, Connections and Joints / Applicable to all three countries (except those noted by “☞”)	Provides design provisions for welded, bolted, screwed connections. The chapter includes the following major sections: E1, General Provisions E2, Welded Connections E3, Bolted Connections E4, Screw Connections E5, Rupture E6, Connections to Other Materials
Chapter F, Tests and Special Cases / Applicable to all three countries	Provides means of determining structural performance through testing. The chapter provides statistic data and methodology for determining a resistance factor for different type of components. The major sections included are F1, Tests for Determining Structural Performance F2, Tests for Confirming Structural Performance F3, Tests for Determining Mechanical Properties
Chapter G, Design of Cold-Formed Steel Structural Members and Connections for Cyclic Loading (Fatigue) / Applicable to all three countries	Provides design provisions for members subjected to cyclic loading (fatigue). The major sections include G1, General G2, Calculation of Maximum Stresses and Stress Ranges G3, Design Stress Range G4, Bolts and Threaded Parts G5, Special Fabrication Requirements

Appendix 1, Design of Cold-Formed Steel Structural Members Using Direct Strength Method / Applicable to all three countries	Provides an alternative procedure for determining the strength and the stiffness of cold-formed steel members and also for members with configurations not covered by the current <i>Specification</i> Chapters A to G. The major sections include: 1.1, General Provisions 1.1.1, Applicability 1.1.2, Elastic Buckling 1.1.3, Serviceability Determination 1.2, Members 1.2.1, Column Design 1.2.2, Beam Design
Appendix 2, Second-Order Analysis/ Applicable to all three countries	Provides an alternative procedure for considering the second order effect in members subjected to compression and bending. Major sections include: 2.1, General Requirements 2.2, Design and Analysis Constraint 2.2.1, General 2.2.2, Types of Analysis 2.2.3, Reduced Axial and Flexural Stiffnesses 2.2.4, Notional Loads
Appendix A / Applicable to the US and Mexico only	Includes design provisions applicable only to the United States and Mexico.
Appendix B / Applicable to Canada only	Includes design provisions applicable only to Canada

Overview of AISI Cold-Formed Steel Design Manual, 2008 Edition

To help users better understand and fully utilize the 2007 edition of the *North American Specification*, AISI has published the *Cold-Formed Steel Design Manual*, 2008 edition. The *Cold-Formed Steel Design Manual* includes six major parts. The materials included in each part are summarized in Table II below.

Table II, Summary of AISI Cold-Formed Steel Design Manual, 2008 Edition

Title	Content
Part I- Dimensions and Properties	This part provides summary of the scope and principal tensile properties of ASTM material specifications referenced in the <i>Specification</i>, gross section properties C, Z, angle and hat sections, formulas and examples for determining the gross section properties. The major sections included are 1, Steels – Availability and Properties 2, Representative Cold Formed Steel Sections (include SSMA sections and representative cold-formed steel sections) 3, Calculation of Section Properties (17 examples are included)
Part II – Beam Design	The part provides tables and charts for cold-formed steel beam effective section properties, nominal strengths, and examples. The major sections included are: 1, Bending 1.1 Notes on the Tables 1.2 Beam Property Tables (Nominal shear strength, V_n, and bending strength of braced beams, M_{nx}, effective section modulus, S_e, and effective moment of inertia for calculating deflection, I_e) 1.3 Distortional Buckling Flexural Strength Tables (Critical unbraced length, L_{cr}; Stiffness, $k_{\phi_{fe}}$, $\tilde{k}_{\phi_{fg}}$, $k_{\phi_{we}}$, $\tilde{k}_{\phi_{wg}}$; F_d/β; and $M_n(\beta=1)$) 1.4 Calculation of L_u 1.5 Notes on Charts 1.6 Beam Charts (C- and Z- section members nominal bending strength with respect to unbraced length) 2, Combined Bending and Shear (Tables are provided for SSMA and representative sections) 3, Web Crippling (Web crippling strengths under different loading conditions and bearing lengths) 4, Example Problems - II-1, Four Span Continuous C-Purlin Attached to Through Fastened Roof-LRFD - II-2, Four Span Continuous Z-Purlin Attached to Through Fastened Roof-ASD - II-3, C-Section Without Lips Braced at Mid-Span - II-4, Distortional Buckling of C-section - II-5, C-Section Without Lips in Weak Axis Bending - II-6, Fully Braced Hat Section - II-7, Tubular Section – Round - II-8, Tubular Section – Rectangular - II-9, C-Section with Openings - II-10, C-Section with Combined Bending and Torsional Loading - II-11, Web Crippling - II-12, Web-Stiffened C-Section by the Direct Strength Method – Flexure