



International Specialty Conference on Cold-Formed Steel Structures

(2010) - 20th International Specialty Conference on Cold-Formed Steel Structures

Nov 3rd, 12:00 AM

Cold-formed Steel for Students a Website

Roger A. LaBoube

Missouri University of Science and Technology, laboube@mst.edu

C. M. Stratman

Follow this and additional works at: <https://scholarsmine.mst.edu/isccss>



Part of the [Structural Engineering Commons](#)

Recommended Citation

LaBoube, Roger A. and Stratman, C. M., "Cold-formed Steel for Students a Website" (2010). *International Specialty Conference on Cold-Formed Steel Structures*. 1.

<https://scholarsmine.mst.edu/isccss/20iccfss/20iccfss-session7/1>

This Article - Conference proceedings is brought to you for free and open access by Scholars' Mine. It has been accepted for inclusion in International Specialty Conference on Cold-Formed Steel Structures by an authorized administrator of Scholars' Mine. This work is protected by U. S. Copyright Law. Unauthorized use including reproduction for redistribution requires the permission of the copyright holder. For more information, please contact scholarsmine@mst.edu.

COLD-FORMED STEEL FOR STUDENTS: A WEBSITE

R.A. LaBoube¹ and C.M. Stratman¹

INTRODUCTION

Cold-formed steel members for decades have been used in numerous applications, for example curtain wall framing, partition wall framing, and as floor and roof deck for both steel framed and concrete framed structures. Also cold-formed members have been used as purlins in metal buildings. In recent years cold-formed steel members have also been assigned the task of providing the axial load bearing system for low- and mid-rise structures. With the increased use of cold-formed steel members and connections there is a more pressing need to have engineers educated on the design aspects of cold-formed steel.

Unfortunately, for most engineering students, at no time during their formal education are they exposed to cold-formed steel design or cold-formed steel framing applications. To better inform undergraduate college engineering students, a student website has been developed (<http://ccfssonline.org/Student/Student.html>). This development effort, the work of the Wei-Wen Yu Center for Cold-Formed Steel Structures (CCFSS), was initially motivated and encouraged by the Cold-Formed Steel Engineers Institute (CFSEI).

¹Wei-Wen Yu Center for Cold-Formed Steel Structures, Missouri University of Science and Technology, Rolla, MO

The initial objective of the website was to provide a college student resource for information pertaining to applications of and the design, fabrication and erection of cold-formed steel structures. Because cold-formed steel design is typically not taught in undergraduate education programs a primary audience for the website is the senior level students enrolled in a capstone design course.

At Missouri University of Science and Technology (formerly University of Missouri-Rolla), the website is also used as a resource in a sophomore level Architectural Engineering course titled Architectural Materials and Methods of Construction.

A student is a learner or one who studies. Therefore, an equally important secondary objective of the website is to provide a resource for the practicing engineer. This may be an engineer who is seeking an initial introduction into the use of cold-formed steel applications and design or who desires to expand his or her knowledge of cold-formed steel design.

WEBSITE CONTENT

The website provides such fundamentals of cold-formed steel design as:

- Terminology (e.g. curtain wall, load bearing wall, purlin, girt, deck and panel, etc.)
- Applications for cold-formed steel (e.g. framing, deck, racks, metal buildings, etc.)
- Student design aids
- Software resource (e.g. CFS and AISIWIN, are free downloads for the student).

The website is designed to provide an introduction for such topics as the possible applications, cross-section shapes and design criteria. Figure 1 presents the Home page for the website.

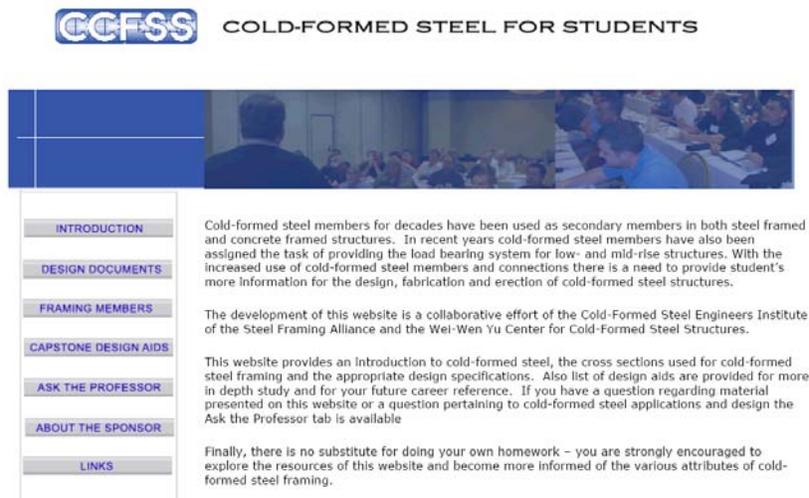


Figure 1 Website Homepage

Introduction:

The introduction page (Figure 2) is intended, through the use of PowerPoint slides, to provide information regarding the application of cold-formed steel framing members, the relevant AISI design documents to include the *North American Specification for the Design of Cold-Formed Steel Structural Members* and the AISI framing standards.

Design Documents

As illustrated by Figure 3, information is provided to introduce the student to cold-formed steel design.

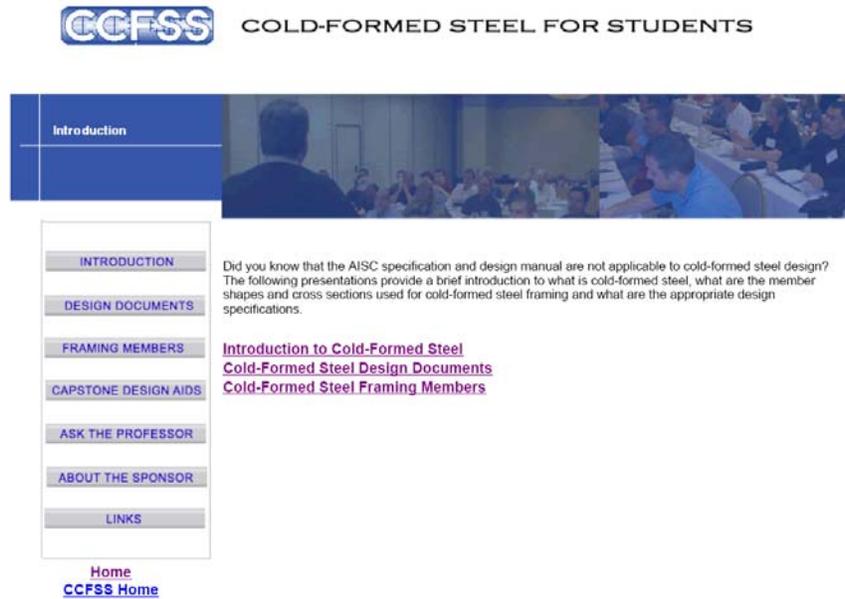


Figure 2 Introduction Web Page

AISI Design Tool. This is a document developed by Dr. Helen Chen of AISI Staff that presents (Figure 4):

- Overview of the *North American Specification for the Design of Cold-Formed Steel Structural Members*, S100-2007
- Overview of the *AISI Cold-Formed Steel Design Manual*, D100-2008
- Overall considerations for cold-formed steel design
- Flow charts for compression member strength, flexural member strength and built-up members


COLD-FORMED STEEL FOR STUDENTS

Design Documents



INTRODUCTION	<p>Starting in the mid-1990's, there began an increased interest in cold-formed steel for residential and light commercial framing in the United States. These applications include wall, floor and roof framing in a number of building types. Although the AISI Specification had gained acceptance and was in widespread use, there were a number of design issues that were not adequately addressed for this emerging market. Therefore AISI extended its standards development activity to support the growing needs of the cold-formed steel framing industry. However, rather than add to the complexity of the AISI Specification, it was decided that a new family of standards should be developed. The list of these standards, as well as other excellent design guides, are provided.</p> <p>AISI Design Tool CQFS Framing Standards Cold-Formed Steel Design Documents Other Design Guides</p> <p>Cold-Formed Steel Design for the Student The "Cold-Formed Steel Design for the Student" is intended to aid students in the design of cold-formed steel members and is therefore limited in scope. The document addresses the design for a C-shaped cross section as a flexural member and a compression member. Connection design is limited to primarily a discussion of screw connections. The scope was selected to provide coverage of the high volume application of cold-formed steel in light-framed construction. This document is intended to serve only as an educational tool. Final design must be based on the <i>North American Specification for the Design of Cold-Formed Steel Structural Members</i>.</p> <p>The document includes excerpts from the <i>North American Specification for the Design of Cold-Formed Steel Structural Members</i> and excerpts from the <i>Commentary on the North American Specification for the Design of Cold-Formed Steel Structural Members</i>. Additional explanatory language is also provided. The commentary and explanatory language is identified by a vertical black line along the right margin.</p> <p>Chapter A: Introduction Chapter B: Elements Chapter C: Flexural Members Chapter E: Connections and Joints</p>
DESIGN DOCUMENTS	
FRAMING MEMBERS	
CAPSTONE DESIGN AIDS	
ASK THE PROFESSOR	
ABOUT THE SPONSOR	
LINKS	

[Home](#)
[CCFSS Home](#)

Figure 3 Design Documents Webpage



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

Figure 4 AISI Design Tool

Cold-Formed Steel Framing Standards. Clicking this tab will provide the user with a compilation of the following AISI framing standards.

- AISI S200-07, *North American Standard for Cold-Formed Steel Framing – General Provision* (2007), American Iron and Steel Institute
- AISI S201-07, *North American Standard for Cold-Formed Steel Framing – Product Data* (2007), American Iron and Steel Institute
- AISI S210-07, *North American Standard for Cold-Formed Steel Framing – Floor and Roof System Designs* (2007), American Iron and Steel Institute

- AISI S211-07, *North American Standard for Cold-Formed Steel Framing – Wall Stud Design* (2007), American Iron and Steel Institute
- AISI S212-07, *North American Standard for Cold-Formed Steel Framing – Header Design* (2007), American Iron and Steel Institute
- AISI S213-07, *North American Standard for Cold-Formed Steel Framing – Lateral Design* (2007), American Iron and Steel Institute
- AISI S214-07, *North American Standard for Cold-Formed Steel Framing – Truss Design* (2007), American Iron and Steel Institute
- *Standard for Cold-Formed Steel Framing – Code of Standard Practice* (2005), American Iron and Steel Institute

Cold-Formed Steel Design Documents. Listed on the website is the AISI design specification, AISI S100, as well as other design related documents.

Other Design Guides. For additional design guidance the student may refer to the following listed documents:

- *Cold-Formed Steel Framing Design Guide*, D110-07, (2007), American Iron and Steel Institute
- *Bracing Cold-Formed Steel Structures: A Design Guide* (2005), ASCE
- *Cold-Formed Steel Design* (2000), W. W. Yu, Wiley-Interscience

Cold-Formed Steel Design for the Student. The document “Cold-Formed Steel Design for the Student” is an abridged version of AISI S100 intended to aid the student in the design of cold-formed steel members and connections. The document is limited in scope

and addresses the fundamental design requirements for a C-shaped cross section used as a flexural member or a compression member. Connection design is limited to primarily a discussion of screw connections. The scope of this document was selected to provide coverage of the high volume application of cold-formed steel in light-framed construction. This document is intended to serve only as an educational tool. Final design must be based on the *North American Specification for the Design of Cold-Formed Steel Structural Members*.

The document includes excerpts from the *North American Specification for the Design of Cold-Formed Steel Structural Members* and excerpts from the *Commentary on the North American Specification for the Design of Cold-Formed Steel Structural Members*. Additional explanatory language is also provided. To distinguish the specification from the commentary, the commentary and explanatory language are identified by a vertical black line along the right margin.

Framing Members

The Framing Members tab provides a copy of AISI S201-07, *North American Standard for Cold-Formed Steel Framing – Product Data*. This document defines standardized light-steel framing profiles such as stud or joist, track furring channel, u-channel and angle.

Capstone Design Aids

Typically Civil and Architectural Engineering undergraduate programs do not teach courses on cold-formed steel design. But the students enrolled in a capstone design course often encounter the challenge of developing a design using cold-formed steel members. Senior capstone design courses attempt to introduce the student to the challenge of designing a complete project to include

main structural framing as well as curtain walls. The student thus will likely encounter cold-formed steel design when developing a design for a curtain wall.

To assist students with their design project, general information or rule of thumb information is provided such as:

- Rule number one when designing cold formed steel bearing walls:

LINE UP THE WALLS.

It is critical that cold formed steel bearing walls align vertically. If you are not able to vertically align the bearing walls then you should consider other framing schemes.

- Avoid welds in the field.
- PAF and screw connections are typically preferred by cold formed steel contractors. Be aware that these connectors have low allowable load capacities.
- 0.14" diameter is the preferred powder actuated fastener (PAF) size by most cold formed steel contractors.
- Identify shear wall locations and indicate main frame lateral forces to be accommodated in the shear wall design.
- Design the foundations at the shear wall anchorage. Provide enough dead load to resist uplifting force at each end of the shear wall

Also a comprehensive list of design office references is provided along with standard construction details, and available software as illustrated by Figure 5.



Figure 5 Capstone Design Aids

Also included in the list of design office references are websites for associations that represent cold-formed steel applications:

- American Iron and Steel Institute (AISI)
- Cold-Formed Steel Engineers Institute (CFSEI)
- Metal Building Manufacturers Association (MBMA)
- Steel Deck Institute (SDI)
- Steel Stud Manufacturers Association (SSMA)
- Steel Framing Alliance (SFA)

Ask the Professor – Message Board

It is impossible for cold-formed steel organizations to provide comprehensive nationwide coverage of cold-formed steel design in seminars, short courses, conferences etc., however, the interaction

such seminars create can be partially re-created on the web through message boards and the like. Therefore the student website has a message board monitored by the CCFSS to provide interaction with the students. Thus, given the manner in which students of all ages consume information today, a web optimized resource has significant merit.

CONCLUSION

To better enlighten both undergraduate engineering college students and practicing engineers regarding the fundamentals and application of cold-formed steel, a student website has been developed. This development effort, the work of the Wei-Wen Yu Center for Cold-Formed Steel Structures (CCFSS), was motivated and encouraged by the Cold-Formed Steel Engineers Institute (CFSEI).

ACKNOWLEDGEMENTS

The authors value the guidance and encouragement provided by the AISI staff (Jay Larson) and CFSEI staff (Don Allen and Brian Berger). Thanks are also extended to Dr. Ben Schafer and his students at Johns Hopkins University for their review and comment during the development of the website. Review and comment provided by Missouri S&T students were helpful during the development and gratefully acknowledged.

