



ICC Evaluation Service, Inc.
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December 29, 2009

TO: PARTIES INTERESTED IN EVALUATION REPORTS ON COLD-FORMED STEEL FRAMING MEMBERS

SUBJECT: Proposed Revisions to the Acceptance Criteria for Cold-formed Steel Framing Members, Subject AC46-0210-R1 (WM/DM)

Hearing Information:

Wednesday, February 3, 2010
8:00 a.m.

Sheraton Gateway Hotel Los Angeles
6101 West Century Boulevard
Los Angeles, California 90045
(888) 627-7104

Dear Madam or Sir:

ICC-ES is requesting changes to AC46 as follows:

1. Update AC46 to include the 2009 *International Building Code*[®] (IBC) and the 2009 *International Residential Code*[®] (IRC). The changes involve updating the editions of codes and standards referenced in the acceptance criteria (AC). The changes between the editions of the codes and standards are editorial, for the most part. The technical changes that staff has been able to identify are minor in nature and do not have any substantive effect. As an example, the definition for “non-structural member” in the Cold-Formed Steel Framing-General Provisions (AISI-S200 [formally AISI-General]) has been revised to allow transverse loads of not greater than 10 psf from 5 psf. The difference between a “structural member” and a “non-structural member” is the type of steel that is allowed for use. “Non-structural steel” is allowed a lesser galvanized coating (G40 vs. G60) and has only required yield strengths, whereas “structural steel” has requirements for yield strength, tensile strength and elongation. Since the changes between the 2006 code requirements and the 2009 code requirements are minor, staff is requesting to use the updated requirements as the basis for recognition of cold-formed steel framing members under the 2006 *International Building Code*[®] and the 2006 *International Residential Code*[®].
2. Delete provisions for field manufacturing of cold-formed steel members found in Section 6.1.2. There are no current reports recognizing field manufacturing of cold-formed steel members nor does ICC-ES have any applications requesting field manufacturing of cold-formed steel members.

3. Delete provisions specific to the 1997 *Uniform Building Code*[™] (UBC). Industry has indicated they believe there is no need to continue with provisions in AC46 for the UBC, and supports removing it from the AC.
4. Add Section 3.2.3 to clarify requirements for engineering calculations.

You are cordially invited to submit written comments on agenda items, or to attend the Evaluation Committee hearing and present verbal comments. If you wish to contribute to the hearing, please note the following:

1. Written comments that are received by the Los Angeles business/regional office by **January 19, 2010**, will be forwarded to the committee prior to the hearing, and will be posted on the ICC-ES web site shortly after the comment deadline.
2. Written comments received up to ten days before the meeting, and staff memos responding to comments, will be posted to the web site on **January 28, 2010**.
3. ICC-ES is no longer providing printed copies at the meeting of proposed acceptance criteria, staff memos or public comments. These documents will be available on a limited number of CDs at the meeting, for uploading to computers; and ICC-ES will make arrangements with the hotel business center to have hard copies available for photocopying.
4. Written comments that miss the deadline noted in item (1), above, will only be available at the meeting if you provide 35 copies, collated, stapled, and three-hole punched, either at the meeting itself or to the Los Angeles business/regional office by **January 28, 2010**.
5. If you plan to speak for more than 15 minutes, or offer a visual presentation lasting longer, you should notify ICC-ES staff as far as possible in advance. There will be a computer, projector, and screen available at the meeting for anyone wishing to make a visual presentation, and presentations in most cases will need to be in PowerPoint format. Also, ICC-ES will need to be provided with your presentation at least a half-hour before the start of the relevant meeting session (morning or afternoon) on either a CD or a flash card.
6. If you have any special needs related to a presentation, you should contact ICC-ES staff well in advance of the meeting.
7. Any visual aids for viewing at committee meetings (charts, overhead transparencies, slides, videos, electronic presentations, etc.) will be permitted only if a copy is provided to ICC-ES, before the presentation, in a medium that can be retained with other records of the meeting.

8. Any materials submitted for committee consideration are considered nonconfidential and available for public discussion, as noted in Section 2.7 of the ICC-ES Rules of Procedure for the Evaluation Committee.
9. Prior to the meeting, you should refrain from trying to communicate directly with committee members about agenda items, either verbally or in writing. Committee members reserve the right to refuse such communications.

Your cooperation with these guidelines is much appreciated, as is your interest in the deliberations of the Evaluation Committee. If you have any questions, please contact the undersigned at (800) 423-6587, extension 5686, or David Musselwhite, P.E., Senior Staff Engineer, at extension 5681. You may also reach us by e-mail at es@icc-es.org.

Yours very truly,

A handwritten signature in black ink that reads "Woods McRoy". The signature is fluid and cursive, with a long horizontal stroke at the end.

Woods McRoy, P.E.
Senior Staff Engineer

WFM/raf

Enclosures

cc: Evaluation Committee



ICC EVALUATION SERVICE, INC., RULES OF PROCEDURE FOR THE EVALUATION COMMITTEE

1.0 PURPOSE

The purpose of the Evaluation Committee is to monitor the work of ICC-ES, in issuing evaluation reports; to evaluate and approve acceptance criteria on which evaluation reports may be based; and to sponsor related changes in the applicable codes.

2.0 MEETINGS

2.1 The Evaluation Committee shall schedule meetings that are open to the public in discharging its duties under Section 1, subject to Section 3.

2.2 All scheduled meetings shall be publicly announced.

2.3 Two-thirds ($\frac{2}{3}$) of the voting Evaluation Committee members shall constitute a quorum. A majority vote of members present is required on any action.

2.4 In the absence of the nonvoting chairman-moderator, Evaluation Committee members present shall elect an alternate chairman from the committee for that meeting. The alternate chairman shall be counted as a voting committee member for purposes of maintaining a committee quorum and to cast a tie-breaking vote of the committee.

2.5 Minutes of the meetings shall be kept.

2.6 An electronic audio record of meetings shall be made by ICC-ES; no other audio, video, electronic or stenographic recordings of the meetings will be permitted. Visual aids (including, but not limited to, charts, overhead transparencies, slides, videos, or presentation software) viewed at meetings shall be permitted only if the presenter provides ICC-ES before presentation with a copy of the visual aid in a medium which can be retained by ICC-ES with its record of the meeting and which can also be provided to interested parties requesting a copy. A copy of the ICC-ES recording of the meeting and such visual aids, if any, will be available to interested parties upon written request made to ICC-ES together with a payment as required by ICC-ES to cover costs of preparation and duplication of the copy. These materials will be available beginning five days after the conclusion of the meeting but will no longer be available after one year from the conclusion of the meeting.

2.7 Parties interested in the deliberations of the committee should refrain from communicating, whether in writing or verbally, with committee members regarding agenda items. All written communications and submissions regarding agenda items should be delivered to ICC-ES. All such written communications and submissions shall be considered nonconfidential and available for discussion in open session of an Evaluation Committee meeting, and shall be delivered at least ten days before the scheduled Evaluation Committee meeting if they are to be forwarded to the committee. Materials delivered to ICC-ES at least ten

days before the scheduled meeting will be posted on the ICC-ES web site (www.icc-es.org) prior to the meeting. After this time, parties wishing to submit materials for consideration by the Evaluation Committee must deliver a sufficient number of copies as directed by ICC-ES. Consideration of materials not received by ICC-ES at least ten days before the meeting is at the discretion of the Evaluation Committee. Following the meeting, ICC-ES will make all materials considered by the Evaluation Committee available on the web site for a maximum period of one year following the meeting. The committee reserves the right to refuse recognition of communications which do not comply with the provisions of this section.

3.0 CLOSED SESSIONS

Evaluation Committee meetings shall be open except that the chairman may call for a closed session to seek advice of counsel.

4.0 ACCEPTANCE CRITERIA

4.1 Acceptance criteria are established by the committee to provide a basis for issuing ICC-ES evaluation reports on products and systems under codes referenced in Section 2.0 of the Rules of Procedure for Evaluation Reports. They also clarify conditions of acceptance for products and systems specifically regulated by the codes.

Acceptance criteria may involve a product, material, method of construction, or service. Consideration of any acceptance criteria must be in conjunction with a current and valid application for an ICC-ES evaluation report, an existing ICC-ES evaluation report, or as otherwise determined by the Evaluation Committee.

4.2 Procedure:

4.2.1 Proposed acceptance criteria shall be developed by the ICC-ES staff and discussed in open session with the Evaluation Committee during a scheduled meeting, except as permitted in Section 5.0 of these rules.

4.2.2 Proposed acceptance criteria shall be available to interested parties at least 30 days before discussion at the committee meeting.

4.2.3 The committee shall be informed of all pertinent written communications received by ICC-ES.

4.2.4 Attendees at Evaluation Committee meetings shall have the opportunity to speak on acceptance criteria listed on the meeting agenda, to provide information to committee members.

4.3 Approval of acceptance criteria shall be as specified in Section 2.3 of these rules.

4.4 Actions of the Evaluation Committee may be

ICC EVALUATION SERVICE, INC., RULES OF PROCEDURE FOR THE EVALUATION COMMITTEE

appealed in accordance with the ICC-ES Rules of Procedure for Appeal of Acceptance Criteria or the ICC-ES Rules of Procedure for Appeals of Evaluation Committee Technical Decisions.

5.0 COMMITTEE BALLOTING FOR ACCEPTANCE CRITERIA

5.1 Acceptance criteria may be issued without a public hearing following a 30-day public comment period and a majority vote for approval by the Evaluation Committee when, in the opinion of ICC-ES staff, one or more of the following conditions have been met:

1. The subject is nonstructural, does not involve life safety, and is addressed in nationally recognized standards or generally accepted industry standards.
2. The subject is a revision to an existing acceptance criteria that requires a formal action by the Evaluation Committee, and public comments raised were resolved by staff with commenters fully informed.
3. Other acceptance criteria and/or the code provide precedence for the revised criteria.

5.2 Negative votes must be based upon one or more of the following, for the ballots to be considered valid and require resolution:

- a. *Lack of clarity:* There is insufficient explanation of the scope of the acceptance criteria or insufficient description of the intended use of the product or system; or the acceptance criteria is so unclear as to be unacceptable. (The areas where greater clarity is required must be specifically identified.)
- b. *Insufficiency:* The criteria is insufficient for proper evaluation of the product or system. (The provisions of the criteria that are in question must be specifically identified.)
- c. *The subject of the acceptance criteria is not within the scope of the applicable codes:* A report issued by ICC-ES is intended to provide a basis for approval under the codes. If the subject of the acceptance criteria is not regulated by the codes, there is no basis for issuing a report, or a criteria. (Specifics must be provided concerning the inapplicability of the code.)

d. *The subject of the acceptance criteria needs to be discussed in a public hearings.* The committee member requests additional input from other committee members, staff or industry.

5.3 An Evaluation Committee member, in voting on an acceptance criteria, may only cast the following ballots:

- Approved
- Approved with Comments
- Negative: Do Not Proceed

6.0 COMMITTEE COMMUNICATION

Direct communication between committee members, and between committee members and an applicant or concerned party, with regard to the processing of a particular acceptance criteria or evaluation report shall take place only in a public hearing of the Evaluation Committee. Accordingly:

6.1 Committee members receiving an electronic ballot should respond only to the sender (staff). Committee members who wish to discuss a particular matter with other committee members, before reaching a decision, should ballot accordingly and bring the matter to the attention of ICC-ES staff, so the issue can be placed on the agenda of a future committee meeting.

6.2 Committee members who are contacted by an applicant or concerned party on a particular matter that will be brought to the committee will refrain from private communication and will encourage the applicant or concerned party to forward their concerns through the ICC-ES staff in writing, and/or make their concerns known by addressing the committee at a public hearing, so that their concerns can receive the attention of all committee members. ■

Effective March 18, 2008

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR COLD-FORMED STEEL FRAMING MEMBERS

AC46

Proposed December 2009

Previously approved February 2007, June 2006, October 2004, January 2001
March 2000, April 1998, January 1994

PREFACE

Evaluation reports issued by ICC Evaluation Service, Inc. (ICC-ES), are based upon performance features of the International family of codes and other widely adopted code families, including the Uniform Codes, the BOCA National Codes, and the SBCCI Standard Codes. Section 104.11 of the *International Building Code*® reads as follows:

The provisions of this code are not intended to prevent the installation of any materials or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Similar provisions are contained in the Uniform Codes, the National Codes, and the Standard Codes.

ICC-ES may consider alternate criteria, provided the report applicant submits valid data demonstrating that the alternate criteria are at least equivalent to the criteria proposed in this document, and otherwise meet the applicable performance requirements of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria proposed in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise meet the applicable performance requirements of the codes, ICC-ES retains the right to refuse to issue or renew an evaluation report, if the product, material, or type or method of construction is such that either unusual care with its installation or use must be exercised for satisfactory performance, or malfunctioning is apt to cause unreasonable property damage or personal injury or sickness relative to the benefits to be achieved by the use of the product, material, or type or method of construction.

Acceptance criteria are developed for use solely by ICC-ES for purposes of issuing ICC-ES evaluation reports.

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR COLD-FORMED STEEL FRAMING MEMBERS

1.0 INTRODUCTION

1.1 Purpose: The purpose of this criteria is to establish requirements for cold-formed steel framing members to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the 2006 and 2009 *International Building Code*[®] (IBC), and the 2006 and 2009 *International Residential Code*[®] (IRC) and the 1997 *Uniform Building Code*[™] (UBC). Basis of recognition under the IBC is the United States of America provisions of AISI-NAS S100 and AISI General S200 as referenced in IBC Sections 1604.3.3 and 2210. Bases of recognition under the IRC are IRC Sections R301.1.3, R505, R603, and R804. Basis of recognition under the UBC is UBC Chapter 22, Division VI or VII, or AISI 1996 Specifications.

1.2 Scope: This acceptance criteria applies to cold-formed steel framing members used in light-frame construction

1.3 Codes and Referenced Standards:

1.3.1 2009 *International Building Code*[®] (IBC), International Code Council.

1.3.2 2009 *International Residential Code*[®] (IRC), International Code Council.

1.3.3 2006 *International Building Code*[®] (IBC), International Code Council.

1.3.4 2006 *International Residential Code*[®] (IRC), International Code Council.

~~1.3.5 1997 *Uniform Building Code*[™] (UBC).~~

~~1.3.5 AISI-NAS 04 S100-07, North American Specification for Design of Cold-formed Steel Structural Members, 2004 2007 edition, with 2004 supplement, published by the American Iron and Steel Institute (AISI). The United States provisions of AISI-NAS S100 are applicable under this criteria.~~

~~1.3.6 AISI General 04 S200-07, AISI North American Standard for Cold-Formed Steel Framing—General Provisions, American Iron and Steel Institute (AISI).~~

~~1.3.8 AISI WSD 04 S211-07, AISI North American Standard for Cold Formed Steel Framing Wall Stud Design, American Iron and Steel Institute (AISI).~~

~~1.3.9 AISI Header 04, AISI Standard for Cold-Formed Steel Framing Header Design, American Iron and Steel Institute (AISI).~~

~~1.3.10 AISI Lateral 04, AISI Standard for Cold-Formed Steel Framing Lateral Design, American Iron and Steel Institute (AISI).~~

~~1.3.11 AISI Truss 04, AISI Standard for Cold Formed Steel Framing Truss Design, American Iron and Steel Institute (AISI).~~

~~1.3.12 Specification for the Design of Cold Formed Steel Structural Members, 1996 edition, American Iron and Steel Institute (AISI) (referred to as 1996 Specifications).~~

~~1.3.7 ASTM A 370-97a 09ae1, Test Methods and Definitions for Mechanical Testing of Steel Products, ASTM International.~~

~~1.3.8 ASTM A 924-99 07, Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process, ASTM International.~~

~~1.3.9 TS 9-05, Standard Test Method for Determining the Web Crippling Strength of Cold-Formed Steel Beams, American Iron and Steel Institute (AISI).~~

1.4 Definitions: Definitions are located in the referenced codes and standards.

2.0 GENERAL

The following information shall be submitted:

2.1 Data concerning material specifications; section properties; maximum allowable heights; maximum allowable spans and/or maximum allowable loads; and lateral, mechanical or material bracing requirements.

2.2 Method of field identification.

2.3 Quality control program.

2.4 Data in support of an application for recognition only under the IRC shall verify compliance with Sections R505, R603 and R804 of the IRC and the requirements noted in this criteria except for Section 4.0.

2.5 Testing Laboratories: Testing laboratories shall comply with Section 2.0 of the ICC-ES Acceptance Criteria for Test Reports (AC85) and Section 4.2 of the ICC-ES Rules of Procedures for Evaluation Reports.

2.6 Test Reports: Test reports shall comply with AC85. Details describing the test configuration, test methods and test procedures, including load application rate, shall be identified in the test report.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 Material Specifications:

3.1.1 Steel: Steel specifications shall comply either with Section A2 of the AISI-NAS S100 and Section A3 of the AISI General S200, for the IBC and IRC; or with Section A.3 of the AISI 1986 ASD Specifications or AISI 1994 LRFD Specifications, as referenced in UBC Chapter 22, Division VII or VI, respectively; with Section A.3 of the 1996 Specifications, for the UBC. Nonstructural grades of steel shall be limited to interior nonload-bearing walls with lateral loads of ≤ 10 psf (240 480 Pa) or less.

3.1.2 Thickness: Minimum steel thicknesses shall comply with or with Section A2.4 of AISI-NAS S100, and Section A5.1 of AISI General S200; or with Section A3.4 of either the 1986 ASD Specifications; 1994 LRFD Specifications; 1996 Specifications. Other thicknesses may be considered, provided substantiating data showing compliance with the applicable code and this criteria are submitted.

3.1.3 Protective Coating: For use with the IBC and IRC, a minimum of G60 (or equivalent) is required for all applications with the exception of minimum G40 (or

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR COLD-FORMED STEEL FRAMING MEMBERS

equivalent) for interior nonload-bearing walls with lateral loads of ≤ 10 psf (480 Pa) or less.

3.2 Cold-formed Steel Framing Members: Evaluation reports on cold-formed steel framing members shall address the section properties and design approach as applicable:

3.2.1 Section Properties: Section properties shall be determined in accordance with AISI-NAS S100 for recognition under the IBC; ~~and 1986 ASD Specifications, 1991 LRFD Specifications or 1996 Specifications for recognition under the UBC.~~ Structural properties data for steel members shall include the minimum information noted in Appendix ~~B~~ A of this criteria. Information on additional properties is optional and can be furnished.

3.2.2 Structural Performance: Capacity of members shall be determined in accordance with Chapters C and D of AISI-NAS S100 ~~for recognition under the IBC; and Chapters C and D of the 1986 ASD Specifications, 1991 LRFD Specifications, or 1996 Specifications for recognition under the UBC.~~ For members that exceed limitations specified in the ~~applicable specifications AISI S100~~ or do not conform to the requirements of applicable specifications AISI S100, full-scale tests are necessary to determine applicable strength and stiffness. See Section 4.2 (4.3 for web crippling) of this criteria.

3.2.3 Calculations: When section properties and/or design parameters are determined by calculations, calculations shall be submitted for each and every value to be recognized in the evaluation report. Calculations shall be signed and sealed by the engineer responsible for the calculations. When calculations are generated using a computer program, the computer program and version or edition shall be identified. The computer calculations shall include the input and output for every member and every value to be recognized in the evaluation report. When calculations are computer-generated, a set of hand-generated confirmatory calculations shall be submitted. The hand generated calculations shall be for one of each type of member to be recognized in the report.

4.0 DESIGN AND TESTING METHODS

4.1 Design Methods: This section is for cold-formed steel members that can be designed in accordance with Chapters C and D of AISI-NAS S100 ~~for recognition under the IBC; and Chapters C and D of the 1986 ASD Specifications, 1991 LRFD Specifications, or 1996 Specifications for recognition under the UBC.~~

Data concerning section properties, maximum allowable heights, spans and/or loads shall be submitted showing compliance with AISI-NAS S100 ~~for recognition under the IBC; and UBC Chapter 22, Division VI or VII, or 1996 Specification, for recognition under the UBC.~~ The analytical approach noted in Appendix A of this criteria can be used as a supplement to ~~UBC Chapter 22, Division VI or VII, or 1996 Specification when appropriate.~~

4.2 Testing Methods: For members whose strength and stiffness cannot be calculated in accordance with Chapters C and D of AISI-NAS S100 ~~used under the IBC and Chapters C and D of the 1986 ASD Specifications, 1991 LRFD Specifications or 1996 Specifications used under the UBC,~~ testing shall be conducted in accordance

~~with Section F1 of the AISI-NAS S100 used under the IBC and of the 1986 ASD Specifications, 1991 LRFD Specifications or 1996 Specifications used under the UBC,~~ except for web crippling. Web crippling shall be tested in accordance with Section 4.3 below. Alternatively, under the IBC and IRC, design strength [allowable design strength] and stiffness may be determined by rational analysis based on appropriate theory and engineering judgment when supported by applicable test data. Specifically, design strength [allowable design strength] shall be determined from calculated nominal strength [resistance] by applying the resistance factors [factors of safety] of Section ~~A1.1(b)~~ A1.2(b) of the AISI-NAS S100. Test data shall demonstrate that strength and stiffness are not less than the nominal strength and stiffness predicted by the analysis.

Testing programs under Section 4.2 of this criteria shall be submitted to the ES staff for review and acceptance prior to any testing being performed. The number of test specimens and test procedures and rate of loading shall be included in the test program submittal.

4.3 Web Crippling Tests:

4.3.1 Testing shall be conducted in accordance with AISI TS-9 on three similar specimens. Two series are required for each assembly: one series for interior reactions and a second series for end reactions. The load rate used under AISI TS-9 shall be reported. Both end reactions and interior reactions shall be evaluated in accordance with the conditions set forth in the applicable specification. The tested bearing width will be the minimum width recognized in the evaluation report. For member profiles available in multiple thicknesses, only the least minimum thickness in each profile is required to be tested.

4.3.2 Conditions of Acceptance: The members shall be loaded to failure or dysfunctional distortions and the loads causing web crippling shall be recorded. The determination of nominal resistance, R_n , shall be based on Sections F1 of AISI-NAS S100 ~~used under the IBC and Sections F1 of the 1986 ASD Specifications, 1991 LRFD Specifications or 1996 Specifications used under the UBC.~~ For ASD, the allowable design strength, R_a , is as follows:

$$R_a = R_n / \Omega.$$

where:

$$\Omega = \frac{1.6}{\phi}$$

For LRFD, equation F1.1-1 of AISI-NAS S100 ~~applies under the IBC, and equation F1.1 in the 1991 LRFD Specifications or equation F1.1-1 in the 1996 Specifications applies under the UBC.~~

The results shall be compared to the design equations in Section C3.4 of AISI-NAS S100 ~~for use under the IBC, and Section C3.4 of the 1986 ASD Specifications, 1991 LRFD Specifications or 1996 Specifications for use under the UBC.~~ The lowest result, from either testing or calculations, will determine the allowable value noted in the evaluation report. Where design capacities are derived from testing, the value will apply to ~~heavier~~ greater thicknesses. If the calculated web crippling value is the

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lowest value, web crippling capacities for heavier ~~greater~~ thicknesses are permitted to be calculated in accordance with the applicable specification.

5.0 FIELD IDENTIFICATION

Each cold-formed steel framing member shall have a legible label, stamp or embossment, at a maximum of 48 inches (1219 mm) on center, indicating the manufacturer's name, logo or initials; the evaluation report number (ESR-XXXX); the acronym "ICC-ES"; material minimum base-metal thickness (uncoated) in decimal thickness or mils; minimum specified yield strength [if greater than 33 ksi (228 MPa)]; coating grade [if G60 or greater]; and ~~inspection agency name or logo and manufacturing equipment serial number (if cold-formed steel framing members are field manufactured in accordance with Section 6.1.2).~~ In addition, for recognition under the UBC, each lift or bundle of cold formed steel framing members shall be identified in accordance with Section 2203.3 of the UBC.

6.0 QUALITY CONTROL

6.1 Manufacturing:

6.1.1 Manufacturing Facility: The manufacturer of the cold-formed steel members shall maintain an in-house quality control program complying with the following:

6.1.1.1 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted.

6.1.1.2 The documentation shall specify the type of steel utilized and the level of quality assurance as outlined in Sections 6.2, 6.3, 6.4, 6.5, 6.6 and 6.7 to verify that each type of steel complies with that specified in the evaluation report.

6.1.1.3 Third-party inspections are not required for factory-fabricated cold-formed steel members.

~~**6.1.2 Field Manufacturing:** The manufacturers of field-manufactured cold-formed steel framing members shall maintain a quality control program. Each field manufacturer shall be listed in a current ICC-ES evaluation report. Each incoming steel coil shall have mill certification. The type of material utilized and the level of quality assurance shall be documented in a field quality documentation that shall include sufficient detail to verify that each type of steel complies with that specified in the evaluation report and with the requirements in Sections 6.2 through 6.7 of this acceptance criteria, excluding Subsection 6.2.2. In addition, the quality documentation shall address the following:~~

- ~~• A monitoring program for each piece of field-manufacturing equipment, to be provided by an inspection agency accredited by the International Accreditation Service (IAS), or as otherwise acceptable to ICC-ES, with inspections to occur at a minimum frequency of once every quarter.~~

- ~~• Environmental conditions, such as temperature range and moisture limitations, for the operation of the field-manufacturing equipment.~~

- ~~• Labeling of the cold formed steel framing members with the serial number of the field-manufacturing~~

~~equipment and with information in accordance with Section 5.0 of this acceptance criteria.~~

6.2 Tests shall verify the following: Steel thickness (uncoated), yield strength, tensile strength, total elongation, chemical composition and galvanized coating thickness. Where required by ~~Section A3.3 of the 1986 ASD Specifications, 1991 LRFD Specifications, or 1996 Specifications,~~ or Section A2.3 of AISI-NAS S100, verification of ductility shall be included.

6.2.1 For steel specified as complying with one of the steel specifications noted in ~~Section A3.1 of the 1986 ASD Specifications, 1991 LRFD Specifications, or 1996 Specifications,~~ or Section A2.1 of AISI-NAS S100, test data for each incoming steel coil from steel mills or steel service centers shall be in the form of mill certificates, independent laboratory tests or in-house testing with calibrated test equipment.

6.2.2 For steel permitted under ~~Sections A3.2 and A3.3 of the 1986 ASD Specifications, 1991 LRFD Specifications, or 1996 Specifications,~~ or Sections A2.2 and A2.3 of AISI-NAS S100, test data for each incoming steel coil shall be from independent laboratory tests or in-house testing with calibrated test equipment. Calibration certificates shall indicate traceability to national standards of measurement. The manufacturer shall have an established program for the calibration and verification of its measuring and test equipment.

6.3 Records of all mill certificates, independent laboratory tests and in-house tests shall be retained by the manufacturer for a minimum of one year.

6.4 Periodic Measurements:

6.4.1 Periodic measurements of material base metal thickness (uncoated) are not required for steel coils that have mill certificates. Method of verification of the base metal thickness of the master coils that have mill certificates shall be detailed in the quality documentation.

6.4.2 Material without mill certification requires periodic measurement of material base metal thickness (uncoated). Measurements of material shall be performed with calibrated equipment, either in-house or by an independent laboratory.

6.4.2.1 Test specimens for periodic testing shall consist of one out of every 250 pieces for nonbearing studs and tracks and one out of every 100 pieces for bearing studs and joists.

6.4.2.2 Alternative specimen testing for the material thickness can be accomplished by measuring each final coil at a minimum of one measurement per 2,000 linear feet (610 m) for nonbearing studs and tracks and one measurement per 800 linear feet (245 m) for bearing studs and joists.

6.4.2.3 Another alternative is to measure each final coil at three locations: the beginning, the end, and at midpoint. Final coil is defined as the steel coil that has been slit into its final width prior to roll forming into a product without additional slitting.

6.4.3 Measurement may be of the total material thickness, including coating, provided complete details

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covering the methods of determining uncoated steel thickness are included in the quality documentation.

6.4.4 Description of test method shall be documented in the quality documentation. Measurements shall be of the uncoated base metal.

6.5 Additional quality control testing may be necessary as determined by ICC-ES when method No. 1, full section tensile tests, or No. 2, stub column tests, as defined in ~~Section A5.2.2 (a) of the 1986 ASD Specifications and 1991 LRFD Specifications, and Section A7.2 (a) of the 1996 Specifications and AISI-NAS S100~~ is used for strength increase from cold work of forming.

6.6 Quality control tests shall be conducted in accordance with the following:

6.6.1 Yield strength—ASTM A 370.

6.6.2 Tensile strength—ASTM A 370.

6.6.3 Ductility—~~Section A3.3 of the 1986 ASD Specifications, 1991 LRFD Specifications and 1996 Specifications and Section A2.3 of AISI-NAS S100.~~

6.6.4 Elongation—~~Section A3.3 of the 1986 ASD Specifications, 1991 LRFD Specifications and 1996 Specifications and Section A2.3 of AISI-NAS S100.~~

6.6.5 Coating—Zinc coating hot-dip process—ASTM A 924, Section 7.1.4. Other coatings are acceptable provided coatings comply with national standards.

6.7 Minimum conditions of acceptance for each test shall be specified in the in-house quality documentation for each specified steel. In addition to the tests listed in Section 6.1, the documentation shall include the following:

6.7.1 Minimum yield strength used in design, or minimum yield stress prior to yield strength increase due to cold work of forming, if applicable.

6.7.2 Minimum base steel thickness (uncoated) allowed for each thickness recognized in an evaluation report. Minimum bare steel thickness shall not be less than 95 percent of the design thickness.

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR COLD-FORMED STEEL FRAMING MEMBERS

APPENDIX A

PERFORATED MEMBERS ANALYTICAL APPROACH TO UBC CHAPTER 22, DIVISION VI AND VII, AND AISI 1996 SPECIFICATIONS

- 1. Allowable axial load of perforated wall studs:
- 2. The effective area A_e at stress F_u can be determined by a rational analysis assuming the web to consist of two unstiffened strips, one each side of the perforation. For axial loading, the strips are treated as uniformly compressed unstiffened elements using Section (B3.1) of the 1986 ASD Specifications, 1991 LRFD Specifications or 1996 Specifications. The approach has the following limitations:
 - a. Web perforations shall have center to center spacing of not less than 24 inches (610 mm).
 - b. Web perforation maximum width shall be the lesser of 0.5 times the stud depth, d , $2^{1/2}$ inches (63.5 mm).
 - c. Web perforation length shall not exceed $4^{1/2}$ inches (114 mm).
 - d. Minimum distance between the end of the stud and the near edge of the web perforation shall be 10 inches (254 mm).
 - e. The section depth to thickness ratio, d/t , shall not be less than 20.

- 3. Flexural load carrying capacity of perforated stud members:

- a. Bending—Major Axis:

$$M_a = 0.6 S_e \times F_y$$

This assumes lateral torsional buckling is precluded.

S_e = Effective section modulus based on an unpunched web as defined in Section [C3.1.1(a)] of the 1986 ASD Specifications, 1991 LRFD Specifications and 1996 Specifications.

F_y = Design yield stress as determined in Section (A5.2.1) of the 1986 ASD Specifications and 1991 LRFD Specifications.

Minor Axis—Procedure is similar to determination of A_e for members subjected to axial compression.

- b. Shear—Allowable shear can be estimated by applying the reduction factor, q_s , to the design values of Section (C3.2) of the 1986 ASD Specifications, 1991 LRFD Specifications or 1996 Specifications. An unpunched web should be assumed for the equations in Section (C3.2) of the 1986 ASD Specifications, 1991 LRFD Specifications and 1996 Specifications.

$$q_s = 1.0 - 1.1 (a'/D)$$

a' = Depth of the opening (perforation).

D = Overall depth of the web.

- c. Web Crippling—The following items must be considered:

- (1) If the edge of the web opening is at least equal to $1.5D$ from the edge of the bearing, no reduction in the web crippling allowable strength is required. Analysis should be based on Section (C3.4) of the 1986 ASD Specifications, 1991 LRFD Specifications or 1996 Specifications.
- (2) If the edge of the web opening is less than $1.5D$ from the edge of the bearing, the allowable code web crippling shall be reduced by using the following factor:

$$R = [1.0 - 0.197 (a'/D)^2] \times [1.0 - 0.127 (b/n_1)^2]$$

The equation is applicable for members having b/n_1 less than 2.0.

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR COLD-FORMED STEEL FRAMING MEMBERS

APPENDIX A (Continued)

where:

$$n_1 = \frac{N}{D - 2t - a'}$$

b = Length of web opening.

N = Actual length of bearing.

t = Base steel thickness.

Other variables are defined in Item 2b.

(3) If the web opening is located within the bearing length, web stiffeners must be used.

- d. ~~Combined Bending and Shear—Design Equation (C3.3.1) of Section (C3.3) of the 1986 ASD Specifications and 1991 LRFDSpecifications, and Equation (C3.3.1.1) or (C3.3.2.1) of Section C3.3 of the 1996 Specifications is applicable with modifications to the allowable shear and moment described above.~~
- e. ~~Combined Bending and Web Crippling—Design Equations in Section (C3.5) of the 1986 ASD Specifications, 1991 LRFDSpecifications and 1996 Specifications are applicable with modifications to allowable concentrated load and moment as described above.~~
- f. ~~The flexural load carrying capacity of perforated stud members is subject to the web perforation limitations noted in Sections 1a, b, c, d and e of Appendix A of this criteria.~~

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR COLD-FORMED STEEL FRAMING MEMBERS

APPENDIX B A

Structural Properties

MEMBER SIZE (inches) OR DESIGNATION	DESIGN THICKNESS (inches)	WEIGHT (lbs./ft.)	GROSS SECTION PROPERTIES					EFFECTIVE SECTION PROPERTIES*			ALLOWABLE MOMENT M_a (in.-lbs.)*	TORSIONAL SECTION PROPERTIES**				
			Area (in ²)	I_x (In ⁴)	r_x (in)	I_y (In ⁴)	r_y (in)	I_x (In ⁴)	S_x (In ³)	A (in ²)		X_o (in)	J (In ⁴)	C_w (In ⁶)	R_o (in)	β

For SI: 1 inch = 25.4 mm, 1 lb./ft. = 1.488 kg/m, 1 in. - lb. = 11.30 N · m.

Notes:

The extreme fiber stress of the flexural members used in design shall be noted in the structural properties tables. This stress shall be the yield stress of the base metal.

In addition, if applicable, the following statement shall be noted in the table: "Effective properties and allowable moment incorporate stress increase as a result of cold work of forming, where applicable."

Definitions:

*Effective section properties are the properties determined from the total effective width of each element of the member and used in the design of the member in accordance with AISI-NAS S100 for recognition under the IBC and UBC Chapter 22, Divisions VI or VII, of the UBC, or AISI 1996 specifications for recognition under the UBC.

1. ~~Effective I_x is based on Procedure I of Section C3.1.1 of the 1986 ASD Specifications, 1991 LRFD Specifications and 1996 Specifications for recognition under the UBC for deflection determination at the allowable moment.~~

2. Effective area is the area based on using $f = F_y$ in equation B2.1-4. (Optional.)

**Torsional section properties are optional for nonaxial load-bearing members.