



December 28, 2007

TO: PARTIES INTERESTED IN EVALUATION REPORTS ON TAPPING SCREW FASTENERS

SUBJECT: Proposed Revisions to the Acceptance Criteria for Tapping Screw Fasteners, Subject AC118-0208-R1 (KS/BG/PB)

Hearing Information:

Tuesday, February 5, 2008
8:00 a.m.

The Westin Los Angeles Airport
5400 West Century Boulevard
Los Angeles, California 90045
(310) 216-5858

Dear Madam or Sir:

Extensive revisions to the criteria were approved by the Evaluation Committee at the October 2007 hearing. One of the items that received extensive discussion involved the requirements for corrosion resistance noted in Sections 3.1.1.2, 3.1.2, 3.1.3.1, 3.1.3.2 and 3.1.4 of the criteria. An evaluation report applicant, in a letter dated December 1, 2007 (enclosed), has requested that the corrosion-resistance item again be placed on the committee hearing agenda. The applicant has also raised questions regarding testing at a manufacturing facility and core hardness requirements for the fasteners noted in Section 2.1.1.3 of the criteria.

The following are staff comments relating to the three items noted in the December 2007 letter.

1. Staff believes there is a possibility of a compromise regarding corrosion-resistance requirements under the 1997 *Uniform Building Code*TM (UBC) and the 2006 *International Building Code*[®] (IBC) as noted in the Hilti letter. It is our understanding that the requirements under the 2006 *International Residential Code*[®] (IRC) will remain unchanged. Section A4 of AISI General states that “. . . fasteners shall have a rust-inhibitive coating suitable for the installation in which they are being use, or manufactured from material not susceptible to carrion.” The AISI-General commentary implies the selection of a material for corrosion protection is the design professional’s responsibility, therefore, staff questions whether any claims on corrosion-resistance should be made. After receiving input

from interested parties and the committee, a revision to the criteria could be proposed at the hearing.

2. Third-party quality control inspections are not required by the criteria. Therefore, quality control testing in accordance with Section 5.3 of the criteria can be done at the manufacturing facility. This should clarify this concern and revised wording, to be included in Section 5.0, will be proposed at the hearing.
3. Staff requests input from interested parties and the committee before supporting a change to Section 2.1.1.3 of the criteria.

You are cordially invited to submit written comments, or to attend the Evaluation Committee hearing and present verbal comments. Written comments will be forwarded to the committee, **prior to the hearing**, if received by **January 23, 2008**. If the deadline is missed, you must provide 35 copies of the submittal material, collated, stapled and three-hole punched, to the Los Angeles business/regional office before the committee meeting. Your consideration in providing written responses by the deadline would be greatly appreciated. Consideration of written comments and presentations of a significant nature received the week of the hearing or at the hearing may be delayed until a future meeting as the committee and staff may not have adequate time for review.

Comments from interested parties that are submitted in response to proposed acceptance criteria will be posted on the ICC-ES web site prior to the meeting. Postings will occur shortly after the comment deadline (January 23, 2008). Staff memos responding to some of the comments, and comments received after the January 23 deadline, will be posted on February 1, 2008.

The purpose for posting the comments prior to the meeting is to help interested parties be better prepared to discuss the issues at the meeting.

Any written material submitted for committee consideration will be available for public distribution as set forth in Section 2.7 of the Rules of Procedure for the Evaluation Committee (copy enclosed).

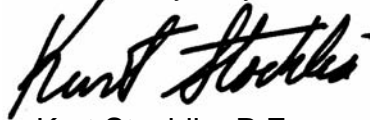
Visual aids (including, but not limited to, charts, overhead transparencies, slides, videos, or presentation software) for viewing at meetings will be permitted only if the presenter provides to ICC-ES, before the presentation, a copy of the visual aid(s) in a medium that can be retained by ICC-ES with its record of the meeting, and that can also be provided to interested parties.

Your cooperation is requested in forwarding to the Los Angeles business/regional office all material directed to the Evaluation Committee. Parties interested in the deliberations of the committee should refrain from communicating, whether in writing or verbally, with committee members regarding agenda items. The committee reserves the right to refuse communications that do not comply with this request.

Newly approved acceptance criteria may involve test methods or test protocols that are not currently included in the scope of testing services offered by accredited testing laboratories. As noted in the ICC-ES Rules of Procedure for Evaluation Reports, the scope of the laboratory's accreditation must include the type of testing that is to be reported to ICC-ES. We encourage accredited laboratories to expand their scopes of accreditation to include testing under newly approved acceptance criteria. Please note that testing laboratories must be accredited by the International Accreditation Service (IAS) or by another accreditation body that is a signatory to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement. For further information, please contact IAS at (562) 699-0541, extension 3309, or send an e-mail to pmccullen@iasonline.org.

If you have any questions, please contact the undersigned at (800) 423-6587, extension 3733, or Brian Gerber, S.E., principal structural engineer, at extension 3260. You may also reach us by e-mail at es@icc-es.org.

Yours very truly,

A handwritten signature in black ink, appearing to read "Kurt Stochlia". The signature is written in a cursive, flowing style.

Kurt Stochlia, P.E.
Vice President

KS/BG/II

Enclosures

cc: Evaluation Committee

Kurt Stochlia
Vice-President
ICC Evaluation Service, Inc.
Los Angeles Business/Regional Office
5360 Workman Mill Road
Whittier, CA 90601

December 1, 2007

Subject: February 2008 Hearing

Dear Mr. Stochlia:

Hilti would like to formally request that AC118 (effective November 1, 2007) be put on the agenda for the February 2008 ICC-ES public hearing. Below you will find the specific changes Hilti recommends. The justifications for making the first proposed change can be found in the e-mail correspondence from Bill Gould and myself to you dated December 1, 2007.

1. Section 3.1.1.2, Section 3.1.2, Section 3.1.3.1, Section 3.1.3.2 & Section 3.1.3.4 – The coating requirement for these sections referring to the IBC and UBC should be modified to either no requirement or should require a 12 hour salt spray rating per ASTM B 117, corresponding to the minimum time required for appearance of red rust in ASTM F1941, as structures covered under the IBC and UBC have a design professional involved. The specific level of fastener corrosion resistance should be determined by the design professional considering the in-service technical performance requirements and material costs. In all cases, a salt spray test shall be performed to ensure that the manufacturer's screw fastener specification is met. In conjunction, a Section 6.7 should be added stating the following.

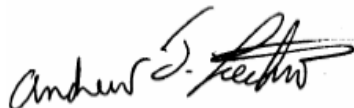
“6.7 A statement indicating that screw fasteners that are not stainless steel shall be limited to dry, interior applications. “

2. Section 3.1 and Table 1 – Are these requirements for tests performed as part of the quality control done at the manufacturing facility? Further clarification of this section is needed in order to specify who does these tests and where they are conducted. Hilti feels that ICC-ES has established a historical precedent by accepting quality control tests performed at the manufacturing facility. Requiring them to now be done at an independent laboratory is not necessary. Other ICC-ES acceptance criteria for fastener products used in cold-formed steel applications do not require such intensive third party quality control tests.

3. Section 2.1.1.3 – As a screw fastener manufacturer, Hilti recognizes that screw fastener core hardness is typically not controlled in the manufacturing process. Surface hardness and case depth are the items that are controlled. We recommend that the words “case and core” be removed from this section.

Hilti looks forward to working with ICC-ES on creating a useful and reasonable document for the evaluation of screw fastening products. I can be reached by phone at (918)294-5805 or by electronic mail at drew.liechti@hilti.com. Please contact me if you have any questions or concerns.

Regards,



Andrew T. Liechti, P.E.
Technical Services Engineer
Hilti, Inc.

Hilti, Inc.
5400 South 122nd East Avenue
Tulsa, OK 74146

cc Peter Bahlo and Brian Gerber

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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 30 days have elapsed 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. Correspondence received by ICC-ES will not

be released to any party, except to the Evaluation Committee, prior to the meeting without permission of the author. The committee reserves the right to refuse recognition of communications which do not comply with the provisions of this section. All such communications and submissions will be available from ICC-ES upon written request and payment of costs associated with duplication. The materials will be available beginning five days after the conclusion of the meeting but will no longer be available after 30 days have elapsed from the conclusion of the meeting.

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 The action of the Evaluation Committee may be appealed in accordance with the ICC-ES Rules of Procedure for Appeal of Acceptance Criteria.

5.0 COMMITTEE BALLOTING FOR ACCEPTANCE CRITERIA

5.1 Acceptance criteria may be issued without a public hearing following a 45-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 November 6, 2006



ACCEPTANCE CRITERIA FOR TAPPING SCREW FASTENERS

AC118

Approved October 2007

Effective November 1, 2007

Previously approved December 2006, June 2005, July 1996, June 2004

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.

This acceptance criteria has been issued to provide all interested parties with guidelines for demonstrating compliance with performance features of the applicable code(s) referenced in the acceptance criteria. The criteria was developed and adopted following public hearings conducted by the ICC-ES Evaluation Committee, and is effective on the date shown above. All reports issued or reissued on or after the effective date must comply with this criteria, while reports issued prior to this date may be in compliance with this criteria or with the previous edition. If the criteria is an updated version from the previous edition, a solid vertical line (|) in the margin within the criteria indicates a technical change, addition, or deletion from the previous edition. A deletion indicator (→) is provided in the margin where a paragraph has been deleted if the deletion involved a technical change. This criteria may be further revised as the need dictates.

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 set forth in this document, and otherwise demonstrate compliance with the performance features of the codes. Notwithstanding that a product, material, or type or method of construction meets the requirements of the criteria set forth in this document, or that it can be demonstrated that valid alternate criteria are equivalent to the criteria in this document and otherwise demonstrate compliance with the performance features 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 if 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.

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ACCEPTANCE CRITERIA FOR TAPPING SCREW FASTENERS

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for tapping screw fasteners to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the 2006 *International Building Code*[®] (IBC), the 2006 *International Residential Code*[®] (IRC), and the 1997 *Uniform Building Code*[™] (UBC).

1.2 Scope: This criteria provides a basis for:

1.2.1 Evaluating the material, dimensional, and performance properties of self-drilling, self-piercing, thread-cutting, and thread-forming tapping screws.

1.2.2 Determining the allowable [design] shear and tension strength values for tapping screws used in cold-formed sheet steel-to-steel connections as described in Section E4 of AISI-NAS or Section 2218 (item 3) of the UBC.

1.2.3 Recognizing tapping screws for use in cold-formed steel framed lateral-force-resisting assemblies described in Section 2210.5 of the IBC and Chapter 22, Division VIII, of the UBC.

1.2.4 Recognizing tapping screws for use in prescriptive cold-formed steel connections as described in Section 2210 of the IBC and Sections R505, R603, and R804 of the IRC.

1.2.5 Recognizing tapping screws for attaching gypsum panel products to cold-formed steel framing members as described in Sections 2210.4 and 2508 of the IBC, Section R702.3 of the IRC, and Sections 2502 and 2511 of the UBC.

1.3 Codes and Reference Standards:

1.3.1 2006 *International Building Code*[®] (IBC), International Code Council.

1.3.2 2006 *International Residential Code*[®] (IRC), International Code Council.

1.3.3 1997 *Uniform Building Code*[™] (UBC).

1.3.4 ANSI/ASME B18.6.4, 1998, Standard Specification for Thread Forming and Thread-Cutting Screws, ASME International.

1.3.5 SAE J78—(1998), Steel Self-drilling Tapping Screws, Society of Automotive Engineers.

1.3.6 ASTM B 117-07, Standard Practice for Operating Salt Spray (Fog) Apparatus, ASTM International.

1.3.7 ASTM B 633-07, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel, ASTM International.

1.3.8 ASTM C 954-00, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness, ASTM International.

1.3.9 ASTM C 1002-01, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs, ASTM International.

1.3.10 ASTM C 1513-01, Standard Specifications for Tapping Screws, ASTM International.

1.3.11 ASTM F 1470-02, Standard Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection, ASTM International.

1.3.12 ASTM F1941-00(2006), Standard Specification for Electrodeposited Coatings on Threaded Fasteners [Unified Inch Screw Threads (UN/UNR)], ASTM International.

1.3.13 AISI Specification for Design of Cold-formed Steel Structural Members, 1996 edition, American Iron and Steel Institute.

1.3.14 AISI–NAS, 2001 North American Specification for Design of Cold-formed Steel Structural Members, including 2004 Supplement, American Iron and Steel Institute.

1.3.15 AISI TS-4-02, Standard Test Method for Determining the Tensile and Shear Strength of Screws, Part VI, AISI Manual, 2002, Cold-Formed Steel Design, American Iron and Steel Institute.

1.3.16 AISI TS-5-02, Test Methods for Mechanically Fastened Cold-Formed Steel Connections, Part VI, AISI Manual, 2002, Cold-Formed Steel Design, American Iron and Steel Institute.

1.4 Definitions:

1.4.1 Allowable Strength: Allowable strength is the nominal strength divided by the safety factor.

1.4.2 Available Strength: Available strength is the design strength or allowable strength, as appropriate.

1.4.3 Connection: A connection is a combination of structural elements and joints used to transmit forces between two or more members.

1.4.4 Design Strength: Design strength is the resistance factor multiplied by the nominal strength.

1.4.5 Joint: A joint is an area where two or more ends, surfaces, or edges are attached, and is categorized by type of fastener and method of force transfer.

1.4.6 Nominal Strength: Nominal strength is the strength of the screw or connection, without the resistance factor or safety factor applied, to resist the load effects determined in accordance with the code.

1.4.7 Tapping Screws: Tapping screws are externally threaded fasteners with the ability to “tap” their own internal mating threads when installed. Tapping screws are high-strength, one-piece, one-side-installation fasteners. (Reference Section 3.2.12 of ASTM C 1513.)

1.4.8 Self-drilling Tapping Screws: Self-drilling tapping screws are externally threaded fasteners with the ability to drill their own hole and form or cut their own internal mating threads, into which they are driven without breaking during assembly. (Reference Section 3.2.9 of ASTM C 1513.)

1.4.9 Self-piercing Tapping Screws: Self-piercing tapping screws are externally threaded fasteners with the ability to self-pierce metallic material 33 mils (0.84 mm), or less, form a sleeve by extruding metallic material and “tap” their own mating threads when driven. Self-piercing screws have a sharp-point with a point angle not more than 30 degrees. (Reference Section 3.2.10 of ASTM C 1513.)

ACCEPTANCE CRITERIA FOR TAPPING SCREW FASTENERS

1.4.10 Thread-cutting Tapping Screws: Thread-cutting tapping screws are for application in materials where disruptive internal stresses are undesirable or where excessive driving torques are encountered with thread-forming screws. (Reference Section 1.3.2 of ASME B18.6.4.)

1.4.11 Thread-forming Tapping Screws: Thread-forming tapping screws are for application in materials where large internal stresses are permissible, or desirable, to increase resistance to loosening. (Reference Section 1.3.1 of ASME B18.6.4.)

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted and shall be included in the submitted test reports:

2.1.1 Screws:

2.1.1.1 Type and description of screw fasteners.

2.1.1.2 Screw fastener specifications, such as ASTM C 954, ASTM C 1002, ASTM C 1513, or SAE J78, as applicable. Any deviations from the applicable specification or standard shall be noted, along with the intended end use of the fastener.

2.1.1.3 Drawings and details noting dimensions, including tolerances for each screw size, configuration, and head and point type, and noting material specifications including case and core hardness, and protective coatings.

2.1.1.4 Head markings used on each screw fastener, when practical.

2.1.1.5 Installation instructions, including description of the recommended tool, and of the recommended tool operation, such as speed and torque, during installation.

2.1.2 Cold-formed Steel: Steel description, including material specification, and measured yield strength, tensile strength and minimum uncoated steel thickness for the tested cold-formed steel connections.

2.2 Packaging and Identification: The method of packaging and identifying the screw fasteners shall be reported. The identifying information on each box or package of fasteners shall include the screw brand name and model number, nominal screw size (number, fraction or decimal equivalent), nominal screw length (fraction or decimal equivalent), point type, the evaluation report holder's name, the ASTM designation (when applicable), and the ICC-ES evaluation report number. Each screw fastener head marking or manufacturer's logo shall be reported.

2.3 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 Procedure for Evaluation Reports.

2.4 Test Reports: Test reports shall comply with AC85 and the report requirements in the applicable test standard.

2.5 Product Sampling:

2.5.1 Sampling of the screw fasteners for tests under this criteria shall comply with Section 3.2 of AC85.

2.5.2 Where the tested fasteners are prototypes, the fasteners shall be representative of later production, and shall be proven to be identical, within specified tolerance

limits, to production fasteners by confirming dimensions, material, and performance requirements set forth in the applicable specification or standard.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 Mechanical Performance and Physical Property Requirements for Tapping Screws Based on End-use Applications:

Different sections of the code require tapping screws to comply with different standards, such as ASTM C 954, ASTM C 1002, ASTM C 1513, or SAE J78, depending upon the end use of the screws. The purpose of this section (Section 3.1) is to clarify which test standard is applicable for the end-use application described in the codes. Reports of testing shall be submitted to establish compliance with Sections 3.1.1 through 3.1.4, as applicable. Sample size for testing in accordance with the applicable tapping screw standard shall comply with Table 1, which is based on the provisions of ASTM F 1470 assuming a minimum lot size of 250,000 screws. Screw type attributes that need to be considered include nominal size (number, fraction or decimal equivalent), threads per inch, nominal length (fraction or decimal equivalent), point type, material, and protective finish.

3.1.1 Prescriptive Steel-to-steel Connections in Accordance with the IRC and IBC:

3.1.1.1 IRC: Fasteners shall be self-drilling tapping screws conforming to SAE J 78 and shall have a Type II coating in accordance with ASTM B 633 or a coating shown to have equivalent or better corrosion resistance when tested in accordance with Section 10.3 of ASTM B 633.

3.1.1.2 IBC: Fasteners shall be self-drilling or self-piercing tapping screws complying with ASTM C 1513. Tapping screws shall comply with SAE J78 or ANSI/ASME B18.6.4, whichever is more restrictive, when the screw size is not covered under ASTM C 1513. Tapping screws shall have a corrosion-resistant treatment specified in ASTM F 1941 and shall be tested in accordance with ASTM B 117 for a minimum 96 hour test period. Coated screws shall not show products of corrosion from either the coating (white corrosion) or the base metal (red rust) at the end of the test period.

3.1.2 Engineered Steel-to-steel Connections in Accordance with Section E4 of AISI-NAS or Section 2218 of the UBC:

Fasteners shall be thread-forming or thread-cutting tapping screws, with or without a self-drilling point, and shall comply with both ASTM C 1513 and ASME B18.6.4. The screws shall have a corrosion-resistant treatment specified in ASTM F 1941 and shall be tested in accordance with ASTM B 117 for a minimum 96-hour test period. Coated screws shall not show products of corrosion from either coatings (white corrosion) or from base metal (red rust) at the end of the test period.

3.1.3 Shear Walls in Accordance with the IBC and UBC:

3.1.3.1 Wood Structural Panel Sheathing: Fasteners used to attach wood-based structural-use panels to cold-formed steel wall framing members and to provide resistance to lateral loads in the plane of the wall, as described in Section 2210.5 of the IBC and Sections 2219 and 2220 of the UBC, shall be either No. 8, flat-head, self-drilling or self-piercing tapping screws with a minimum head diameter of 0.285 inch (7.24 mm) or No. 10, flat-head, self-

ACCEPTANCE CRITERIA FOR TAPPING SCREW FASTENERS

drilling or self-piercing tapping screws with a minimum head diameter of 0.333 inch (8.46 mm) complying with ASTM C 1513. The flat-head, self-drilling tapping screws shall have a corrosion-resistant treatment specified in ASTM F 1941 and shall be tested in accordance with ASTM B 117 for a minimum 96-hour test period. Coated screws shall not show products of corrosion from either coatings (white corrosion) or from base metal (red rust) at the end of the test period.

3.1.3.2 Sheet Steel Sheathing: Fasteners used to attach sheet steel to cold-formed steel wall framing members and to provide resistance to lateral loads in the plane of the wall, as described in Section 2210.5 of the IBC, shall be self-drilling or self-piercing tapping screws complying with ASTM C 1513. Tapping screws shall comply with SAE J78 or ANSI/ASME B18.6.4, whichever is more restrictive, when the screw size is not covered under ASTM C 1513. Tapping screws shall have a corrosion-resistant treatment specified in ASTM F 1941 and shall be tested in accordance with ASTM B 117 for a minimum 96-hour test period. Coated screws shall not show products of corrosion from either the coating (white corrosion) or the base metal (red rust) at the end of the test period.

3.1.3.3 Gypsum Board Panel Sheathing: Fasteners used to attach gypsum board to cold-formed steel wall framing members and to provide resistance to lateral loads in the plane of the wall, as described in 2210.5 of the IBC and Sections 2219 and 2220 of the UBC, shall be self-drilling tapping screws complying with ASTM C 954, or self-piercing tapping screws complying with ASTM C 1002.

3.1.4 Wood Structural Panel Diaphragms in Accordance with the IBC: Fasteners used to attach wood-based structural-use panels to roof or floor cold-formed steel framing members as described in Section 2210.5 of the IBC for structural diaphragms, shall be minimum No. 8 (when framing members have a designation thickness of 54 mils or less) or No. 10 (when framing members have a designation thickness greater than 54 mils) flat-head, self-drilling or self-piercing tapping screws complying with ASTM C 1513. The flat-head self-drilling tapping screws shall have a corrosion-resistant treatment specified in ASTM F 1941 and shall be tested in accordance with ASTM B 117 for a minimum 96 hour test period. Coated screws shall not show products of corrosion from either coatings (white corrosion) or from base metal (red rust) at the end of the test period.

3.2 Tapping Screw Available Strength:

3.2.1 General: Tapping screws designed to transmit design forces acting on steel-to-steel connections described in Section 1.2.2 of this criteria shall comply with this section.

3.2.2 Shear and Tension Strength of Tapping Screws: Each type and size (diameter) of tapping screw shall be tested in accordance with Sections 4.1 and 4.2 of this criteria. The available tensile and shear strengths (IBC) and capacities (UBC) of each screw type shall be determined in accordance with the following:

3.2.2.1 Analysis—IBC: The available shear and tension strength of the screw shall be in accordance with Section E4.3.3 (Shear in Screws) and E4.4.3 (Tension in Screws), respectively, of AISI-NAS.

3.2.2.2 Analysis—UBC: The allowable shear capacity, P_{as} , and allowable tension capacity, P_{at} , of the screw shall be determined in accordance with Sections

E6.3.2 (Shear in Screws) and E6.4.3 (Tension in Screws), respectively, as described in Amendment 3 in Section 2218 of the UBC, using a safety factor of 3.0.

3.3 Available Strength Values of Tapping Screw Connections:

3.3.1 Connection Strength Analysis—IBC: Available strength of screw connections shall be the lesser of the following:

3.3.1.1 Available strength value of the tapping screw determined in accordance with Section 3.2.2.1 of this criteria.

3.3.1.2 The calculated available strength value of a screw connection determined in accordance with Sections E4.3, E4.4, and E4.5 of AISI-NAS using a safety factor, Ω , equal to 3.0, or a resistance factor, ϕ , equal to 0.50 as described in Section E4 of AISI-NAS.

3.3.2 Connection Strength Analysis—UBC: Allowable strength of screw connections shall be the lesser of the following:

3.3.2.1 Allowable capacity value of the tapping screw determined in accordance with Section 3.2.2.2 of this criteria.

3.3.2.1.1 The shear capacity of the tapping screw shall be at least 125 percent of the nominal shear strength of the connection, P_{ns} , calculated in accordance with Section E6.3.1 (Connection Shear) as described in Amendment 3 in Section 2218 of the UBC.

3.3.2.1.2 The tension capacity of the tapping screw shall be at least 125 percent of the nominal pull-out force, P_{not} , and of the nominal pull-over force, P_{nov} , of the connection calculated in accordance with Section E6.4.1 (Pull-out) and Section E6.4.2 (Pull-over) of the connection as described in Amendment 3 in Section 2218 of the UBC.

3.3.2.2 The calculated allowable shear and tension force values of a screw connection determined in accordance with Sections E6.3 (Shear) and E6.4 (Tension), respectively, as described in Amendment 3 in Section 2218 of the UBC, using a safety factor, Ω , equal to 3.0.

3.4 Empirically Derived Available Strength Values of Tapping Screw Connections (Alternate to Section 3.3):

3.4.1 General: The available strength values of particular screw connections empirically derived in accordance with this section (Section 3.4) are not required to be compared to the available strength connection values calculated in accordance with Sections 3.3.1 (IBC) or 3.3.2 (UBC) of this criteria.

3.4.2 Connection Testing: Reports of connection testing in accordance with Sections 4.1 and 4.3 of this criteria shall be submitted when empirically derived available strength values for particular connection applications are sought for recognition in an evaluation report.

3.4.3 Connection Strength Analysis—IBC: Available strength of a particular screw connection shall be the lesser of the following:

3.4.3.1 Available strength values of the tapping screw determined in accordance with Section 3.2.2.1 of this criteria.

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3.4.3.2 The allowable [design] strengths of the particular connection based on the tested values in conjunction with the safety factor, Ω , and resistance factor, ϕ , from Section F1 of AISI-NAS.

3.4.4 Connection Strength Analysis—UBC: Allowable strength values of the tapping screw shall be determined in accordance with Section 3.2.2.2 of this criteria, and the following:

3.4.4.1 The shear capacity of the screw, determined per Section 3.2.2.2 of this criteria, shall be at least 125 percent of the shear test results from connection testing conducted per Section 3.4.2 of this criteria.

3.4.4.2 The tension capacity of the tapping screw shall be at least 125 percent of the pull-out and pull-over force test results from the connection testing conducted per Section 3.4.2 of this criteria.

4.0 TEST METHODS

4.1 General: As a minimum, a series of three identical tests shall be performed for each combination of variables that affect the performance of the connector, provided deviation of any individual test result from the average value does not exceed ± 15 percent. If such a deviation from the average value exceeds ± 15 percent, more tests of the same kind shall be conducted until the deviation of any individual test result from the average value obtained from all the tests does not exceed ± 15 percent, or until at least three additional tests have been conducted. No test result shall be eliminated unless a rationale for its exclusion can be given. The average value of all tests made shall be regarded as the nominal strength, R_n , for the series of the tests. The nominal strength, R_n , and the coefficient of variation, V_p , of the test results shall be determined by statistical analysis.

4.2 Fastener Testing: Tension and shear testing of screws shall comply with TS-4. Steel plates or shapes used in the tests shall comply with TS-4. Reporting shall comply with Section 4 of TS-4.

4.3 Connection Testing:

4.3.1 Tension (pull-over and pull-out) and shear test specimen setup and dimensions and load application shall comply with TS-5. Steel plates or shapes used in the tests shall comply with TS-5, and be representative of connected steel material that is to be recognized in the evaluation report. Reporting shall comply with Section 10 of TS-5.

4.3.2 If the tensile strength of the steel from which the tested steel structural members forming the connection are formed is greater than the specified minimum value, the test results shall be calibrated to the specified minimum tensile strength of the steel which the manufacturer intends to use, by the following adjustment factor, R_s :

$$R_s = \left(\frac{F_{u(\text{specified})}}{F_{u(\text{tested})}} \right) \times \left(\frac{t_{(\text{specified})}}{t_{(\text{tested})}} \right) \leq 1.0$$

where:

- R_s = Adjustment factor.
- $F_{u(\text{specified})}$ = Specified tensile strength of the steel, psi (Pa).
- $F_{u(\text{tested})}$ = Measured tensile strength of the steel, psi (Pa).

$t_{(\text{specified})}$ = Specified steel thickness, inch (mm).

$t_{(\text{tested})}$ = Measured steel thickness, inch (mm).

If the thickness of the steel, from which the critical cold-formed elements of tested connectors are made, is greater than the specified (design) thickness by more than 5 percent, the test results shall be reduced by the ratio of the specified (design) thickness of the connector to the measured thickness, as shown in the formula above.

5.0 QUALITY CONTROL

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

5.2 Third-party follow-up inspections are not required under this acceptance criteria.

5.3 Ongoing quality control testing shall be performed for each lot, and the sample size shall be consistent with the requirements of ASTM F 1470. Ongoing quality control tests shall be conducted in accordance with the standards upon which the screws have been qualified and shall meet the conditions of acceptance noted in the appropriate section of the standard as it relates to the type of fastener.

6.0 EVALUATION REPORT RECOGNITION

6.1 The following statement shall appear in the Conditions of Use section in the product evaluation report "Fasteners are installed in accordance with the manufacturer's published installation instructions and this report. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs."

6.2 The evaluation report shall note the allowable [design] shear and tension strength values for tapping screws used in cold-formed sheet steel-to-steel connections determined in accordance with Section 3.2.2 of this criteria.

6.3 The evaluation report shall note that the allowable load values (ASD) for screws or for screw connections are not permitted to be increased for short-duration loads, such as wind or earthquake loads.

6.4 For screws qualified in accordance with Section 3.3, the evaluation report shall include a statement that the available connection strength shall be in accordance with Section E4 of AISI-NAS.

6.5 For connections qualified in accordance with Section 3.4, the evaluation report shall include the following:

6.5.1.1 A statement indicating that the most restrictive of fastener tensile strength, pull-out from the supporting material or pull-over of the supported material governs.

6.5.1.2 A statement indicating that the more restrictive of fastener shear strength and bearing and tilting capacity of the connected steel, including minimum end and edge distances, governs.

6.5.1.3 Description of the specific tested connections, including physical and dimensional properties and material specifications.

6.6 The evaluation report shall include a description of the screw fasteners, including the screw series, model, size, threads per inch (tpi), point number or type, head type, head diameter, minor and major shank diameter, overall length, thread length, and drill point length. ■

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TABLE 1—SAMPLE SIZE FOR TESTS SPECIFIED IN SCREW STANDARDS REFERENCED IN SECTION 3.1 OF THIS CRITERIA

CHARACTERISTIC	SAMPLE SIZE
Assembly tension (Section 6.2 of ASTM C 954; Section 12.6.3 of ASTM C 1002)	15
Case depth	15
Chemistry	(see footnote 1)
Corrosion resistance (salt-spray testing)	15
Drill capacity	29
Drill drive	29
Drill hole size (Section 5.4 of SAE J78)	29
Ductility	15
Hardness	15
Hydrogen embrittlement	15
Plating/coating thickness	29
Spin out (Section 6.1 of ASTM C 954)	6
Torsional strength	6

¹A certified copy of the material's chemical or product analysis, which is traceable to the lot of test specimens, shall be furnished.