



ICC Evaluation Service, Inc.
Los Angeles Business/Regional Office
5360 Workman Mill Road
Whittier, CA 90601
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www.icc-es.org

May 13, 2010

TO: PARTIES INTERESTED IN EVALUATION REPORTS ON EXTERIOR WALL COVERINGS OF STEEL-BACKED VENEER PANELS ATTACHED TO WALLS WITH STEEL FRAMING AND BRACKETS

SUBJECT: Proposed Revisions to the Acceptance Criteria for Exterior Wall Coverings of Steel-backed Veneer Panels Attached to Walls with Steel Framing and Brackets, Subject AC359-0610-R1 (RK/BG)

Hearing Information:

Tuesday, June 15, 2010
8:00 a.m.

Double Tree Hotel
808 South 20th Street
Birmingham, Alabama 35205
(800) 222-8733

Dear Madam or Sir:

An evaluation report applicant has requested revisions to the subject acceptance criteria, which will be considered at the ICC-ES Evaluation Committee hearing noted above. The proposed changes are as follows:

1. Update the acceptance criteria to include the 2009 *International Building Code* (IBC) and the 2009 *International Residential Code* (IRC), without deleting the 2006 IBC or IRC from the criteria. Based on information provided by Hughes Associates Inc., the updates to the editions of ASTM standards listed in Section 1.3 of the criteria will have no effect on the data required by the criteria.
2. Revise the conditions of acceptance of the mortar durability tests in Section 3.2.2.2, as described in the attached letter from Hughes Associates, Inc. Please note that the proposed revisions in the attached draft, prepared by the ICC-ES staff, are not identical to those proposed by Hughes Associates. However, the revisions are consistent with the intent of those proposed by Hughes Associates.
3. Revise the criteria section reference in Section 3.2.2.3.1 (i.e., change reference from Section 3.8.4 to Section 3.8.5). This is an editorial correction.

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 **June 1, 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 **June 10, 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 **June 10, 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 question, please contact the undersigned at (800) 423-6587, extension 3275, or Brian Gerber, P.E., Principle 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 that reads "Russ Krivchuk". The signature is written in a cursive, flowing style.

Russ Krivchuk, P.E.
Senior Staff Engineer

RK/md

Enclosures

cc: Evaluation Committee



January 13, 2010

Mr. Kurt Stochlia, PE
Vice President
ICC Evaluation Service, Inc.
5360 Workman Mill Rd.
Whittier, CA 90601

Subject: Proposed Revisions to "Acceptance Criteria for Exterior Wall Coverings Of Steel-Backed Veneer Panels Attached To Walls Utilizing Steel Framing and Brackets (AC359), Effective November 1, 2008"

HAI Project No.: INRI00026.000

Dear Kurt:

Several proposed changes to ICC-ES AC359 are hereby being submitted by Hughes Associates, Inc., (HAI), engineering consultants acting on behalf of Stonel Inc. Mr. Ron Ogden is HAI's contact with Stonel, and he has reviewed and endorsed these proposed revisions. Please copy Stonel Inc. on your responses, comments, or any requests for additional product or other information at the following address:

Mr. Ron Ogden
Stonel Inc.
15533 NE 144th Place
Woodinville, WA 98072
rj.ogden@verizon.net

The proposed changes to Sections 3.2.2.2 and 3.2.2.3 are highlighted in color in the attached. **A slightly increased degradation range of up to 15% in the conditioned mortar strength is proposed (in place of the current maximum 5% strength loss and 95% minimum acceptance limit) if this environmentally reduced mortar strength is still higher than the wall design load effects by at least the factor of safety of 4.0.** The magnitude of this suggested 15% tolerance would also be consistent with similar standard allowances for test result deviations in Sections 3.5 and 3.8.

The overall context of these AC359 sections is to establish, by means of smaller component tests, the ultimate mortar strengths (out of plane to-veneer brick shear and to-steel backer tensile bond, and in-plane to-steel backer shear), which are then appropriately reduced by a factor of safety of 4.0 to determine the allowable mortar design values. This allowable mortar strength for the three directions must be adequate to transmit the effects of the required allowable gravity and transverse wind design loads for the wall system. The full wall system strength and its allowable design loads are determined from a different set of tests (Section 3.8).

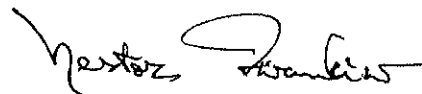
Currently, the four durability conditioned strengths of the mortared specimens (for freeze-thaw, ultraviolet light, wet/dry, and heating-cooling exposures) are simply checked to be no more than 5% less than their corresponding ambient (normal) test values, irrespective of how these conditioned mortar strengths compare to the overall allowable design load effects on the wall system. It is conceivable that for a worst-case, relatively weak mortar situation, the mortar could have a 5% mortar strength reduction allowed in AC359 to be currently acceptable even though it would marginally decrease the final wall design safety factor on the mortar from 4.0 to 3.8 (= 4.0×0.95) in such a state. Conversely, a relatively high strength mortar with a larger 10% loss of durability strength would not be considered acceptable (due to its 90% residual strength being less than the current 95% limit) despite the mortar's having no effect at all on the overall allowable wall design load and its factor of safety of 4.0.

The proposed AC359 changes for Section 3.2.2.2, Mortar Durability, as described herein and highlighted in the enclosure, are intended to remedy such potential anomalies and simultaneously permits a more reasonable tolerance range for mortar durability. Again, a slightly lower 85% limit in the conditioned mortar strength is proposed (in place of the current 95% limit) provided, however, that this environmentally reduced mortar strength, with at least the factor of safety of 4.0, is adequate to resist the wall design load effects. These recommended changes would consistently maintain the intended overall structural safety and performance of the wall system while allowing for a reasonably increased tolerance on the environmentally conditioned strength durability of the mortar.

We request that ICC-ES review our suggested changes and justification and provide us with your comments. If you would like, we could schedule a teleconference at your convenience to further discuss this matter, answer questions and decide how best to proceed forward.

We look forward to your timely response to these proposed changes to AC359.

Cordially,



Nestor Iwankiw, P.E., S.E., PhD
Senior Engineer
Hughes Associates, Inc.

Enclosure (1)
cc: R. Ogden
J. Beitel

Proposed Modifications Draft (NI, 1-13-10)

ACCEPTANCE CRITERIA FOR EXTERIOR WALL COVERINGS OF STEEL-BACKED VENEER PANELS ATTACHED TO WALLS UTILIZING STEEL FRAMING AND BRACKETS (AC359)

.....unchanged

3.2.2.2 Mortar Durability:

3.2.2.2.1 Freeze-thaw Resistance: The durability of the bond of the mortar used to factory-attach the thin clay bricks to the steel backer panel, when subjected to freeze-thaw conditions, shall be tested in accordance with ASTM C 1262, except as amended by this criteria. Two sets of specimens are required, since one specimen set shall be tested with a test solution of water and the second set of specimens shall be tested with a 3 percent saline solution. Each specimen set shall consist of five veneer panel sections, each having minimum height and width dimensions of 24 and 12 inches (610 and 305 mm), respectively, but of sufficient size such that the specimen contains representative factory-installed mortar head and bed joints of the veneer units. The specimens shall be cured and maintained for a minimum of 28 days at 50 percent relative humidity and 70°F. ($\pm 3^\circ\text{F}$) ($21.1^\circ\text{C} \pm 1.66^\circ\text{C}$). If the panels are cut using water, the specimens shall be returned to these conditions for a minimum of 48 hours prior to commencement of the freeze-thaw exposure. After curing, the specimens shall be placed with the steel backer panel side down in the container and submerged so that approximately 50 percent of the mortar thickness is under the water. Each specimen shall be subjected to 50 freeze-thaw cycles.

The conditions of acceptance are that the maximum weight loss of each specimen shall not exceed 0.5 percent; the veneer, mortar and steel backer panel must not crack or degrade; and there shall be no debonding between the components of the test specimens. In addition, a minimum of five mortar bond tests in accordance with Section 3.2.2.3.1 and five mortar bond tests in accordance with Section 3.2.2.3.2 shall be performed on the freeze-thaw specimens. The average bond strength of each set of specimens shall be at least 98.5 percent of the corresponding results for tests conducted under Sections 3.2.2.3.1 and 3.2.2.3.2 and not less than 4 times the effects of the corresponding allowable gravity or transverse wind load under Sections 3.8.2 and 3.8.5.

3.2.2.2.2 Ultraviolet Light Resistance: Quarter size thin clay brick veneer panels with mortared joints [12 inches by 24 inches (305 mm by 610 mm)] shall be subjected to a minimum of 2000 hours of accelerated weathering using Cycle No. 1 of ASTM D 4587. Following the weathering period, the specimens shall be tested in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2. The average bond and shear strength of each set of specimens shall be at least 98.5 percent of the corresponding results for tests conducted in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2 and not less than 4 times the effects of the corresponding allowable gravity or transverse wind load under Sections 3.8.2 and 3.8.5.

3.2.2.2.3 Wet/Dry Cyclic Resistance: Quarter size thin clay brick veneer panels with mortared joints [12 inches by 24 inches (305 mm by 610 mm)] shall be subjected to 50 wet/dry cycles in accordance with ASTM C 67, modified such that the specimens shall be immersed in water with the steel backer side down, with the specimens exposed to 16 hours at 70°F (21.1°C), followed by eight hours of air drying at 70°F (21.1°C). Following the wet/dry cyclic exposure, the specimens shall be tested in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2. The average bond and shear strength of each set of specimens shall be at least 98.5 percent of the corresponding results for tests conducted in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2 and not less than 4 times the effects of the corresponding allowable gravity or transverse wind load under Sections 3.8.2 and 3.8.5.

3.2.2.2.4 Heating/Cooling Cyclic Resistance: Quarter size thin clay brick veneer panels with mortared joints [12 inches by 24 inches (305 mm by 610 mm)] shall be subjected to 50 heating/cooling cycles. Each cycle shall consist of exposure of the specimens to 140°F (60°C) for 16 hours followed by eight hours at 70°F (21.1°C). Following the heating/cooling cyclic exposure, the specimens shall be tested in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2. The average bond and shear strength of each set of specimens shall be at least 98.5 percent of the corresponding results for tests conducted in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2 and not less than 4 times the effects of the corresponding allowable gravity or transverse wind load under Sections 3.8.2 and 3.8.5.

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3.2.2.3 Veneer Unit to Steel Backer Panel Mortar Connection Strength: This criteria section is applicable to the thin clay brick veneer panels which have the veneer units factory-attached to the steel backer panels with mortar. The veneer's attachment to the steel backer panel to be included in the evaluation report shall be evaluated under both Section 3.2.2.3.1 and Section 3.2.2.3.2.

3.2.2.3.1 Forces Due to Outward Wind Pressure: The strength of the mortared connection of the veneer unit to the steel backer panel for outward wind pressures shall be evaluated by testing in accordance with the concentrated load test procedure of Section 13 of ASTM E 72, with the concentrated load applied to the back of the veneer units and with the load apparatus inserted through the punchouts provided in the steel backer panels. The test load shall be applied at a uniform rate of 0.25 inch per minute to veneer panel specimens that are representative of standard manufactured that have been cured and maintained for a minimum of 28 days at 50 percent relative humidity and 70°F. ($\pm 3^\circ\text{F}$) ($21.1^\circ\text{C} \pm 1.66^\circ\text{C}$). If the panels are cut using water, the specimens shall be returned to these conditions for a minimum of 48 hours prior to commencement of the load test. The test specimen shall be supported on the veneer units adjacent to the load tested veneer unit.

The load at failure of a minimum of five specimens shall be analyzed utilizing Method B of ASTM C 1531 to calculate the mortar-to-veneer unit shear strength. The value of A_i , used in the analysis to calculate the shear strength of the mortar-to-veneer unit, shall be the surface contact area between the veneer unit and mortar, measured around the perimeter of the tested veneer unit. The allowable mortar-to-veneer unit shear strength must be based on a minimum safety factor of 4.0, applied to the average of these test results.

The average mortar-to-steel backer tensile bond strength shall be calculated by dividing the average load at failure of the five specimens by a factor of 2.0 (the factor of 2.0 is based on there being two veneer units adjacent to each mortar joint) and dividing the result by the contact area of the mortar on the steel backer located around the perimeter of the load-tested veneer unit. The allowable mortar-to-steel backer tensile strength must be based on a minimum safety factor of 4.0, applied to the average of these test results.

The allowable outward wind loads for the attachment of the veneer units to the steel backer panel by the mortar shall be calculated by dividing the average load at failure of the five specimens by a factor of 2.0 (the factor of 2.0 is based on there being two veneer units adjacent to each mortar joint), dividing by the surface area of the veneer unit and dividing by a minimum safety factor of 4.0. The allowable outward wind pressure for the veneer unit-to-steel backer shall exceed the allowable outward wind pressures derived under Section 3.8.45 of this criteria.

3.2.2.3.2 Forces Due to Veneer Unit Gravity Loads: unchanged

Comment [N1]: This appears to just be an editorial correction of a typo, otherwise unrelated to this series of proposed changes.

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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 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 EXTERIOR WALL COVERINGS OF STEEL-BACKED VENEER PANELS ATTACHED TO WALLS UTILIZING STEEL FRAMING AND BRACKETS

AC359

Proposed May 2010

Previously Approved October 2008

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 purpose of issuing ICC-ES evaluation reports.

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR EXTERIOR WALL COVERINGS OF STEEL-BACKED VENEER PANELS ATTACHED TO WALLS UTILIZING STEEL FRAMING AND BRACKETS (AC359)

1.0 INTRODUCTION:

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for exterior wall coverings of steel-backed veneer panels attached to walls utilizing steel framing and brackets, 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). Bases of recognition are IBC Section 104.11 and IRC Section R104.11. The reason for development of this criteria is that the IBC and IRC do not contain sufficient provisions for evaluation of this product.

1.2 Scope: This criteria is applicable to exterior wall covering systems consisting of cold-formed steel attachment brackets and cold-formed steel framing members with factory-fabricated steel-backed veneer panels that are jobsite-installed onto the framing members.

The following types of steel-backed veneer panels, as defined in Section 1.4, are addressed in this acceptance criteria:

- Thin clay brick veneer panels.
- Metal veneer panels.
- Artificial cast stone veneer panels.
- Stucco substrate veneer panels.

All of the steel backer panels shall include punchouts to allow the veneer panels to be hung on the horizontal steel framing members of the system. In addition to being hung on the horizontal steel framing members, each veneer panel is to be mechanically attached at the jobsite with rivets installed through holes predrilled in the steel backer panels, and into the horizontal steel framing members. The horizontal framing members are jobsite-attached to the vertical steel framing members of the system. The vertical steel framing members are jobsite-attached to the supporting wall with attachment brackets. The steel-to-steel connections between the horizontal and vertical framing members, and between the vertical framing members and the attachment brackets, are proprietary bolted connections with elongated threaded slots.

This criteria is applicable to installations of the wall covering system to concrete, masonry, wood-framed or cold-formed steel framed, load-bearing or nonload-bearing supporting walls.

1.3 Codes and Referenced Standards: Where standards are referenced in this criteria, the standards shall be applied consistently with the code (IBC or IRC) upon which compliance of the wall covering system is based.

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

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

1.3.4 **1.3.3** 2006 *International Building Code*[®] (2006 IBC), International Code Council.

1.3.2 **1.3.4** 2006 *International Residential Code*[®] (2006 IRC), International Code Council.

1.3.3 **1.3.5** ICC Evaluation Service, Inc. (ICC-ES):

1.3.3.1 **1.3.5.1** Acceptance Criteria for Cold-formed Steel Framing Members (AC46).

1.3.3.2 **1.3.5.2** Acceptance Criteria for Tapping Screw Fasteners (AC118).

1.3.3.3 **1.3.5.3** Acceptance Criteria for Metal Plaster Bases (Lath) (AC191).

1.3.6 AISI S100-07, North American Specification for the Design of Cold-formed Steel Structural Members (AISI S100), American Iron and Steel Institute.

1.3.4 **1.3.7** 2001 North American Specification for the Design of Cold-Formed Steel Structural Members, with 2004 Supplement (AISI-NAS), American Iron and Steel Institute.

1.3.8 AISI S200-07, North American Standard for Cold-formed Steel Framing – General Provisions (AISI S200), American Iron and Steel Institute.

1.3.5 **1.3.9** 2004 AISI Standard for Cold-formed Steel Framing—General Provisions (AISI-General), American Iron and Steel Institute.

1.3.10 AISI S905-08, Test Method for Mechanically Fastened Cold-formed Steel Connections, American Iron and Steel Institute.

1.3.6 **1.3.11** ANSI/ASME B 18.6.4, 1998, Standard Specification for Thread Forming and Thread-Cutting Screws, ASME International.

1.3.7 **1.3.12** **ASTM International:**

1.3.7.1 **1.3.12.1** ASTM A 370-07a, Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

1.3.7.2 **1.3.12.2** ASTM A 653-04a (ASTM A 653-07 for use under the 2009 IBC and IRC, and ASTM A 653-04a for use under the 2006 IBC and IRC), Standard Specification for Steel Sheet, Zinc-coated Galvanized or Zinc-iron Alloy-coated Galvannealed by the Hot-dip Process.

1.3.7.3 **1.3.12.3** ASTM A 755-04 (ASTM A755-07 for use under the 2009 IBC and IRC, and ASTM A 755-04 for use under the 2006 IBC and IRC), Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

1.3.7.4 **1.3.12.4** ASTM C 109-02, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

1.3.7.5 **1.3.12.5** ASTM C 270-04 (ASTM C270-07 for use under the 2009 IBC and IRC, and ASTM C 270-04 for use under the 2006 IBC and IRC), Standard Test Method for Mortar for Unit Masonry.

1.3.7.6 **1.3.12.6** ASTM C 307-03, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.

PROPOSED REVISIONS TO THE ACCEPTANCE CRITERIA FOR EXTERIOR WALL COVERINGS OF STEEL-BACKED VENEER PANELS ATTACHED TO WALLS UTILIZING STEEL FRAMING AND BRACKETS (AC359)

1.3.7.7 1.3.12.7 ASTM C 348-02, Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.

1.3.7.8 1.3.12.8 ASTM C 426-06, Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.

1.3.7.9 1.3.12.9 ASTM C 473-03 (ASTM C 473-06a for use under the 2009 IBC and IRC and ASTM C 473-03 for use under the 2006 IBC and IRC), Standard Test Methods for Physical Testing of Gypsum Panel Products.

1.3.12.10 1.3.12.10 ASTM C 567-81(Reapproved 1996), Test Method for Unit Weight of Structural Lightweight Concrete.

1.3.7.11 1.3.12.11 ASTM C 666-97, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

1.3.7.12 1.3.12.12 ASTM C 920-05, Standard Specification for Elastomeric Joint Sealants.

1.3.7.13 1.3.12.13 ASTM C 947-03, Standard Test Method for Flexural Properties of Thin-Section Glass-Fiber-Reinforced Concrete (Using Simple Beam With Third-Point Loading).

1.3.7.14 1.3.12.14 ASTM C 1063-03 (ASTM C 1063-06 for use under the 2009 IBC and IRC, and ASTM C 1063-03 for use under the 2006 IBC and IRC), Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.

1.3.7.15 1.3.12.15 ASTM C 1088-02 (ASTM C 1088-07a for use under the 2009 IBC and IRC, and ASTM C 1088-02 for use under the 2006 IBC and IRC), Specification for Thin Veneer Brick Units Made from Clay or Shale.

1.3.7.16 1.3.12.16 ASTM C 1185-03, Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.

1.3.7.17 1.3.12.17 ASTM C 1194-03, Standard Test Method for Compressive Strength of Architectural Cast Stone.

1.3.7.18 1.3.12.18 ASTM C 1195-03, Standard Test Method for Absorption of Architectural Cast Stone.

1.3.7.19 1.3.12.19 ASTM C 1262-05a, Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units.

1.3.7.20 1.3.12.20 ASTM C 1325-04, Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets.

1.3.7.21 1.3.12.21 ASTM C 1354-96 (Reapproved 2004), Standard Test Method for Strength of Individual Stone Anchorages in Dimension Stone.

1.3.7.22 1.3.12.22 ASTM C 1364-06, Standard Specification for Architectural Cast Stone.

1.3.10.23 1.3.12.23 ASTM C 1439-99^{e1}, Standard Test Method for Polymer-Modified Mortar and Concrete.

1.3.7.24 1.3.12.24 ASTM C 1513-01, Standard Specifications for Tapping Screws.

1.3.7.25 1.3.12.25 ASTM C 1531-02, Standard Test Method for in Situ Measurement of Masonry Mortar Joint Shear Strength Index.

1.3.7.26 1.3.12.26 ASTM D 1037-99, Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.

1.3.7.27 1.3.12.27 ASTM D 2394-83 (Reapproved 1999), Standard Test Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring.

1.3.7.28 1.3.12.28 ASTM D 4587-05, Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings.

1.3.10.29 1.3.12.29 ASTM E 72-02, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

1.3.7.30 1.3.12.30 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

1.3.7.31 1.3.12.31 ASTM E 575-99, Standard Practice for Reporting Data from Structural Tests of Building Constructions, Elements, Connections, and Assemblies.

1.3.7.32 1.3.12.32 ASTM E 1592-01, Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

1.3.7.33 1.3.12.33 ASTM G 21-96 (Reapproved 2002), Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.3.7.34 1.3.12.34 ASTM G 22-76 (Reapproved 1996), Standard Practice for Determining Resistance of Plastics to Bacteria.

1.3.13 TMS 402-08/ACI 530-08/ASCE 5-08, Building Code Requirements for Masonry Structures, Masonry Standards Joint Committee (American Concrete Institute, Structural Engineering Institute of the American Society of Civil Engineers, The Masonry Society).

1.3.8 1.3.14 ACI 530-05/ASCE 5-05 /TMS 402-05, Building Code Requirements for Masonry Structures, American Concrete Institute, Structural Engineering Institute of the American Society of Civil Engineers, The Masonry Society.

1.3.15 TMS 602-08/ACI 530.1-08/ASCE 6-08, Specification for Masonry Structures, Masonry Standards Joint Committee (American Concrete Institute, Structural Engineering Institute of the American Society of Civil Engineers, The Masonry Society).

1.3.9 1.3.16 ACI 530.1-05/ASCE 6-05/TMS 602-05, Specification for Masonry Structures, American Concrete Institute, Structural Engineering Institute of the American Society of Civil Engineers, The Masonry Society.

1.3.10 1.3.17 ASCE/SEI 7-05 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers.

1.3.11 1.3.18 IFI-130, Structural Splitting Self-plugging Pull Mandrel Blind Rivets, International Fasteners Institute, issued December 1980, revised February 2003.

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~~1.3.12~~ **1.3.19** IFI-134, Multi-Grip Flush Break Pull Mandrel Self-plugging Blind Rivets, International Fasteners Institute, issued August 1984, revised February 2003.

1.4 Definitions:

1.4.1 Thin Clay Brick: A masonry unit having a maximum thickness not exceeding $1\frac{3}{4}$ inches (44.5 mm), made of clay formed into a rectangular prism while in the plastic state and burned or fired in a kiln. See Section 3.2.2.1 for requirements.

1.4.2 Thin Clay Brick Veneer Panels: Thin clay brick veneer panels consist of veneer units of thin clay bricks, factory-attached to a proprietary cold-formed steel backer panel using a proprietary mortar that is applied only at the clay brick joints. The steel backer panels of this type of veneer panel are formed with integral punchouts to allow the factory-applied mortar to key into the steel backer panel. The veneer panels shall have maximum nominal dimensions of 24 inches by 48 inches (610 by 1219 mm). Systems with this veneer panel type also include a proprietary mortar for jobsite application to joints between the veneer units of adjacent veneer panels.

1.4.3 Metal Veneer Panels: Metal veneer panels consist of a pressed steel veneer factory-attached with corrosion-resistant screws to a proprietary cold-formed steel backer panel. The metal veneer panels shall have maximum nominal dimensions of 24 inches by 48 inches (610 by 1219 mm).

1.4.4 Artificial Cast Stone Veneer Panels: Artificial cast stone veneer panels consist of artificial stone factory cast onto a proprietary cold-formed steel backer panel. The steel backer panels of this type of veneer panel shall be a maximum of 48 by 24 inches (1219 by 610 mm) in size, and shall be formed with integral punchouts to allow the artificial cast stone veneer to key into the steel backer panel. Systems with artificial cast stone veneer panels also consist of a proprietary mortar for jobsite application to joints between veneer units of adjacent veneer panels.

1.4.5 Stucco Substrate Veneer Panels: Stucco substrate veneer panels consist of a $\frac{1}{4}$ -inch-thick (6.4 mm) cement backerboard and expanded metal lath, both factory-attached with mechanical fasteners (screws) to a proprietary cold-formed steel backer panel. These veneer panels are for use as a substrate for jobsite or factory application of exterior cement plaster (stucco), applied over the veneer panels. The exterior cement plaster shall be applied to the metal plaster base of each veneer panel in accordance with the applicable code. The steel backer panels of this type of veneer panels shall have maximum nominal dimensions of 24 inches by 48 inches (610 by 1219 mm). This system requires jobsite application of a joint sealant at the joints of each veneer panel after application of the cement plaster.

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted:

2.1.1 Product Description:

2.1.1.1 Veneer Panels:

2.1.1.1.1 Veneer:

2.1.1.1.1 Thin Clay Bricks: The specifications for the masonry thin clay bricks shall include dimensions, grade, type, surface condition (such as flat and smooth, or grooved) and applicable national standard.

2.1.1.1.2 Artificial Cast Stone: The description of the artificial cast stone veneer shall include a description and specifications for the artificial cast stone veneer constituents (cement, sand, aggregates and admixtures), the mix design, description of method of forming and casting the veneer onto the steel backer panels, curing and storage requirements, dimensions, density, weight and compressive strength.

2.1.1.1.3 Stucco Substrate Veneer Panels:

2.1.1.1.3.1 Cement Backerboard: The specifications for the cement backerboard of the stucco substrate veneer panels shall include the dimensions, composition, material specifications and applicable national standard.

2.1.1.1.3.2 Expanded Metal Lath: The description of the expanded metal lath shall include information as required by the ICC-ES Acceptance Criteria for Metal Plaster Bases (Lath) (AC191).

2.1.1.1.3.3 Factory-applied Stucco: The description of the factory-applied stucco shall include all constituents and the method of application.

2.1.1.1.3.4 Metal: The description of the metal veneer of the metal veneer panels shall include a description of the shape, dimensions and material specifications. The material specifications shall include the applicable national standard, specified yield strength, specified tensile strength, elongation properties, base-metal thickness, and coating.

2.1.1.1.2 Joint Mortar: The description of the proprietary joint mortar applied between veneer units at the factory and applied at veneer panel joints at the jobsite shall include the product designation, material specifications for the constituents, mix design, and applicable national standard.

2.1.1.1.3 Steel Backer Panel: The description of the steel backer panel shall include dimensions and material specifications. The material specifications shall include the applicable national standard, specified yield strength, specified tensile strength, elongation properties, base-metal thickness, and coating. The dimensions shall be illustrated on a production drawing with all dimensions and tolerances specified on the drawing. The drawings shall include details of all punchouts, deformations and perforations.

2.1.1.1.4 Veneer Panel Fasteners: The description of the screws used to factory-attach the metal veneer, cement backerboard and metal plaster base to the steel backer panels shall include the fastener material, type, size (length and diameter), screw head shape and diameter, corrosion-resistant coating description, and applicable national standard. The quantity and location of the fasteners, factory-installed in each veneer panel, shall also be included.

2.1.1.1.5 Veneer Panel Manufacture: The standard procedure for manufacturing the veneer panels shall be specified.

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2.1.1.2 Steel Framing Members and Attachment

Brackets: The description of the steel framing members and attachment brackets shall include dimensions and material specifications, including the dimensions of the elongated, threaded holes, slots and perforations used to facilitate the attachment of the horizontal steel framing members to the vertical framing members and to facilitate the attachment of the vertical framing members to the attachment brackets. A description of the size, shape and location of holes in the horizontal framing members to facilitate drainage of water shall be included in the description of the horizontal framing members. The material specifications shall include the applicable national standard, the grade, class, specified yield strength, specified tensile strength, elongation properties, base-metal thickness, and coating.

2.1.1.3 Fasteners:

2.1.1.3.1 Bolts: The description of the bolts used to connect the steel framing members together and to connect the attachment brackets to the steel framing members of the system shall include dimensions, applicable national standard, grade, material type and corrosion protective coatings.

2.1.1.3.2 Rivets: The description of the rivets used to fasten the steel backer panels of the veneer panels to the horizontal steel framing members shall include fastener material, type, size (length and diameter), grade, grip range, corrosion-resistant coating description and the applicable national standard. The quantity and location of the fasteners, to be used at the jobsite to attach each veneer panel, shall also be included.

2.1.1.4 Flashing: Details illustrating the installation of flashing at the locations described in Section 1405 of the IBC 2009 IBC Section 1405.4 and 2006 IBC Section 1405.3 shall be provided for inclusion in the evaluation report.

2.1.1.5 Expansion Joints: Evidence of the expansion joint material's compliance with Section 2.5B of TMS 602/ACI 530.1/ASCE 6 for use under the 2009 IBC and IRC and Section 2.5B of ACI 530.1-05/ASCE 6-05/TMS 602-05 for use under the 2006 IBC and IRC shall be submitted. Details illustrating the installation of expansion joints and the maximum spacing permitted between joints shall be provided.

2.1.1.6 Joint Treatment: The method of treating the joints between panels shall be specified.

2.1.2 Installation Instructions: Published installation instructions for the wall covering system bearing the date of publication. The installation instructions shall comply with 2009 and 2006 IBC Sections 1403.2 and 2512.1, Sections 6.1.6 and 6.2.2.7 of TMS 402/ACI 530/ASCE 5 for use under the 2009 IBC and IRC, and Sections 6.1.5 and 6.2.2.7 of ACI 530/ASCE 5/TMS 402 for use under the 2006 IBC and IRC.

The instructions shall address installation of each veneer panel type on each type of supporting wall, and the structural support system intended in all locations. As a minimum, instructions shall include:

- a. Preparation of supporting wall.
- b. Application of water-resistive barrier and flashing.

- c. Installation of vertical and horizontal framing members of the wall covering system to the wall, including methods of assuring that the horizontal framing members are properly located so that the veneer panels are provided with consistent support at each horizontal framing member. The spacing of horizontal and vertical framing members shall be included in the instructions.
- d. The method of installing the veneer panels onto the horizontal framing members and a description of the mechanical attachment of each panel to the horizontal framing member with rivets.
- e. Method of interconnecting the veneer panels.
- f. Jobsite mortar preparation, application, thickness and curing instructions, for veneer panels installed with mortar at joints between veneer panels.
- g. Ambient temperatures for jobsite application of mortar, when used in the system.
- h. Width and depth of mortar/grout joints, when used in the system.
- i. Installation of exterior plaster over the stucco substrate veneer panels with the metal plaster base factory-attached to steel backer panel.

In addition, the following information shall be submitted to explain the installation of the product:

2.1.2.1 Illustrated Details: As a minimum, illustrations shall be submitted of the following:

- a. Details at the head, sill and jambs of windows and doors showing flashing, sealing and support requirements.
- b. Closures and flashing at other veneer terminations, such as eaves and sills, and where abutting dissimilar exterior wall coverings.
- c. Typical conditions within the field of the veneer, showing substrates, drainage media, water-resistive barriers, and control joints.
- d. Detail at the bottom of the wall illustrating the means for drainage of water from behind the veneer panels.
- e. Details of attachment of supporting steel brackets to framing and/or foundation.
- f. Connection of attachment bracket to vertical framing member of the system.
- g. Connection of vertical framing member to horizontal framing member.
- h. Connection of veneer panel to horizontal framing member.

2.1.2.2 Limitations: Limitations on usage, such as veneer panel height, wind and/or seismic loading, and minimum and maximum angle of installation, if applicable, shall be specified. For recognition under the IRC, the total thickness of the veneer system shall not exceed 5 inches (127 mm).

2.1.2.3 Joints: Required locations and details of masonry joints used to control cracking, if applicable.

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2.1.2.4 Field Preparation: Method of field cutting, trimming or forming, and treatment of cut edges and cut ends of the veneer panels and steel framing members.

2.1.3 Packaging and Identification: The method of packaging and identification of the wall covering system components assembled and applied at the jobsite. Identification provisions shall include the evaluation report number, product name and company name of the wall covering system manufacturer. The labels for the veneer panels shall also include the name or logo of the inspection agency. In addition, the steel framing members shall have a legible label, stamp or embossment, at a maximum of 48 inches (1219 mm) on center, including the manufacturer's name, logo or initials; the evaluation report number (ICC-ES ESR-XXXX); material minimum base-metal thickness (uncoated) in decimal thickness or mils; minimum specified yield strength [if greater than 33 ksi (228 MPa)]; and coating grade [if G60 or greater].

2.2 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.

2.3 Test Reports: Test reports required by this acceptance criteria shall comply with AC85 and also include the following:

1. Documentation of the test laboratory witnessing the manufacturing of the veneer panels, and fabrication and installation of the assembly test specimens.
2. Documentation of the test laboratory witnessing the preparation of component test specimens (such as the mortar strength or durability test specimens, bolted connection test specimens), including a complete description of the component specimens, density, mix proportions and curing.
3. Description of test procedures, along with details.
4. Test observations, including description of test specimen before and after testing. Description shall be supported by photographs.
5. Descriptions of sampled veneer panels.
6. Age of specimens at time of testing. Tests must be conducted within 45 days of specimen preparation.
7. Curing, storage, handling and conditioning procedures of test specimens.

2.4 Product Sampling: For the tests specified under this criteria, the components of the test specimens must be representative of normal manufacture and sampled in accordance with Section 3.1 or 3.2 of AC85, except the veneer panels must be sampled in accordance with Section 3.1 of AC85. The testing laboratory shall witness assembly of the test specimens to reflect field assembly procedures (see also Section 2.3).

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 Water-resistive Barrier: A water-resistive barrier is required under the wall covering system prior to installation of the attachment brackets for the vertical framing members of the system. For installation under the IBC, the water-resistive barrier shall comply with IBC Section 1404.2. For installations under the IRC, the water-

resistive barrier shall be a weather-resistive sheathing paper complying with IRC Section R703.2.

3.2 Veneer Panels:

3.2.1 Veneer Units:

3.2.1.1 Thin Clay Bricks: The specifications for the thin clay bricks shall be ASTM C 1088, grade exterior.

3.2.1.2 Artificial Cast Stone Veneer:

3.2.1.2.1 Thickness: The thickness of the artificial cast stone veneer shall be a minimum of 1.5 inches (38 mm) and a maximum of 2.625 inches (67 mm).

3.2.1.2.2 Physical Properties: The compressive strength, cold-water absorption, boiling-water absorption and linear drying shrinkage of the artificial cast stone veneer shall be demonstrated to comply with the requirements of ASTM C 1364 Sections 5.1, 5.2, 5.3 and 5.7, respectively, with tests conducted in accordance with ASTM C 1194, ASTM C 1195, ASTM C 1195 and ASTM C 426, respectively. The specimens shall be cut from artificial cast stone veneer panels, with the steel backer panel removed from the test specimens prior to testing.

3.2.1.2.3 Weight: The average saturated weight of the artificial cast stone veneer per unit area of wall shall not exceed 15 psf (718 Pa) based on the equilibrium density, increased by the percentage of cold-water water absorption determined under Section 3.2.1.2.1. The equilibrium density shall be determined in accordance with ASTM C 567.

3.2.1.2.4 Durability:

3.2.1.2.4.1 General: The freeze-thaw resistance durability of the artificial cast stone veneer and the durability of the bond of the artificial cast stone to the steel backer panel shall be demonstrated with tests conducted in accordance with Procedure A of ASTM C 666, as specified in ASTM C 1364, on 12-inch-by-24-inch (305 by 610 mm) specimens cut from the artificial cast stone veneer panels.

3.2.1.2.4.2 Conditions of Acceptance: Based on the average of three specimens, the cumulative percent mass loss (CPWL) of the freeze-thaw specimens shall comply with the requirements of Section 5.6.3 of ASTM C 1364. In addition, the average shear bond strength of the artificial cast stone to the steel backer panel of a minimum of five control specimens and five specimens subjected to freeze-thaw conditions, shall be a minimum of 50 psi (345 kPa). The test method used in the shear bond tests shall be as specified in ASTM C 1354 for load applied to surface.

3.2.1.3 Stucco Substrate Veneer Panels:

3.2.1.3.1 Cement Backerboard: The specifications for the cement backerboard of the stucco substrate veneer panels shall require the cement backerboard to have a minimum $\frac{1}{4}$ -inch thickness and be a Type A non-asbestos fiber-mat reinforced cement substrate sheet complying with ASTM C 1325, including the requirements in the Supplementary Requirements section of ASTM C 1325. These requirements specify testing of the cement backerboard in accordance with ASTM C 473, ASTM C 666, ASTM C 947, ASTM C 1185, ASTM D 1037, ASTM D 1037, ASTM D 2394, ASTM G 21, and ASTM G 22. Reports of tests demonstrating that the cement

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backerboard complies with these requirements need to be submitted.

3.2.1.3.2 Metal Plaster Base: The specifications for the metal plaster base shall require it to comply with the ICC-ES Acceptance Criteria for Metal Plaster Bases (Lath) (AC191).

3.2.1.4 Metal: The specifications for the metal veneer shall require the veneer to be steel with a minimum galvanization coating weight of G90 and a minimum base-metal thickness complying with 2009 IBC Section 1405.11 and 2006 IBC Section 1405.10.

3.2.2 Mortar:

3.2.2.1 Mortar Physical Properties:

3.2.2.1.1 Compressive Strength: The compressive strength of the mortar used in the preparation of the specimens for the qualification tests described in Sections 3.2.2.2, 3.2.2.3 and 3.8 shall be determined in accordance with ASTM C 1439 and ASTM C 348, except that the compressive strength of the mortar shall be determined by tests in accordance with ASTM C 109, as modified by ASTM C 1439. The compressive strength of the mortar specimens shall be the basis for the quality control specifications for the mortar used in the production of the veneer panels. The freshly mixed mortar tests specified in ASTM C 1439 shall be conducted on the mortar used in the compressive strength tests, and the results of the freshly mixed mortar tests recorded in the test report. The tests of a reference mortar, as noted in ASTM C 1439, are not required under this criteria.

3.2.2.1.2 Flexural Strength: The flexural strength of the mortar used in the preparation of the specimens for the qualification tests described in Sections 3.2.2.2, 3.2.2.3 and 3.8 shall be determined in accordance with ASTM C 348 on mortar specimens prepared and cured in accordance with ASTM C 1439 and ASTM C 348. The flexural strength of mortar specimens shall be the basis for the quality control specifications for the mortar used in the production of the veneer panels.

3.2.2.1.3 Tensile Strength: The tensile strength of the mortar used in the preparation of the specimens for the qualification tests described in Sections 3.2.2.2, 3.2.2.3 and 3.8 shall be determined in accordance with ASTM C 307 on specimens prepared and cured in accordance with ASTM C 1439 and ASTM C 307. The tensile strength of mortar specimens shall be the basis for the quality control specifications for the mortar used in the production of the veneer panels.

3.2.2.2 Mortar Durability:

3.2.2.2.1 Freeze-thaw Resistance: The durability of the bond of the mortar used to factory-attach the thin clay bricks to the steel backer panel, when subjected to freeze-thaw conditions, shall be tested in accordance with ASTM C 1262, except as amended by this criteria. Two sets of specimens are required, since one specimen set shall be tested with a test solution of water and the second set of specimens shall be tested with a 3 percent saline solution. Each specimen set shall consist of five veneer panel sections, each having minimum height and width dimensions of 24 and 12 inches (610 and 305 mm), respectively, but of sufficient size such that the specimen contains representative factory-installed mortar head and

bed joints of the veneer units. The specimens shall be cured and maintained for a minimum of 28 days at 50 percent relative humidity and 70°F. ($\pm 3^\circ\text{F}$) ($21.1^\circ\text{C} \pm 1.66^\circ\text{C}$). If the panels are cut using water, the specimens shall be returned to these conditions for a minimum of 48 hours prior to commencement of the freeze-thaw exposure. After curing, the specimens shall be placed with the steel backer panel side down in the container and submerged so that approximately 50 percent of the mortar thickness is under the water. Each specimen shall be subjected to 50 freeze-thaw cycles.

The conditions of acceptance are that the maximum weight loss of each specimen shall not exceed 0.5 percent; the veneer, mortar and steel backer panel must not crack or degrade; and there shall be no debonding between the components of the test specimens. In addition, a minimum of five mortar bond tests in accordance with Section 3.2.2.3.1 and five mortar bond tests in accordance with Section 3.2.2.3.2 shall be performed on the freeze-thaw specimens. The average bond strength of each set of specimens shall be at least 95 85 percent of the corresponding results for tests conducted under Sections 3.2.2.3.1 and 3.2.2.3.2.

3.2.2.2.2 Ultraviolet Light Resistance: Quarter size thin clay brick veneer panels with mortared joints [12 inches by 24 inches (305 mm by 610 mm)] shall be subjected to a minimum of 2000 hours of accelerated weathering using Cycle No. 1 of ASTM D 4587. Following the weathering period, the specimens shall be tested in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2. The average bond and shear strength of each set of five specimens shall be at least 95 85 percent of the corresponding results for tests conducted in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2.

3.2.2.2.3 Wet/Dry Cyclic Resistance: Quarter size thin clay brick veneer panels with mortared joints [12 inches by 24 inches (305 mm by 610 mm)] shall be subjected to 50 wet/dry cycles in accordance with ASTM C 67, modified such that the specimens shall be immersed in water with the steel backer side down, with the specimens exposed to 16 hours at 70°F (21.1°C), followed by eight hours of air drying at 70°F (21.1°C). Following the wet/dry cyclic exposure, the specimens shall be tested in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2. The average bond and shear strength of each set of five specimens shall be at least 95 85 percent of the corresponding results for tests conducted in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2.

3.2.2.2.4 Heating/Cooling Cyclic Resistance: Quarter size thin clay brick veneer panels with mortared joints [12 inches by 24 inches (305 mm by 610 mm)] shall be subjected to 50 heating/cooling cycles. Each cycle shall consist of exposure of the specimens to 140°F (60°C) for 16 hours followed by eight hours at 70°F (21.1°C). Following the heating/cooling cyclic exposure, the specimens shall be tested in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2. The average bond and shear strength of each set of five specimens shall be at least 95 85 percent of the corresponding results for tests conducted in accordance with Sections 3.2.2.3.1 and 3.2.2.3.2.

3.2.2.3 Veneer Unit to Steel Backer Panel Mortar Connection Strength: This criteria section is applicable

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to the thin clay brick veneer panels which have the veneer units factory-attached to the steel backer panels with mortar. The veneer's attachment to the steel backer panel to be included in the evaluation report shall be evaluated under both Section 3.2.2.3.1 and Section 3.2.2.3.2. Where the average bond strength or shear strength of the mortar determined under Section 3.2.2.2 is less than the average strength from tests under Section 3.2.2.3.1 or 3.2.2.3.2, the average strength from the tests of aged specimens under Section 3.2.2.2 shall be used to calculate the allowable mortar-to-veneer unit shear strength and mortar-to-steel backer tensile strength under Section 3.2.2.3.1, and to calculate the allowable mortar-to-steel backer shear strength under Section 3.2.2.3.2.

3.2.2.3.1 Forces Due to Outward Wind Pressure:

The strength of the mortared connection of the veneer unit to the steel backer panel for outward wind pressures shall be evaluated by testing in accordance with the concentrated load test procedure of Section 13 of ASTM E 72, with the concentrated load applied to the back of the veneer units and with the load apparatus inserted through the punchouts provided in the steel backer panels. The test load shall be applied at a uniform rate of 0.25 inch per minute to veneer panel specimens that are representative of standard manufactured that have been cured and maintained for a minimum of 28 days at 50 percent relative humidity and 70°F ($\pm 3^\circ\text{F}$) ($21.1^\circ\text{C} \pm 1.66^\circ\text{C}$). If the panels are cut using water, the specimens shall be returned to these conditions for a minimum of 48 hours prior to commencement of the load test. The test specimen shall be supported on the veneer units adjacent to the load tested veneer unit.

The load at failure of a minimum of five specimens shall be analyzed utilizing Method B of ASTM C 1531 to calculate the mortar-to-veneer unit shear strength. The value of A_j , used in the analysis to calculate the shear strength of the mortar-to-veneer unit, shall be the surface contact area between the veneer unit and mortar, measured around the perimeter of the tested veneer unit. The allowable mortar-to-veneer unit shear strength must be based on a minimum safety factor of 4.0, applied to the average of these test results.

The average mortar-to-steel backer tensile bond strength shall be calculated by dividing the average load at failure of the five specimens by a factor of 2.0 (the factor of 2.0 is based on there being two veneer units adjacent to each mortar joint) and dividing the result by the contact area of the mortar on the steel backer located around the perimeter of the load-tested veneer unit. The allowable mortar-to-steel backer tensile strength must be based on a minimum safety factor of 4.0, applied to the average of these test results.

The allowable outward wind loads for the attachment of the veneer units to the steel backer panel by the mortar shall be calculated by dividing the average load at failure of the five specimens by a factor of 2.0 (the factor of 2.0 is based on there being two veneer units adjacent to each mortar joint), dividing by the surface area of the veneer unit and dividing by a minimum safety factor of 4.0. The allowable outward wind pressure for the veneer unit-to-steel backer shall exceed the allowable outward wind pressures derived under Section 3.8.4 3.8.5 of this criteria.

3.2.2.3.2 Forces Due to Veneer Unit Gravity Loads:

The strength of the mortar to transfer the veneer unit gravity load from the veneer unit to the steel backer panel shall be evaluated by testing a minimum of five specimens in accordance with ASTM C 1354, with the test apparatus modified to accommodate the veneer units and steel backer panel, and the load applied parallel to the surface of the panel. The uplift restraint device, illustrated in Figure 4 of ASTM C 1354, shall either not be used during the tests or shall not contact the steel backer of the test specimens. Each specimen shall be a single veneer unit attached to the steel backer with mortar around the perimeter edge of the veneer unit, with each specimen representative of standard manufacture and cured and maintained for a minimum of 28 days at 50 percent relative humidity and 70°F ($\pm 3^\circ\text{F}$). If the panels are cut using water, the specimens shall be returned to these conditions for a minimum of 48 hours prior to commencement of the load test. The average mortar-to-steel backer shear bond strength shall be calculated by dividing the average load at failure of the five specimens by a factor of 2.0 (the factor of 2.0 is based on there being two veneer units adjacent to each mortar joint) and dividing the result by the contact area of the mortar on the steel backer located around the perimeter of the load-tested veneer unit. The allowable mortar-to-steel backer shear strength must be based on a minimum safety factor of 4.0, applied to the average of these test results.

The allowable mortar-to-steel backer shear strength must exceed the shear stress at the mortar-to-steel backer interface due to the saturated weight of the veneer unit.

3.2.3 Factory-installed Veneer Panel Fasteners: The screws used to factory-attach the metal plaster base to the steel backer panel of the stucco substrate veneer panels shall be Class G90 zinc-coated fasteners complying with, and installed in accordance with, ASTM C 1063, as required by IBC Section 2510.3 and IRC Section R703.6.

The screws used to factory-attach the metal veneer to the steel backer of the metal veneer panels shall be self-drilling, steel tapping screws complying with the requirements specified in the ICC-ES Acceptance Criteria for Tapping Screw Fasteners (AC118) for the fasteners for use under the IBC and IRC, except that for use under the IBC, the test period for the corrosion resistance test of the fastener coating must be a minimum of 96 hours.

3.2.4 Steel Backer Panels: The steel backer panels shall be cold-formed from galvanized steel with a minimum Class G90 zinc-coating complying with ASTM A 653. The steel shall be one of the types and grades of steel listed in Section A2 of AISI S100 for use under the 2009 IBC and IRC and Section A2 of AISI-NAS for use under the 2006 IBC and IRC.

3.3 Rivets:

3.3.1 General: The specifications for the rivets used to fasten the steel backer panels to the horizontal framing members shall require the rivets to be Grade 30 carbon steel rivets complying with IFI-130, with a minimum 0.0015-inch-thick (0.038 mm) zinc-coating in accordance with IFI-134. The rivets shall be tested in accordance with ASTM B 117 for a minimum 96-hour period. The rivets shall not show products of corrosion from either the

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coating (white corrosion) or from the base metal (red rust) at the end of the test period.

3.3.2 Riveted Connection Strength: The shear capacity of the steel-to-steel riveted connections of the steel backer panel of the veneer panels to the horizontal steel framing members shall be determined with testing and data analysis similar to that described for bolted connections in Sections 3.5.2 through 3.5.4. The testing of the riveted connection shall encompass installation of the rivets in the most critical fastener location, such as centered on the holes in the flanges of the horizontal framing member.

The actual yield strength, tensile strength, base-metal thickness and elongation properties of the steel backer panel and steel framing members of the load-test specimens shall be determined in accordance with Section 3.5.5 of this criteria.

3.4 Steel Framing Members and Attachment Brackets: The steel framing members and attachment brackets shall be galvanized with a minimum Class G90 (0.90 ounce of zinc per square foot) zinc-coating complying with ASTM A 653.

3.5 Proprietary Bolted Connections of the Wall Covering Systems Framing System:

3.5.1 General: The shear and tension capacity of the steel-to-steel bolted connections of the horizontal steel framing members to the vertical steel framing members shall be determined in accordance with the bolted connection testing and data analysis requirements of Sections 3.5.2 through 3.5.4. The actual yield strength, tensile strength, base-metal thickness and elongation properties of the steel framing members and attachment brackets of the load-test specimens shall be determined in accordance with Section 3.5.5 of this criteria.

3.5.2 Connection Load-tests: Tension and shear tests of the steel-to-steel bolted connections shall be conducted in accordance with ~~AISI TS 5-02~~ AISI S905-08 on test specimens assembled in accordance with the installation instructions of the veneer wall covering system evaluation report applicant. For steel-to-steel bolted connections of bolts installed through elongated holes, the shear load-tests must be conducted with the length of the elongated holes parallel to the load direction. The minimum number of test specimens for each specific connection condition shall be in accordance with Section 3.5.3.2.

3.5.3 Analysis of Bolted Connection Test Results:

3.5.3.1 General: The strength of the bolted connection shall be determined in accordance with Sections 3.5.3.2 and 3.5.3.3, with adjustments to the values in accordance with Section 3.5.3.4.

3.5.3.2 Number of Bolted Connection Test Specimens and Determination of the Average Maximum Strength: The average maximum strength of each specific bolted connection shall be based on the average of the maximum load values of at least three identical specimens, provided the maximum load value of each test specimen does not deviate by more than 15 percent from the average value. If any of the test results has a greater deviation from the average value, additional

identical specimens shall be tested, such that the deviation of each test result does not exceed 15 percent of the average for all tested specimens or at least three additional specimens have been tested. All tests shall be considered, unless there is a rationale for exclusion of individual test results, such as a test equipment malfunction. The average of the maximum load values is the nominal strength, R . The coefficient of variation, V_p , of the maximum load values of the test specimens shall be determined by statistical analysis.

3.5.3.3 Connection Strength: The allowable load for use in allowable strength design shall be calculated as follows:

$$R_a = \frac{R}{\Omega}$$

where:

R_a = Allowable strength of the connection (lbs or N).

R = Average value of all test results (lbs or N).

Ω = Factor of safety to be computed as follows:

$$\Omega = \frac{1.6}{\phi} \geq 3.75$$

where:

$$\phi = 1.67e^{-3.5\sqrt{0.0766 + C_p V_p^2}}$$

where:

e = Natural logarithmic base (2.718).

$$C_p = \text{Correction factor} = \frac{\left(1 + \frac{1}{n}\right)^m}{(m - 2)}$$

for $n \geq 4$, and 5.7 for $n = 3$.

n = Number of tests performed.

m = Degrees of freedom = $n - 1$.

V_p = Coefficient of variation of the test results, but not less than 6.5 percent.

3.5.4 Connection Strength Adjustments:

3.5.4.1 Steel Sheet Physical Properties: If the actual yield strength of the steel sheets of the bolted connection load-test specimens, as determined in accordance with Section 3.5.5 of this criteria, exceeds the specified yield strength for the steel sheets, the results of the bolted connection load-tests shall be adjusted down to the steel's specified yield strength by multiplying the average maximum strength of the connection by the ratio of F_y (specified) / F_y (actual). Connection test results shall not be increased if the actual yield strength of the steel sheets is less than the specified yield strength.

Where the actual tensile strength of the steel sheets of the tested connections exceeds the specified tensile strength for the steel sheets, the results of the connection load-tests shall be adjusted downward based on the steel sheet's tensile strength, instead of the steel sheet's yield strength.

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3.5.4.2 Steel Sheet Thickness: Downward adjustment of the connection load-test results shall be made when a variation or difference exists between the design base-metal thickness of the steel sheets and the base-metal thickness of the steel sheets of the bolted connection load-test specimens.

3.5.5 Steel Sheet Physical Properties and Thickness: The actual yield strength, tensile strength, elongation and base-metal thickness of the steel sheets of the bolted connection load-test specimens tested under Section 3.5 of this criteria shall be determined by conducting tension tests of coupons in accordance with ASTM A 370. The tension test coupons shall be taken from a flat undamaged area of the steel sheet. When the steel sheet is profiled, the length of the tension test coupons shall be oriented parallel to the profiles. Where the number of steel coupon specimens is not specified in the specific standard, a minimum of three, single, sheet-type coupon specimens shall be tested to demonstrate compliance with the applicable standard for the steel sheet and to determine the base-metal thickness of the steel sheets, excluding all coatings such as zinc galvanization. Three identical coupon specimens shall be tested provided the deviation of each individual test result from the average value obtained from all tests does not exceed 15 percent. If deviation from the average value exceeds 15 percent, more coupon tests shall be performed until the deviation of each individual test result from the average value obtained from all tests does not exceed 15 percent, or until at least three additional tests have been performed. All tests shall be considered, unless there is a rationale for exclusion of individual test results, such as a test equipment malfunction. The actual yield strength, tensile strength, elongation and base-metal thickness is the average of the tested values.

3.6 Joint Sealants: Sealants used at control joints, intersections, or terminations of the clay brick veneer panels, artificial cast stone veneer panels and stucco substrate veneer panels, around the perimeter of each stucco substrate veneer panel after plaster application, and at intersections with dissimilar materials, wall/eave interfaces, penetrations, and openings, shall be a minimum Type S or M, minimum Grade NS, minimum Class 25, Use O sealant complying with ASTM C 920, and shall be compatible with the mortar, thin brick, artificial cast stone and plaster materials used in the panels. Under the Use O classification, the sealant shall be qualified for each of the materials to which the sealant will be applied, by the adhesion and cohesion under cyclic movement and adhesion-in-peel tests of Sections 8.8 and 8.9 of ASTM C 920. The details of the sealant installation, including the width and thickness, shall be designed by a registered design professional, designer, builder or veneer panel evaluation report applicant, in that order, to the satisfaction of the code official.

3.7 Metal Veneer Units Mechanically Attached to the Steel Backer Panel:

3.7.1 General: This criteria section addresses the metal veneer panel with metal veneer units mechanically attached to the steel backer panels

3.7.2 Metal Veneer to Steel Backer Panel Attachment: The metal veneer shall be attached to the

steel backer panel in compliance with 2009 IBC Section 1405.11.1 and 2006 IBC Section 1405.10.1. The attachment of the metal veneer units to the steel backer panels shall be evaluated by testing in accordance with the concentrated load-test procedure of Section 13 of ASTM E 72, with the concentrated load applied to the back of the metal veneer units and with the load apparatus inserted through the punchouts provided in the steel backer panels. The test load shall be applied at a uniform rate of 0.25 inch per minute to veneer panel specimens that are representative of standard manufacture. The test specimen shall be supported on the metal veneer units adjacent to the load-tested metal veneer unit. The allowable outward wind loads for the attachment of the veneer units to the steel backer panel shall be calculated by dividing the average load at failure of the five specimens by the surface area of the veneer unit and dividing by a minimum safety factor of 4.0. The allowable outward wind pressure for the veneer unit-to-steel backer shall exceed the allowable outward wind pressures derived under Section 3.8.5 of this criteria. The allowable wind load shall be the average of the maximum test load of a minimum of five specimens for each tested configuration divided by a safety factor of 4.

3.8 Veneer Panel and Steel Framing Members Structural Assembly Performance:

3.8.1 General: This criteria section is applicable to all veneer panel types under consideration for inclusion in the evaluation report. The test specimens under this section of this criteria shall represent the critical conditions of installation. This includes the maximum horizontal and vertical steel framing member spacing, maximum attachment bracket spacing, minimum base-metal thickness of the steel backer panel and any other conditions that affect the structural performance of the system. The test assembly shall not include mortar in the panel joints that represents jobsite-installed mortar.

3.8.2 Gravity Loads:

3.8.2.1 General: Gravity load tests in accordance with Section 4.1 are required to evaluate the ability of the veneer wall covering system to transfer the weight of the veneer to the supporting structure.

3.8.2.2 Conditions of Acceptance: The maximum weight of the veneer panels shall be equal to the average of the maximum loads from tests in accordance with Section 4.1, divided by a minimum factor of safety of 4, provided the following provisions are satisfied:

3.8.2.2.1 No single test result varies by more than 15 percent from the average result for three tests. Variations exceeding this limit require larger safety factors.

3.8.2.2.2 The allowable gravity load does not exceed the allowable veneer weight based on the allowable strength of the mortar attaching the veneer units to the steel backer panel.

3.8.2.2.3 The allowable gravity load does not exceed the allowable shear strength of the steel-to-steel connections, as applicable, determined in accordance with Section 3.5 of this criteria. The analysis of the connections shall consider load eccentricities.

3.8.3 In-plane Horizontal Seismic Shear Loads:

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3.8.3.1 General: In-plane horizontal shear tests in accordance with Section 4.2 are required to evaluate the ability of the veneer wall covering system to transfer the in-plane, horizontal seismic force due to the weight of the veneer to the supporting structure.

3.8.3.2 Conditions of Acceptance: The maximum in-plane horizontal seismic shear force due to the weight of the veneer panels shall be equal to the average of the maximum loads derived from the tests conducted in accordance with Section 4.2, divided by a minimum factor of safety of 4, provided the following provisions are satisfied:

3.8.3.2.1 No single test result varies by more than 15 percent from the average for three tests. Variations exceeding this limit requires larger safety factors.

3.8.3.2.2 The allowable load does not exceed the allowable strength of the rivets used to attach the steel backer panel to the horizontal framing member of the system.

3.8.3.2.3 The allowable load does not exceed the allowable shear strength of the steel-to-steel connections, as applicable, determined in accordance with Section 3.5 of this criteria.

3.8.4 In-plane Upward Seismic Shear Loads:

3.8.4.1 General: In-plane uplift seismic shear load-tests in accordance with Section 4.3 are required to evaluate the ability of the veneer wall covering system to transfer the upward seismic force due to the weight of the veneer to the supporting structure.

3.8.4.2 Conditions of Acceptance: The maximum in-plane upward seismic shear force due to the weight of the veneer panels shall be equal to the average of the maximum loads derived from tests in accordance with Section 4.3, divided by a minimum factor of safety of 4, provided the following provisions are satisfied:

3.8.4.2.1 No single test result varies by more than 15 percent from the average for three tests. Variations exceeding this limit require larger safety factors.

3.8.4.2.2 The allowable load does not exceed the allowable strength of the rivets used to attach the steel backer panel to the horizontal framing member of the system.

3.8.4.2.3 The allowable load does not exceed the allowable shear strength of the steel-to-steel connections, as applicable, determined in accordance with Section 3.5 of this criteria. The analysis of the connections shall consider load eccentricities.

3.8.5 Transverse Wind Loads:

3.8.5.1 General: Transverse load-tests in accordance with Section 4.4 are required to determine allowable inward and outward wind pressures for the veneer wall covering system.

3.8.5.2 Conditions of Acceptance: The allowable inward and outward pressures shall be based on a minimum factor of safety of 3 applied to the average maximum load if the following three provisions are satisfied:

3.8.5.2.1 No single test result varies by more than 15 percent from the average for three tests. Variations exceeding this limit requires larger safety factors.

3.8.5.2.2 Allowable outward wind pressure does not exceed the allowable pressure based on the allowable strength of the mortar attaching the veneer units to the steel backer panel.

3.8.5.2.3 Allowable inward and outward wind pressures do not exceed the allowable tension or shear strength of the steel-to-steel connections, as applicable, determined in accordance with Section 3.5 of this criteria.

3.9 Attachment to Walls: For installation over concrete or masonry walls, the attachment brackets of the veneer wall covering system shall be attached to the wall with fasteners. For installations over wood or steel frame walls, the horizontal steel framing members or attachment brackets of the veneer wall covering system shall be attached to the wall framing members with fasteners. The fasteners shall be any fastener designated by the report applicant, provided the fasteners are not the failure mode in the tests and the evaluation report states that the fastener shall be designed to the satisfaction of the code official for the gravity load of the veneer wall covering system and design wind loads. The analysis of the connections to the supporting wall shall consider load eccentricities.

3.10 Noncombustible Construction: When the wall covering system is to be evaluated for use in Types I, II, III and/or IV construction, the veneer shall be fabricated from a code-recognized noncombustible material, or testing shall be submitted to establish compliance with either Section 703.4 or Section 1406.2 of the 2009 and 2006 IBC. For veneer systems with combustible materials, the distance between the back of the wall covering and the wall shall comply with 2009 IBC Section 1406.2.4 and the space shall be fireblocked as noted in 2009 IBC Section 1406.2.4.

4.0 TEST METHODS

4.1 Gravity Load Tests:

4.1.1 Test Procedure: The gravity load tests as required by Section 3.8.2 shall be conducted in accordance with ASTM C 1354, with the loads applied parallel to the surface of the veneer, parallel to the length of the vertical framing of the system in the gravity load direction. Specimens shall be mounted in a vertical orientation. A minimum of three assemblies shall be tested.

4.1.2 Test Specimens: Each specimen shall be an assembly of multiple veneer panels with the intended framing members and connections, with each specimen of sufficient size to represent the end use installation conditions, reflecting the tributary gravity loads that the system components and connections are required to support. The horizontal and vertical steel framing members shall be located at the maximum spacing for which recognition is sought. The components and configuration of the test specimens shall be based on minimum conditions, since test specimens establish the basis of acceptance. The base-metal thickness and physical properties of the steel of the framing members,

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attachment brackets and veneer backer panel also establish the minimum basis of acceptance.

4.2 In-plane Horizontal Seismic Shear Tests:

4.2.1 Test Procedure: The in-plane horizontal seismic shear load-tests as required by Section 3.8.3 shall be conducted in accordance with ASTM C 1354, with the loads applied parallel to the surface of the veneer, perpendicular to the length of the vertical framing of the system. Specimens shall be mounted in a vertical orientation. A minimum of three assemblies shall be tested.

4.2.2 Test Specimens: Each specimen shall be an assembly of multiple veneer panels with the intended framing members and connections, with each specimen of sufficient size to represent the end use installation conditions, reflecting the tributary seismic loads that the system components and connections are required to support. The horizontal and vertical steel framing members shall be located at the maximum spacing for which recognition is sought. The components and configuration of the test specimens shall be based on minimum conditions, since test specimens establish the basis of acceptance. The base-metal thickness and physical properties of the steel of the framing members, attachment brackets and veneer backer panel used in the test specimens also establish the minimum requirements.

4.3 In-plane Upward Seismic Shear Tests:

4.3.1 Test Procedure: The in-plane upward seismic shear load-tests as required by Section 3.8.4 shall be conducted in accordance with ASTM C 1354, with the loads applied parallel to the surface of the veneer, parallel to the length of the vertical framing of the system, in the opposite direction to gravity loads. Specimens shall be mounted in a vertical orientation. A minimum of three assemblies shall be tested.

4.3.2 Test Specimens: Each specimen shall be an assembly of multiple veneer panels with the intended framing members and connections, with each specimen of sufficient size to represent the end use installation conditions, reflecting the tributary seismic loads that the system components and connections are required to support. The horizontal and vertical steel framing members shall be located at the maximum spacing for which recognition is sought. The components and configuration of the test specimens shall be based on minimum conditions, since test specimens establish the basis of acceptance. The base-metal thickness and physical properties of the steel of the framing members, attachment brackets and veneer backer panel used in the test specimens also establish the minimum requirements.

4.4 Transverse Load Structural Tests:

4.4.1 Test Procedure: The transverse load structural tests of the wall covering system required by Section 3.8.5 shall be in accordance with ASTM E 330, Procedure B. Application of load to ultimate shall consist of at least six increments, with a 60-second load duration for each increment. Specimens shall be mounted in accordance with ASTM E 330 in a vertical orientation to prevent disconnection of the veneer from the steel framing. At

least three positive and three negative load-tests must be conducted, for each veneer and/or method of attachment.

4.4.2 Test Specimens: The specimens shall be an assembly of the veneer panels with framing members and shall have a width that is a minimum of twice the maximum spacing of the vertical steel framing members of the wall covering system or twice the veneer panel width, whichever is greater, and not less than 4 feet (1219 mm). (This will ensure a minimum of three vertical framing members on the test assembly.) The height of the specimen shall be a minimum of three times the veneer panel height but not less than 4 feet (1219 mm) to ensure the test assembly includes at least three full-height veneer panels. The horizontal steel framing members shall be located at the maximum spacing for which recognition is sought. The components and configuration of the test specimens shall be based on minimum conditions since test specimens establish the basis of acceptance. The base-metal thickness and physical properties of the steel framing members, attachment brackets and veneer backer panel used in the test specimens also establish the minimum basis of acceptance.

5.0 QUALITY CONTROL

5.1 The veneer panels shall be manufactured under an approved quality control program with inspections by an inspection agency accredited by the International Accreditation Service (IAS) or otherwise acceptable to ICC-ES.

5.2 Third-party follow-up inspections are not required under this criteria for mortar, steel framing members or brackets, or the bolts used at connections.

5.3 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted for the manufacture of the proprietary mortar and the steel framing members and brackets, and for fabrication of the veneer panels.

In addition, the quality documentation for the steel framing members, brackets and steel backing panels shall also include sufficient detail to verify that each type of steel complies with the specifications and requirements noted in Sections ~~6.2~~ 6.1 through 6.7 of AC46.

6.0 EVALUATION REPORT RECOGNITION

The evaluation report shall include the following information:

6.1 Product description, installation instructions, and packaging and identification information for the veneer panels, jobsite-installed mortar, steel framing members and brackets, and rivets and other fasteners, based on the information submitted under Section 2.0 of this criteria. The installed weight of the system is to be included.

6.2 Allowable inward and outward wind pressures based on requirements in Section 3.8.5 of this criteria.

6.3 Statements regarding the attachment of the system to the supporting walls, consistent with Section 3.9 of this criteria.

6.4 Statements that the need for, and locations of, expansion and control joints shall be determined and specified by the registered design professional. Where a

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registered design professional is not involved, the designer or fabricator shall be responsible.

6.5 A statement as to the types of construction in which the product is recognized for use.

6.6 A statement, included in the Installation section of the evaluation report, that requires the installation to be performed only by qualified installers approved by the evaluation report applicant.

6.7 Statements that when regulation is by the IBC, a water-resistive barrier must be installed in accordance with 2009 and 2006 IBC Section 1404.2; and that when regulation is by the IRC, a weather-resistive sheathing paper must be installed in accordance with 2009 and 2006 IRC Sections R703.1 and R703.2.

6.8 A statement that for installation of the wall covering system under the IRC, the installation shall be in accordance with the requirements of 2009 and 2006 IRC Section R703.7

6.9 A statement that for installation of the wall covering system on walls of wood framing under the IBC, the installation is limited to 30 feet (9144 mm) in height above a noncombustible foundation. Installations on walls of wood framing above 30 feet (9144 mm) under the IBC are outside the scope of the report.

6.10 A statement that the riveted connection of the veneer panels to the horizontal steel framing members of the system shall be designed for seismic loads determined

in accordance with Chapter 13 of ASCE 7, utilizing the allowable loads for the riveted connection included in the evaluation report.

6.11 A statement that when the wall covering system is installed on an existing building, calculations by a registered design professional must be submitted to the code official establishing the ability of the existing structure to support the additional weight and applied loads of the system.

6.12 Each box of fasteners provided by the wall covering system evaluation report applicant shall bear a label, or be stamped with, the evaluation report applicant's company name.

6.13 A statement that the metal veneer panels must be grounded as required by 2009 IBC Section 1405.11.4 and 2006 IBC Section 1405.10.4.

6.14 A statement that when regulation is by the IBC, periodic special inspection shall be provided as required under 2009 IBC Section 1707.6 and 2006 IBC Section 1707.7.

6.15 A statement that when the wall covering system is attached to concrete or masonry walls, special inspection shall be provided for the installation of the fasteners to the concrete or masonry, as specified in the applicable fastener evaluation report.

6.16 A statement that all walls must be braced in accordance with the applicable code. ■