



February 22, 2008

TO: PARTIES INTERESTED IN EVALUATION REPORTS ON PRECAST STONE VENEER

SUBJECT: Acceptance Criteria for Precast Stone Veneer, Subject AC51-0208-R1 (EL/RK)

Dear Madam or Sir:

Enclosed is a copy of the subject revised acceptance criteria approved by the ICC-ES Evaluation Committee on February 6, 2008, effective March 1, 2008.

The approved revisions may be summarized as follows:

1. Removal of the word "portland" from Section 1.4.4, and revision of Section 2.1.1.1.1 to allow the use of cements meeting the requirements of Section 3.2.1 of ACI 318, including portland cement.
2. Editorial revision to Section 2.1.2.1 to add the term "brown coat."
3. Addition of language to Section 3.1.2 allowing the average saturated weight of the veneer to be based on the pattern of veneer with the largest average veneer thickness and density.
4. Deletion of the words "or later" from Table 1.

Regarding revisions that were proposed to Sections 4.7.1 and 4.7.3 of the criteria, concerning the strength of the mortar used in the shear bond testing, neither the revisions proposed by the MVMA, which were included in the staff memo to interested parties, dated December 28, 2007, nor the revisions proposed in the staff memo to the committee, dated February 1, 2008, were approved. As a result of the discussion at the committee hearing and additional discussions, staff is continuing to study this issue and seeks input from industry.

Currently, Item 4 of Section 4.7.1 of the criteria states that the shear bond test specimens are to be assembled using the mortar setting bed material recommended by the veneer manufacturer, with the mortar type described in the test report. Section 4.7.3 of the criteria requires the compressive strength of the mortar of the shear bond test specimens to be measured and be within 10 percent of the minimum compressive

strength specified in the code. Revisions were proposed because industry raised a concern that this requirement would be difficult to meet.

The discussion at the committee hearing and additional discussions have raised the following concerns:

1. Currently AC51 attempts to ensure that the mortar used in the shear bond testing is representative of field conditions by requiring the strength of the mortar used in the shear bond test to have a compressive strength that is within 10% of the minimum compressive strength specified in the code. The industry proposal considered at the hearing was for the shear bond specimens to be assembled using the proportion method of IBC Table 2103.8(1) with a mortar mix having the maximum quantity of sand permitted for the specified mortar type. However, since IBC Table 2103.8(1) contains three different mortars (cement-lime mortar, mortar cement mortar and masonry cement mortar) and more than one mix design for each mortar type, a question has been raised as to whether recognition of the end-use installation of the veneer needs to be limited to the specific mortar mix design used in the shear bond test specimens. The industry proposal has also raised the question of whether mortar complying with IBC Table 2103.8(2) should be permitted, if the compressive strength of the mortar of the shear bond test specimens significantly exceeds the specified strength in the table. Our understanding is that the industry will provide revised proposed revisions.
2. It is not clear how compressive strength relates to shear bond strength. Currently, evaluation reports may indicate that Types M or S mortar can be used as the setting bed. However, AC51 does not currently include statements that mortars with greater compressive strengths than the mortar of the shear bond test specimens can be recognized. The ICC-ES staff is seeking industry comments on the relationship between mortar compressive strength and shear bond strength.

Evaluation reports issued on or after the effective date noted above, and falling within the scope of this criteria, will be required to comply with the enclosed edition of the criteria. Evaluation reports issued prior to the effective date may be in compliance either with the enclosed acceptance criteria or with the previous edition. Evaluation reports based on a superseded version of an acceptance criteria must be brought into compliance with the most recent edition at the time the reports are reissued. Therefore, applicants should submit data verifying compliance at the time they apply for re-examination.

If you would like to provide input or if you have any questions, please contact Elyse G. Levy, S.E., at (800) 423-6587, extension 4315. You may also reach us by e-mail at es@icc-es.org.

Yours very truly,

A handwritten signature in black ink that reads "Kurt Stochlia". The signature is written in a cursive style with a horizontal line under the "i" at the end.

Kurt Stochlia, P.E.
Vice President

KS/EL/raf

Enclosure

cc: Evaluation Committee



ACCEPTANCE CRITERIA FOR PRECAST STONE VENEER

AC51

Approved February 2008

Effective March 1, 2008

Previously approved October 2007, January 2001, June 1988

PREFACE

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

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

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

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

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

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ACCEPTANCE CRITERIA FOR PRECAST STONE VENEER

1.0 INTRODUCTION

1.1 Purpose: The purpose of this criteria is to establish the minimum requirements for recognition of adhered precast stone veneer in ICC Evaluation Service, Inc. (ICC-ES), evaluation reports under the 2006 *International Building Code*® (IBC), the 2006 *International Residential Code*®(IRC), the BOCA® *National Building Code/1999* (BNBC), the 1999 *Standard Building Code*® (SBC) and the 1997 *Uniform Building Code*™ (UBC).

This criteria is needed to clarify the requirements for composition, strength, durability and installation of precast stone veneer, which are not addressed in the code.

1.2 This criteria applies to precast stone veneer adhered with mortar to the exterior face of exterior walls and, at the report applicant's option, to interior wall surfaces. The veneer system is considered a variation of exterior plaster regulated by IBC Section 2512, IRC Section R703.6, BNBC Section 2506.0, SBC Section 2504.2 and UBC Section 2508, and a variation of adhered masonry veneer regulated by IBC Section 1405.9, BNBC Section 1406.6, SBC Section 1403.3 and UBC Sections 1403.4.2 and 1403.5. The veneer may be adhered to backings consisting of concrete, masonry or cement plaster applied over metal or wire fabric lath.

1.3 Codes and Reference Standards: Where standards are referenced in this criteria, the standards shall be applied consistent with the requirements of the applicable code. Editions of the standards applicable to each code are summarized in Table 1.

1.3.1 ASTM International:

1.3.1.1 ASTM C 33, Specification for Concrete Aggregates.

1.3.1.2 ASTM C 39, Test Method for Compressive Strength of Cylindrical Concrete Specimens.

1.3.1.3 ASTM C 67, Test Methods for Sampling and Testing Brick and Structural Clay Tile.

1.3.1.4 ASTM C 144, Specifications for Aggregate for Masonry Mortar.

1.3.1.5 ASTM C 150, Specification for Portland Cement.

1.3.1.6 ASTM C 190, Test Method for Tensile Strength of Hydraulic Cement Mortars.

1.3.1.7 ASTM C 192, Practice for Making and Curing Concrete Test Specimens in the Laboratory.

1.3.1.8 ASTM C 330, Specification for Lightweight Aggregates for Structural Concrete.

1.3.1.9 ASTM C 331, Specification for Lightweight Aggregates for Concrete Masonry Units.

1.3.1.10 ASTM C 348, Test Method for Flexural Strength of Hydraulic Cement Mortars.

1.3.1.11 ASTM C 482, Test Method for Bond Strength of Ceramic Tile to Portland Cement.

1.3.1.12 ASTM C 567, Test Method for Unit Weight of Structural Lightweight Concrete.

1.3.1.13 ASTM C 926, Specification for Application of Portland Cement-based Plaster.

1.3.1.14 ASTM E 84, Test Method for Surface Burning Characteristics of Building Materials.

1.3.1.15 ASTM E 119, Test Methods for Fire Tests of Building Construction and Materials.

1.3.2 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.

1.3.3 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.

1.3.4 ACI 318-05, Building Code Requirements for Structural Concrete, American Concrete Institute.

1.3.5 2006 *International Building Code*® (IBC), International Code Council.

1.3.6 2006 *International Residential Code*® (IRC), International Code Council.

1.3.7 BOCA® *National Building Code/1999* (BNBC).

1.3.8 1999 *Standard Building Code*® (SBC).

1.3.9 1997 *Uniform Building Code*™ (UBC).

1.3.10 UBC Standard 7-1, Fire Tests of Building Construction and Materials.

1.4 Definitions:

1.4.1 Backing: The surface to which the veneer units are adhered. The backing may be concrete, masonry or a scratch coat of cement plaster or masonry mortar applied over metal or wire fabric lath.

1.4.2 Veneer: A facing attached to a wall for the purpose of providing ornamentation, protection or insulation, but not counted as adding strength to the wall.

1.4.3 Adhered Veneer: A veneer secured and supported by adhesion with an approved bonding material applied over an approved backing.

1.4.4 Precast Stone Veneer: An adhered veneer made from lightweight precast concrete, comprised of portland cement, water and mineral aggregates, with or without other materials. Units of precast stone veneer are formed and cast off-site to provide the appearance of stone or other masonry materials.

1.4.5 Pattern: The repeating combination of veneer units and mortar joints used to produce the finished architectural effect.

1.4.6 Scratch Coat: A backing of cement plaster or masonry mortar applied over metal or wire fabric lath, to which the veneer units are adhered.

1.4.7 Veneer System: The combination of the veneer units with the supporting materials used to affix the veneer units to the supporting wall, including joint mortar, setting bed, and scratch coat, as applicable.

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2.0 BASIC INFORMATION AND REPORTS OF TESTS

2.1 General: The following basic information shall be submitted:

2.1.1 Product Description:

2.1.1.1 Veneer Materials: A description of the constituent materials of the lightweight concrete used to form the precast stone veneer units in accordance with the following:

2.1.1.1.1 Cement: Type and description in accordance with Section 3.2.1 of ACI 318.

2.1.1.1.2 Sand: Sand shall be clean and free from deleterious amounts of loam, clay, silt, soluble salts and organic matter. Sampling, testing and gradation shall comply with ASTM C 144.

2.1.1.1.3 Aggregate: Type and size designation must comply with ASTM C 33, ASTM C 330 or ASTM C 331, except gradation requirements need not apply. Gradation, however, shall be specified.

2.1.1.1.4 Admixtures: Description and purpose of the admixture shall be specified. Purposes may include, but not be limited to, expediting setting, enhancing durability and improving workability.

2.1.1.1.5 Colors: To be indicated as surface or integral. Integral color material shall be an inorganic type that is nonreactive with the aggregate, cement and other admixtures.

2.1.1.1.6 Mix Design: For each mix design to be recognized, all of the constituent materials and their proportions must be listed.

2.1.1.2 Veneer Units:

2.1.1.2.1 Physical Properties: The specified density and compressive strength of the precast stone veneer units must be provided.

2.1.1.2.2 Dimensions: The range of sizes and shapes of the veneer units must be provided. Veneer units are limited to 36 inches (914 mm) in the greatest dimension and 720 square inches (464 515 mm²) in total area. For installation under the IBC and IRC, the minimum and maximum thicknesses of the veneer units are $\frac{5}{8}$ inch and $2\frac{5}{8}$ inches (15.9 and 67 mm), respectively. For installation under the BNBC and SBC, the veneer units shall be less than $1\frac{5}{8}$ inches (41 mm) thick.

2.1.1.3 Veneer System:

2.1.1.3.1 System Components:

2.1.1.3.1.1 Mortar: There must be a description of the type of mortar used for the setting bed and/or scratch coat. Mortar must comply with IBC Section 2103.8, IRC Section R607.1, BNBC Section 2104.7, SBC Section 2104.7.1 or UBC Section 2103.3, as applicable. The thickness must be described of the setting bed. The setting bed shall be a minimum of $\frac{3}{8}$ inch (9.5 mm) thick and a maximum of $1\frac{1}{4}$ inches (32 mm) thick.

2.1.1.3.1.2 Cement Plaster: If applicable, the type of plaster used for the scratch coat, in accordance with ASTM C 926, must be described.

2.1.1.3.1.3 Lath: The type and weight of the lath and the type, size and spacing of the fasteners used to attach the lath to the supporting structure must be described. The lath and its installation shall comply with IBC Section 2510, IRC Section R703.6, BNBC Section 2506, SBC Sections 2503 and 2504.2, or UBC Section 2506, as applicable.

2.1.1.3.2 Physical Properties and Dimensions: A description of each pattern to be recognized; the average weight of the installed system for each pattern; the overall thickness of the system.

2.1.1.4 Veneer Manufacture: Information submitted in accordance with Appendix A of the ICC-ES Acceptance Criteria for Quality Documentation (AC10) must include the standard procedure for manufacture of the precast stone veneer units. This shall include material proportions, mixing instructions (including equipment used), methods used for forming the mixture into proper shapes, curing requirements and storage requirements.

2.1.2 Installation Instructions:

2.1.2.1 Installation under the IBC and IRC: The installation instructions must comply with IBC Sections 1403.2 and 2512.1; and Sections 6.1.5 and 6.3.2 of ACI 530/ASCE 5/TMS 402 and Article 3.3C of ACI 530.1/ASCE 6/TMS 602. Where the veneer units are installed directly onto the uncured mortar setting bed (brown coat) without a paste of neat portland cement, as described in Article 3.3C of ACI 530.1/ASCE 6/TMS 602, the shear bond of veneer units to the backing must be determined in accordance with Section 3.1.3.4 of this criteria.

Except when installation is over concrete or masonry walls, a water-resistive barrier is required under the precast stone veneer system. The water-resistive barrier shall comply with IBC Sections 1404.2 and 2510.6 or with IRC Sections R703.2 and R703.6.3, as applicable.

2.1.2.2 Installation under the BNBC: The installation instructions must comply with BNBC Section 1406.6.5. Where the veneer units are installed directly onto the uncured mortar setting bed without a paste of neat portland cement, as described in BNBC Section 1406.6.5, the shear bond of veneer units to the backing must be determined in accordance with Section 3.1.3.4 of this criteria.

Except when installation is over concrete or masonry walls, a water-resistive barrier is required under the precast stone veneer system. The water-resistive barrier shall comply with BNBC Section 1406.3.6.

2.1.2.3 Installation under the SBC: The installation instructions must comply with SBC Section 1403.3.5. Where the veneer units are installed directly onto the uncured mortar setting bed without a paste of neat portland cement, as described in SBC Section 1403.3.5, the shear bond of veneer units to the backing must be determined in accordance with Section 3.1.3.4 of this criteria.

Except when installation is over concrete or masonry walls, a waterproof building paper is required under the precast stone veneer system.

2.1.2.4 Installation under the UBC: The installation instructions must comply with UBC Sections 1402, 1403.5 and 2508. As an alternative to these prescriptive methods,

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installation must comply with UBC Sections 1403.4.1 and 1403.4.2. A weather-resistive barrier complying with UBC Section 1402.1 is required under the precast stone veneer system.

2.1.2.5 General: Instructions shall address each type of backing, and the structural support system intended, including metal studs, wood studs, masonry and concrete, in all interior and exterior locations. At a minimum, instructions shall include:

- a. Lath type and lath installation, including fastening requirements.
- b. Portland cement plaster preparation and installation.
- c. Masonry or concrete surface preparation.
- d. Mortar preparation, application, thickness and curing instructions.
- e. Application of water-resistive barrier.
- f. Ambient temperatures for application of veneer.
- g. Width of mortar joints.

2.1.3 Product Identification and Labeling: The method of packaging and identifying components shall be specified. A label on the packaging of the veneer, or on each piece of veneer, shall bear the manufacturer's name, the product name, the pattern name and the ICC-ES evaluation report number.

2.2 Testing Laboratories: Testing laboratories must 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 must comply with AC85 and include the following:

1. Witnessing of production, fabrication and installation of test specimens.
2. Preparation of test specimens, including complete description of the specimen components, mix proportions and curing.
3. Description of test procedures, along with details.
4. Test observations, including description of veneer before and after testing. Description shall be supported by photographs.
5. Statement as to whether the test results meet the conditions of acceptance given in the criteria.
6. Descriptions of veneer units sampled.
7. Unless noted otherwise, age of specimens following molding or fabrication. Tests must be conducted within 45 days of specimen preparation.
8. Sample curing or conditioning procedures.

2.4 Product Sampling: Test specimens must be representative of standard manufacture. The test specimens must be sampled in accordance with Sections 3.1, 3.3 and 3.4 of AC85.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 Veneer Units: For each mix design to be recognized, test data in accordance with Sections 3.1.1 to 3.1.5 must be

submitted. Alternatively, where more than one mix design is to be recognized, a testing program must be submitted to ICC-ES for approval prior to the commencement of testing. At a minimum, this testing program must include the following: the mix design(s) to be tested, the mix designs that are to be qualified based on the testing, and justification for the selection of the mix design(s) to be tested.

3.1.1 Density: The density of veneer units to be included in the evaluation report shall be the equilibrium density determined in accordance with ASTM C 567. The equilibrium density may be determined by measurement or by calculation as allowed by ASTM C 567. When the density is determined by measurement, five samples must be tested and the average density shall be reported.

3.1.2 Weight: The average saturated weight of the veneer units in each pattern, per unit area of wall, shall be determined in accordance with Section 4.1. The average saturated weight must not exceed 15 pounds per square foot (73 kg/m²). The testing laboratory is permitted to verify compliance of a manufacturer's multiple patterns with the 15-pounds-per-square-foot requirement by evaluating the pattern that has been determined to have the highest average thickness with the heaviest density mixture used for that pattern.

3.1.3 Strength Requirements:

3.1.3.1 Compressive strength tests of veneer mixture must be conducted in accordance with Section 4.3. Minimum requirements are 1800 psi (12.4 MPa) average for five specimens. The results for any one sample cannot vary by more than 10 percent from the average for all samples.

3.1.3.2 Tensile strength tests of veneer mixture must be conducted in accordance with Section 4.5. The results for any one sample cannot vary by more than 10 percent from the average for all samples.

3.1.3.3 Flexural tests of veneer mixture must be conducted in accordance with Section 4.4. The results for any one sample cannot vary by more than 10 percent from the average for all samples.

3.1.3.4 The bond strength between the veneer unit, the mortar setting bed and the backing shall be determined in accordance with Section 4.7. The test series must be repeated for each combination of mortar type and type of backing to be recognized. The shearing strength must be a minimum of 50 pounds per square inch (345 kPa). Individual bond strength result shall be within 20 percent of the average strength results, or the lowest individual bond strength result shall be a minimum of 50 pounds per square inch (345 kPa).

3.1.4 Absorption: Veneer units must be tested for water absorption in accordance with Section 4.6. Precast stone veneer units must comply with the water-absorption requirements in Table 2.

3.1.5 Freeze-Thaw: Resistance to freezing and thawing shall be tested in accordance with Section 4.2. Test samples must not break or disintegrate, and weight loss is limited to 3 percent of original weight.

3.1.6 Thermal Resistance (Optional): If thermal resistance (*R*-value) of the veneer units is to be addressed, the results of testing in accordance with an applicable test method must be submitted.

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3.2 Interior Finish (Optional): For precast stone veneer to be recognized for use as an interior finish, a report of testing in accordance with ASTM E 84 must be submitted to determine the interior finish classification.

3.3 Fire-resistance-rated Construction (Optional): Testing in accordance with ASTM E 119 (IBC, IRC, BNBC, SBC) or UBC Standard 7-1 (UBC) is required if fire-resistance-rated recognition is sought.

4.0 TEST PROCEDURES

4.1 Weight:

1. The average saturated weight of the veneer units shall be determined by the testing laboratory.

2. The laboratory shall document how the volume of veneer per unit area of wall is determined.

3. The equilibrium density determined in accordance with Section 3.1.1 shall be increased by the percentage of water absorption determined in accordance with Section 3.1.4 and multiplied by the volume of veneer per unit area of wall to determine the average saturated weight.

4.2 Freeze-thaw Test:

1. Procedures follow those outlined in ASTM C 67. Veneer specimens must be a minimum of 2 inches (51 mm) square by the minimum thickness to be recognized. At least five samples at the minimum thickness are required.

2. The specimens are subjected to 50 cycles of freezing and thawing, unless test specimens break or appear to have lost more than 3 percent of their original weight, as judged by the original inspection.

3. Weight loss is determined as a percentage of the original weight of the dry specimens. The number of cycles causing disintegration of the specimen must be reported. The manner of breakage or disintegration must be reported in detail.

4.3 Compressive Strength:

1. Compressive strength tests are conducted on cylinders of veneer mixture prepared, cured, and tested in accordance with ASTM C 192 and ASTM C 39. A minimum of five samples must be tested.

2. The samples are cured in accordance with the standard and then tested at the age of 28 days.

3. Reporting procedures shall comply with the standard. The maximum compressive load imposed on each sample is reported, along with the compressive strength in pounds per square inch.

4.4 Flexural Strength:

1. Flexural strength tests of veneer mixture are conducted on samples prepared and tested in accordance with ASTM C 348. A minimum of five samples is necessary.

2. After casting and prior to the specimens' being subjected to the load test after 28 days, the specimens shall be covered immediately after finishing, preferably with a nonabsorptive, nonreactive plate or a sheet of tough, durable, impervious plastic. Wet burlap may be used for covering, but care must be exercised to keep the burlap wet until the specimens are removed from the molds. Placing a sheet of plastic over the burlap will facilitate keeping it wet. Specimens shall be removed from the molds not less than

20 nor more than 48 hours after casting. While in storage, for a minimum period of 20 hours immediately prior to testing, they shall be immersed in saturated-lime solution at $73.4 \pm 3^\circ\text{F}$ ($23 \pm 1^\circ\text{C}$). At the end of the curing period, between the time the specimen is removed from curing and the time testing is completed, drying of the surfaces shall be prevented.

3. Reporting procedures follow those specified in the standard. The report shall include the maximum load imposed and the flexural strength, calculated as set forth in Section 8 of ASTM C 348.

4.5 Tensile Strength:

1. Tensile strength tests of veneer mixture are conducted on samples prepared, stored and tested in accordance with ASTM C 190. A minimum of five specimens is necessary.

2. Tests are conducted in accordance with the standard, approximately 28 days after molding of the specimens.

3. Reporting procedures follow those specified in the standard. The maximum load imposed and the tensile strength in pounds per square inch are to be reported.

4.6 Moisture Absorption:

1. A minimum of 10 samples is required.

2. Samples shall be taken from pieces of broken veneer units.

3. The percent of water absorption based on dry weight shall be reported.

4. Procedure: Loose particles shall be removed by scrubbing with a fiber brush and clean water. Samples shall be dried in a well-ventilated oven for 24 hours at a temperature of 221°F (105°C) varying not more than 3.6°F (2.0°C). After drying, the samples may be cooled at room temperature for 15 minutes after identifying and weighing to the nearest 0.01 gram. The samples shall then be immersed in filtered or distilled water for 48 hours at a temperature of 68°F (20°C), varying not more than 9°F (5°C). One sample shall be removed, its surfaces wiped dry, and the sample weighed immediately. The process shall be repeated for each sample.

4.7 Shear Bond Strength:

4.7.1 Shear bond tests shall be conducted in accordance with ASTM C 482, with the following modifications/clarifications:

1. A minimum of five samples shall be tested.

2. The cement plaster, masonry, or concrete backing shall be substituted for the cement mortar bed specified in Section 9 of ASTM C 482.

3. The cement plaster shall be allowed to cure in accordance with IBC Table 2512.6 and the manufacturer's installation instructions, before the veneer units are applied.

4. The veneer units shall be adhered to the backing using the mortar setting bed recommended by the manufacturer, in lieu of the pure portland cement paste specified in ASTM C 482. The mortar type, thickness and method of application shall be described in the test report. The samples shall be cured in accordance with Section 9.7 of ASTM C 482.

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5. Dimension C in Figure 3 of the standard may be modified to match the thickness of the test samples.

6. Where veneer specimens have a back pattern, the pattern shall be parallel to the direction of loading in the test setup.

4.7.2 Compressive strength tests shall be conducted in accordance with Section 4.3 on concrete cylinders prepared from the same batch of concrete as the veneer unit samples. The compressive strength shall be within 10 percent of the average compressive strength determined in accordance with Section 3.1.3.1.

4.7.3 Compressive strength tests shall be conducted on the mortar in accordance with ASTM C 109. The compressive strength of the mortar shall not exceed the minimum specified compressive strength by more than 10 percent.

4.7.4 The maximum load and bond strength for each sample shall be reported. The mode of failure, i.e., failure of the veneer unit, bond of the unit to the mortar setting bed, or bond of the setting bed to the backing, shall be reported.

5.0 QUALITY CONTROL

5.1 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted. See Section 2.1.1.4 for specific requirements.

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

6.0 EVALUATION REPORT RECOGNITION

The evaluation report shall include the following:

6.1 A description of the veneer units, including the information from Sections 2.1.1.2 and 2.1.1.3.

6.2 Basic procedures for installation of precast stone veneer onto each type of backing.

6.3 Requirements for water-resistive barrier, flashing and weep screeds. For installations under the IBC and IRC, weep screeds shall have weepholes at least $\frac{3}{16}$ inch (4.8 mm) in diameter, spaced less than 33 inches (838 mm) on center, in accordance with Section 6.1.5.2 of ACI 530.

6.4 The evaluation report shall include the following conditions of use:

6.4.1 Expansion or control joints used to limit the effect of differential movement of precast stone veneer supports must be specified by the architect, designer or veneer manufacturer, in that order. Consideration must be given to movement caused by temperature changes, shrinkage, creep and deflection.

6.4.2 For installation in accordance with the IBC, BNBC, SBC and UBC, supporting wall construction must be designed to support the weight of the veneer system. Horizontal framing members, such as lintels and headers, which support precast stone veneer, must be designed to limit deflection to $\frac{1}{600}$ of the span.

6.4.3 In jurisdictions adopting the IRC, where the seismic provisions of Section R301.2.2 apply, the average weight of the wall supporting the precast stone veneer, including the weight of the veneer system, must be determined. When this weight exceeds the applicable limits of IRC Section 301.2.2.2.1, an engineered design of the wall construction must be performed in accordance with IRC Section R301.1.3.

6.4.4 In jurisdictions adopting the UBC, the height of the veneer system attached to wood-frame construction shall comply with UBC Section 1403.1.2.

6.4.5 In jurisdictions adopting the BNBC, the height of the veneer system attached to wood-frame construction shall comply with BNBC Section 1406.6.2.

6.4.6 In jurisdictions adopting the SBC, the height of the veneer system attached to wood-frame construction shall comply with SBC Section 1403.3.3. ■

ACCEPTANCE CRITERIA FOR PRECAST STONE VENEER

TABLE 1—CROSS REFERENCE OF EDITIONS OF STANDARDS

STANDARD	IBC	IRC	BNBC	SBC	UBC
ASTM C 33	-03	-03	-97	-93	-93
ASTM C 39	-99ae1	-99ae1	-96	-93a	-86
ASTM C 67	-03ae01	-03ae01	-98a	-93a	-97a
ASTM C 144	-02	-02	-93	-93	-93
ASTM C 150	-04	-04	-97a	-94	-94
ASTM C 190	-85	-85	-85	-85	-85
ASTM C 192	-81	-81	-81	-90a	-81
ASTM C 330	-04	-04	-97	-89	-89
ASTM C 331	-04	-04	-04	-94	-89
ASTM C 348	-86	-86	-86	-86	-86
ASTM C 482	-02	-02	-81 (Reapproved 1996)	-81 (Reapproved 1996)	-81 (Reapproved 1996)
ASTM C 567	-81 (Reapproved 1996)	-81 (Reapproved 1996)	-81 (Reapproved 1996)	-81 (Reapproved 1996)	-81 (Reapproved 1996)
ASTM C 926	-98a	-98a	-98a	-94	n/a
ASTM E 119	-00	-00	-98	-95a	UBC Standard 7-1

TABLE 2—MAXIMUM WATER-ABSORPTION OF VENEER SAMPLES, BASED ON OVEN-DRY WEIGHT OF CONCRETE

WEIGHT CLASSIFICATION (lb./ft.³)	WATER ABSORPTION (percent)
Less than 65	29
Less than 85	22
Less than 105	18
Less than 125	15
125 or more	13

For **SI**: 1 lb/ft³ = 16.018 kg/m³.