

ACCEPTANCE CRITERIA FOR PRECAST STONE VENEER

AC51

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PREFACE

Evaluation reports issued by ICC Evaluation Service, LLC (ICC-ES), are based upon performance features of the International family of codes. (Some reports may also reference older code families such as the BOCA National Codes, the Standard Codes, and the Uniform 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.

This acceptance criteria has been issued to provide interested parties with guidelines for demonstrating compliance with performance features of the codes referenced in the criteria. The criteria was developed through a transparent process involving public hearings of the ICC-ES Evaluation Committee, and/or on-line postings where public comment was solicited.

New acceptance criteria will only have an “approved” date, which is the date the document was approved by the Evaluation Committee. When existing acceptance criteria are revised, the Evaluation Committee will decide whether the revised document should carry only an “approved” date, or an “approved” date combined with a “compliance” date. The compliance date is the date by which relevant evaluation reports must comply with the requirements of the criteria. See the ICC-ES web site for more information on compliance dates.

If this criteria is a revised edition, a solid vertical line (|) in the margin within the criteria indicates a change from the previous edition. A deletion indicator (→) is provided in the margin where any significant wording has been deleted.

ICC-ES may consider alternate criteria for report approval, provided the report applicant submits 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. ICC-ES retains the right to refuse to issue or renew any evaluation report, if the applicable product, material, 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 injury or unreasonable damage.

NOTE: The Preface for ICC-ES acceptance criteria was revised in July 2011 to reflect changes in policy.

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

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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, LLC (ICC-ES), evaluation reports under the 2012, 2009 and 2006 *International Building Code*[®] (IBC), the 2012, 2009 and 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 1405.10 (Section 1405.9 of the 2006 IBC), 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 C33, Specification for Concrete Aggregates.

1.3.1.2 ASTM C39, Test Method for Compressive Strength of Cylindrical Concrete Specimens.

1.3.1.3 ASTM C67, Test Methods for Sampling and Testing Brick and Structural Clay Tile.

1.3.1.4 ASTM C144, Specifications for Aggregate for Masonry Mortar.

1.3.1.5 ASTM C150, Specification for Portland Cement.

1.3.1.6 ASTM C190, Test Method for Tensile Strength of Hydraulic Cement Mortars.

1.3.1.7 ASTM C192, Practice for Making and Curing Concrete Test Specimens in the Laboratory.

1.3.1.8 ASTM C330, Specification for Lightweight Aggregates for Structural Concrete.

1.3.1.9 ASTM C331, Specification for Lightweight Aggregates for Concrete Masonry Units.

1.3.1.10 ASTM C348, Test Method for Flexural Strength of Hydraulic Cement Mortars.

1.3.1.11 ASTM C482, Test Method for Bond Strength of Ceramic Tile to Portland Cement.

1.3.1.12 ASTM C567, Test Method for Unit Weight of Structural Lightweight Concrete.

1.3.1.13 ASTM C926, Specification for Application of Portland Cement-based Plaster.

1.3.1.14 ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.

1.3.1.15 ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.

1.3.2 TMS 402-11/ACI 530-11/ASCE 5-11, Building Code Requirements for Masonry Structures (TMS 402-11), The Masonry Society, American Concrete Institute, Structural Engineering Institute of the American Society of Civil Engineers.

1.3.3 TMS 602-11/ACI 530.1-11/ASCE 6-11, Specification for Masonry Structures (TMS 602-11), The Masonry Society, American Concrete Institute, Structural Engineering Institute of the American Society of Civil Engineers.

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

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

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

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

1.3.8 ACI 318-11 Building Code Requirements for Structural Concrete, American Concrete Institute.

1.3.9 ACI 318-08, Building Code Requirements for Structural Concrete, American Concrete Institute.

1.3.10 2012, 2009 and 2006 *International Building Code*[®] (IBC), International Code Council.

1.3.11 2012, 2009 and 2006 *International Residential Code*[®] (IRC), International Code Council.

1.3.12 BOCA[®] *National Building Code/1999* (BNBC).

1.3.13 1999 *Standard Building Code*[®] (SBC).

1.3.14 1997 *Uniform Building Code*[®] (UBC).

1.3.15 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

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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 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.

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 C144.

2.1.1.1.3 Aggregate: Type and size designation must comply with ASTM C33, ASTM C330 or ASTM C331, 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 2012 IBC Section 2103.9 (2009 and 2006 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 of the setting bed must be described. 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 C926, 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, 1405.10.1 and 2512.1; and Sections 6.1.6 and 6.3.2 of TMS 402 (or Sections 6.1.5 and 6.3.2 of ACI 530 as applicable) and Article 3.3C of TMS 602, or ACI530.1, as applicable. 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 TMS 602 (or ACI530.1), the shear bond of veneer units to the backing must be determined in accordance with Section 3.1.3.4 of this criteria.

2.1.2.2 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.

2.1.2.3 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

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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.

2.1.2.4 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.

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

2.1.2.6 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 oven-dry density determined in accordance with ASTM C567. The density may be determined by measurement or by calculation as allowed by ASTM C567. 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

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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.

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 E84 must be submitted to determine the interior finish classification.

3.3 Fire-resistance-rated Construction (Optional): Testing in accordance with ASTM E119 (IBC, IRC, NBBC, 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 oven-dry 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 C67. 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 C192 and ASTM C39. 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 C348. 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 C348.

4.5 Tensile Strength:

1. Tensile strength tests of veneer mixture are conducted on samples prepared, stored and tested in accordance with ASTM C190. 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

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shall be repeated for each sample.

4.7 Shear Bond Strength:

4.7.1 Shear bond tests shall be conducted in accordance with ASTM C482, 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 C482.
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 C482. 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 C482.
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 C109. 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 for each facility manufacturing or labeling products that are to be recognized in the ICC-ES evaluation report.

5.2 A qualifying inspection shall be conducted at each manufacturing facility in accordance with the requirements of the ICC-ES Acceptance Criteria for Inspections and Inspection Agencies (AC304)

5.3 An annual inspection shall be conducted at each manufacturing facility in accordance with AC304.

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 and flashing shall comply with 2012 IBC Section 1405.10.2. 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 6.1.6.2 of TMS 402, or Section 6.1.5.2 of ACI 530 as applicable.

6.3.1 Clearance of exterior veneer from earth, paving or exterior walking surfaces shall comply with 2012 IBC Section 1405.10.1.3.

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.

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TABLE 1—CROSS REFERENCE OF EDITIONS OF STANDARDS

STANDARD	2006 IBC/IRC	2009 IBC/IRC	2012 IBC/IRC	BNBC	SBC	UBC
ASTM C33	-03	-03	-07	-97	-93	-93
ASTM C39	-99ae1	-99ae1	99ae1	-96	-93a	-86
ASTM C67	-03ae01	-07	-08	-98a	-93a	-97a
ASTM C144	-02	-02	-02	-93	-93	-93
ASTM C150	-04	-07	-07	-97a	-94	-94
ASTM C190	-85	-85	-85	-85	-85	-85
ASTM C192	-81	-81	-81	-81	-90a	-81
ASTM C330	-04	-05	-05	-97	-89	-89
ASTM C331	-04	-05	-05	-04	-94	-89
ASTM C348	-86	-86	-86	-86	-86	-86
ASTM C482	-02	-02	-02	-81 (Reapproved 1996)	-81 (Reapproved 1996)	-81 (Reapproved 1996)
ASTM C567	-05a	-05a	-05a	-85	-85	-85
ASTM C926	-98a	-98a (2005)	-06	-98a	-94	n/a
ASTM E84	-04	-07	-09	-98e1	-95	-84
ASTM E119	-00	-07	-08a	-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.