ICC EVALUATION SERVICE

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ACCEPTANCE CRITERIA FOR PRECAST REINFORCED CEMENTITIOUS SLURRY STRUCTURAL MEMBERS

AC373

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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.

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

ACCEPTANCE CRITERIA FOR PRECAST REINFORCED CEMENTITIOUS SLURRY STRUCTURAL MEMBERS (AC373)

1.0 INTRODUCTION

1.1 Purpose: The purpose of this acceptance criteria is to establish requirements for precast reinforced cementitious slurry structural members used as beams, columns, floor, roof and wall panels to be recognized in an ICC Evaluation Service, Inc. (ICC-ES), evaluation report under the 2006 *International Building Code*® (IBC). The basis of recognition is Section 104.11 of the IBC.

The reason for the development of this criteria is that the code and associated referenced standards do not specify design, durability, installation, and quality requirements for this type of product.

1.2 Scope: This criteria is applicable to structural beams, columns, and floor, roof and wall panels, produced from a cementitious slurry reinforced with steel wire reinforcement mats. When used in load-bearing applications, the precast reinforced structural members shall be qualified in accordance with the additional requirements in Annex A. The precast reinforced cementitious slurry structural members may be fire-resistance-rated or nonfire-resistance-rated for use in all construction types.

1.3 Codes and Referenced Standards:

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

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

1.3.3 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.

1.3.4 ASCE 7-05, Minimum Design Loads for Buildings and Other Structures, ASCE.

1.3.5 ASTM A 1022-06, Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement, ASTM International.

1.3.6 ASTM C 33-03, Standard Specification for Concrete Aggregates, ASTM International.

1.3.7 ASTM C 39-03, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens, ASTM International.

1.3.8 ASTM C 78-02, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading), ASTM International.

1.3.9 ASTM C 109-02, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens), ASTM International.

1.3.10 ASTM C 150-04, Standard Specification for Portland Cement, ASTM International.

1.3.11 ASTM C 293-08, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading), ASTM International.

1.3.12 ASTM C 469-02e1, Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression, ASTM International.

1.3.13 ASTM C 494-05a, Standard Specification for Chemical Admixtures for Concrete, ASTM International.

1.3.14 ASTM C 496-04e1, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens, ASTM International.

1.3.15 ASTM C 503-03, Standard Specification for Marble Dimension Stone (Exterior), ASTM International.

1.3.16 ASTM C 568-03, Standard Specification for Limestone Dimension Stone, ASTM International.

1.3.17 ASTM C 615-03, Standard Specification for Granite Dimension Stone, ASTM International.

1.3.18 ASTM C 616-03, Standard Specification for Quartz-Based Dimension Stone, ASTM International.

1.3.19 ASTM C 618-05, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete, ASTM International.

1.3.20 ASTM C 642-06, Standard Test Method for Density, Absorption, and Voids in Hardened Concrete, ASTM International.

1.3.21 ASTM C 666-03, Standard Specification for Resistance of Concrete to Rapid Freezing and Thawing, ASTM International.

1.3.22 ASTM C 920-05, Standard Specification for Elastomeric Joint Sealants, ASTM International.

1.3.23 ASTM C 1017-03, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete, ASTM International.

1.3.24 ASTM C 1201-91 (Reapproved 2003), Standard Test Method for Structural Performance of Exterior Dimension Stone Cladding Systems by Uniform Static Air Pressure Difference, ASTM International.

1.3.25 ASTM C 1218-99, Standard Test Method for Water-Soluble Chloride in Mortar and Concrete, ASTM International.

1.3.26 ASTM C 1240-05, Standard Specification for Silica Fume Used in Cementitious Mixtures, ASTM International.

1.3.27 ASTM C 1242-05, Standard Guide for Selection, Design, and Installation of Dimension Stone Anchoring Systems, ASTM International.

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

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

1.3.30 ASTM E 119-00, Standard Test Methods for Fire Tests of Building Construction and Materials, ASTM International.

1.3.31 ASTM E 136-98$^{\varepsilon 1}$, Standard Test Methods for Behavior of Materials in a Vertical Tube Furnace at 750^{o}C, ASTM International.

1.3.32 ASTM E 529-04, Standard Guide for Conducting Flexural Tests on Beams and Girders for Building Construction.

1.3.33 ASTM E 564-06, Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings, ASTM International.

1.3.34 ASTM E 831-06, Standard Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis, ASTM International.

1.3.35 ASTM E 1875-00e1, Standard Test Method for Dynamic Young's Modulus, Shear Modulus, and Poisson's Ratio by Sonic Resonance, ASTM International.

1.3.36 ASTM E 1876-07, Standard Test Method for Dynamic Young's Modulus, Shear Modulus, and Poisson's Ratio by Impulse Excitation of Vibration, ASTM International.

1.3.37 ICC-ES Acceptance Criteria for Sandwich Panel Adhesives (AC05).

1.3.38 ICC-ES Acceptance Criteria for Precast Stone Veneer (AC51).

1.3.39 ICC-ES Acceptance Criteria for Chemical Admixtures used in Concrete (AC198).

1.3.40 ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193).

1.3.41 ICC-ES Acceptance Criteria for Post-installed Adhesive Anchor in Concrete Elements (AC308).

1.4 Definitions:

1.4.1 Cementitious Slurry: Cementitious slurry is a mixture composed of portland cement conforming to ASTM C 150; sand conforming to ASTM C 33; silica fume conforming to ASTM C 1240; fly ash or natural pozzolans conforming to ASTM C 618; admixtures conforming to ASTM C 494 and ASTM C 1017 or the ICC-ES Acceptance Criteria for Chemical Admixtures used in Concrete (AC198); and water conforming to Section 3.4 of ACI 318.

1.4.2 Connections: A combination of components, such as fasteners, anchors and attachments, used to mechanically attach the precast cementitious slurry structural members to the supporting structure of a building. Fasteners or anchors may be preinstalled in the precast reinforced cementitious slurry structural members.

1.4.3 Steel Wire Reinforcement Mats: Steel wire reinforcement mats are assembled from multiple layers of steel wire reinforcement complying with ASTM A 1022, other appropriate national standards, and/or manufacturer's specifications.

2.0 BASIC INFORMATION

2.1 General: The following information shall be submitted:

2.1.1 Product Description:

2.1.1.1 Precast Cementitious Slurry Structural Members: Complete information concerning precast cementitious slurry structural members to be recognized in the ICC-ES evaluation report (i.e., beams, columns, and floor, roof and wall panels) shall be in the quality documentation required in Section 5.0 of this criteria, and shall include shapes, dimensions, component specifications, the manufacturing process, and drawings with sufficient details illustrating the precast cementitious slurry structural members. Details shall incorporate reinforcement figures showing steel wire reinforcement configuration and orientation, wire grade, size and spacing, and number of reinforcement layers. The specifications for the welded wire reinforcement and specification for the steel wire reinforcement mats shall be provided. The cementitious slurry mix designs shall be provided.

2.1.2 Connections:

2.1.2.1 For fasteners cast into the cementitious slurry of the precast cementitious slurry structural members at the manufacturing facility, descriptions and specifications of the fasteners shall be provided, such as generic or trade name, dimensions, physical and mechanical properties, protective coatings, and appropriate national standards for the material. The specifications and attachment methods of the preinstalled fasteners shall be included in the quality documentation.

2.1.2.2 Attachments used at the jobsite to connect the precast cementitious slurry wall panel to adjacent precast cementitious slurry wall panels and to connect the precast cementitious slurry structural members the supporting structure of a building, shall be described and specified.

2.1.3 Grout:

2.1.3.1 Descriptions and specifications of the grout shall be provided. For example: grout type, mix design, compressive strength and thickness.

2.1.3.2 Manufacturer's installation instructions.

2.1.4 Installation Instructions: Installation instructions, details, and drawings describing installation requirements and limitations of the precast cementitious slurry structural members. The installation instructions shall describe the methods used to attach the precast cementitious structural members to the supporting structures. Specifications and locations of the connections shall be properly described. Joint treatment shall also be included.

2.1.5 Joint Sealants: Sealants used at control joints, intersections or terminations of precast reinforced cementitious slurry exterior wall panels at dissimilar materials, wall/eave interfaces, penetrations and openings, shall be minimum Type S or M, minimum Grade NS, minimum Class 25, and Use O, in compliance with ASTM C 920, and shall be compatible with the precast reinforced cementitious slurry wall panels. Under the Use O classification, the sealant needs to be qualified for each of the materials to which the sealant will be applied, such as the cementitious slurry material, copper piping, galvanized steel and vinyl window frames, by the adhesion-and-cohesion under-cyclic-movement test and adhesion-in-peel tests of Sections 8.8 and 8.9 of ASTM C 920. The details of sealant installation, including the width and thickness of the sealant, shall be designed by the registered design professional, designer, builder or precast reinforced cementitious slurry wall panel evaluation report holder, in that order, to the satisfaction of the building official. An installation card, in the format shown in Exhibit A, completed by the sealant installer, shall be presented to the code official at the completion of each project. The declaration states that the sealant installation conforms to the precast reinforced cementitious slurry wall panel evaluation report and the

sealant manufacturer's installation methods and procedures.

2.1.6 Packaging and Identification: A description of the method of packaging and field identification of the precast structural members. Identification shall include the report holder's name and address, product name, end-use of the product, cementitious slurry compressive strength, a means of traceability to the production process, the evaluation report number, the name or logo of the inspection agency and other information deemed necessary by the ICC-ES. Exterior panels and other members shall have the exterior face clearly identified.

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 shall comply with AC85. Test reports shall be in sufficient detail to identify the specimen properties that might affect performance, such as the following:

1. Cementitious slurry mix design and reports of cementitious slurry compressive strength at the time of load tests of the structural members.
2. Reports of coupon tests that include the actual tensile and yield strength of the steel reinforcement.

2.4 Product Sampling: Product sampling shall comply with Sections 3.1, 3.3 and 3.4 of AC85. Products shall be representative of the product to be evaluated and shall be sampled from each manufacturing facility for which recognition is sought. The production of the precast cementitious slurry structural members used as test specimens shall be witnessed by representatives of an accredited testing laboratory or an accredited inspection agency.

3.0 TEST AND PERFORMANCE REQUIREMENTS

3.1 General:

3.1.1 Noncombustible Construction: When recognition is sought for use in building elements required to be of noncombustible construction under the IBC, reports of tests on the cementitious slurry in accordance with ASTM E 136 shall be submitted.

3.1.2 Cementitious Slurry Property Tests: Reports of cementitious slurry physical property tests in accordance with Section 4.1 and Table 1 of this criteria shall be submitted. The tests shall be performed on each mixture of cementitious slurry of precast structural members used for load tests noted in this criteria.

3.1.3 Concrete Cover: The minimum concrete cover for precast concrete shall comply with IBC Section 1907.7. When an alternative method is used in lieu of complying with the minimum concrete cover specified in IBC Section 1907.7, substantiating data or test reports shall be submitted to ICC-ES justifying the equivalent performance of the alternative method to minimum concrete cover requirement for concrete protection of reinforcement noted in the code. If testing is needed, the test plan shall be submitted to ICC-ES prior to test commencement. Dimension stone veneer with a thickness greater than the minimum required concrete cover applied to the interior and exterior faces of precast reinforced cementitious slurry nonload-bearing wall panels, may be used as an alternative. The qualification of dimension stone veneer shall be in accordance with Annex B of this criteria.

3.1.4 Water-soluble Chloride Ion Concentrations: The maximum water-soluble chloride ion concentrations in hardened cementitious slurry at ages from 28 to 42 days contributed from the ingredients including water, cementitious materials, and admixtures, shall not exceed the limits of ACI 318, Table 4.4.1. Testing shall be performed to determine water-soluble ion content in accordance with ASTM C 1218.

3.1.5 Steel Reinforcement: Reports of material properties for the steel reinforcement used in the load tests of precast structural members shall be included as a part of test documentation. Reports of material properties shall be generated by a mill or independent testing laboratory, and shall verify compliance of the steel reinforcement material with the appropriate national standard. For steel types where tensile and yield strength is not specified, the test reports and mill certificates shall include actual yield and tensile strengths of the steel reinforcement used in the tests conducted under this criteria, in order to form the basis for quality control under Section 6.0 of this criteria. Actual yield and tensile strength shall be obtained by testing coupons taken from the same steel reinforcement batch used in the cementitious slurry structural members test specimens. Where the actual steel strength exceeds the specified strength, test results shall be adjusted, by the ratio F_u (specified)/F_u (actual).

3.1.6 Connections: Panels subject to transverse loads shall have approved values for fasteners, anchors and attachments that provide the connections of the panels to the supporting structure. Where no values are recognized by the IBC or ICC-ES evaluation reports, supporting data including test reports deemed necessary by ICC-ES shall be provided to establish the allowable capacity of the connections. Prior to performing the tests, the test plan shall be submitted for ICC-ES consideration. Allowable values for connections may control allowable panel loads, when they are less than the panel test values.

3.2 Structural Tests for NonLoad-bearing Wall Panels:

3.2.1 Transverse Load Tests: Reports shall be submitted of transverse load tests in accordance with Section 4.2 of this criteria. The test reports shall include a description of the test specimens, descriptions and illustration of the test setup, rate and method of loading, tabulation and graphical representation of load-deflection readings, observations and photographs of specimen response at significant stages of the loading process, and failure modes. Recognition of wall panels is limited to panel thickness, materials, cementitious slurry mix design and compressive strength at 28-days; steel wire reinforcement configuration, wire grade, size and spacing; and number and orientation of reinforcement layers used in the test. Allowable transverse loads may be used for shorter spans or heights, but extrapolation is not permitted.

3.2.2 Condition of Acceptance:

3.2.2.1 The allowable transverse loads shall be the lesser of the following:

3.2.2.1.1 A factor of safety of three shall be applied to the average peak result, provided none of the test results vary by more than ten percent from the average of three specimens. If the test results vary by more than ten percent, the lowest value shall be used. The average result based on a minimum six test specimens shall be used regardless of the variations.

3.2.2.1.2 The maximum deflection of the wall panels under the allowable transverse load shall be $^1/_{240}$ of the span in accordance with Table 1604.3 of the IBC.

3.2.2.1.3 For exterior walls, the minimum allowable stress design wind load shall be 10 psf (478.8 Pa) as specified in Section 6.4.2.2.1 of ASCE 7.

3.2.2.1.4 For interior walls, the minimum allowable stress design transverse load shall be 5 psf (239.4 Pa), as specified in Section 1607.13 of the IBC.

3.3 Durability: Precast cementitious slurry durability shall be determined by conducting freezing and thawing cyclic testing in accordance with Section 4.3 of this criteria. Each specimen shall withstand a minimum of 300 freeze-thaw cycles before the relative dynamic modulus of elasticity decreases to 80 percent of the initial modulus. The average durability factor of the specimens shall be a minimum of 80 percent.

3.4 Fire-resistance-rated Construction (Optional): When recognition is sought for use on walls required to be fire-resistance-rated construction, reports of tests in accordance with ASTM E 119 shall be submitted.

3.5 Wind-driven Rain Tests: Reports of wind-driven rain tests shall be submitted in accordance with Section 1403.2, Exception 2, of the IBC. The test shall be performed on a wall assembly containing precast reinforced cementitious wall panels and joint sealants complying with Section 2.1.5 of this criteria in accordance with IBC Section 1403.2, Exception 2, and ASTM E 331, as follows:

3.5.1 Exterior wall envelope test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. All tested openings and penetrations shall be representative of the intended end-use configuration.

3.5.2 Exterior wall envelope test assemblies shall be at least 4 feet wide by 8 feet high (1219 mm by 2438 mm).

3.5.3 Exterior wall envelope assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (0.297 kN/m^2).

3.5.4 Exterior wall envelope assemblies shall be subjected to a minimum test exposure duration of two hours.

The precast reinforced cementitious slurry wall panel age shall be a minimum of 28 days before testing.

3.5.5 The conditions of acceptance shall comply with IBC Section 1403.2, Exception 2, and the water shall not penetrate to the interior face of the wall panels.

4.0 TEST METHODS AND CONDITIONS OF ACCEPTANCE

4.1 Cementitious Slurry Properties Tests: Testing shall be performed in accordance with Table 1 of this criteria with a minimum of three test specimens.

4.2 Transverse Load Tests: At least three positive and three negative load tests shall be conducted on the wall panels. For symmetrical panels with symmetrical lateral restraint, panels need only be tested in one direction. Testing shall be in accordance with ASTM E 72, modified as follows:

4.2.1 `The installation and support conditions of the test specimens shall represent field installation and support conditions including applicable connections, grouting, etc.

4.2.2 Loading in out-of-plane direction may be applied by an air bag system, chamber method, or third-point loading. If an air bag system is used, air bags shall fully contact the test specimens during testing. Structural members of the test chamber supporting the panel specimens shall be of sufficient strength and rigidity to minimize deflection of the panel ends.

4.2.3 When a vacuum chamber is used, ends of the test specimen shall be sealed against the frame with a flexible material that allows unrestricted movement, such as a single thickness of polyethylene film having a thickness of 6 mils (0.006 inch or 0.15 mm) loosely applied with extra folds of the film at the panel perimeter.

4.2.4 Application of load and duration of load application shall be in accordance with Sections 4.2 and 4.3 of ASTM E 72, respectively. Where preloading is applied, the loading, deflection and recovery shall be noted. The amount of preloading shall not exceed 10 percent of the anticipated peak load.

4.2.5 Where tests are not conducted to failure, the highest load achieved for each test will be assumed as peak load.

4.2.6 Deflection readings are to be taken at midspan and within 3 inches (76 mm) of each edge and at the center of the panel width.

4.2.7 Voids in wall panels for electrical outlet boxes and raceways are permitted, provided they are included in the test specimens.

4.2.8 Where panels are to be field installed with grout on the interface between panels or between panels and the foundation, such conditions shall be duplicated along the bottom edge of the panel in the tests. Descriptions and specifications of the grout, if used, shall be noted in the test report. The installation method of the grout shall be described and shall be in accordance with the manufacturer's installation instructions.

4.2.9 Testing of cementitious slurry compressive strength in accordance with ASTM C 39 shall be determined at the time the transverse load tests are performed. Three specimens shall be used, at a minimum.

4.3 Durability: At least six specimens taken from three precast cementitious slurry structural members shall be used for each type of precast cementitious slurry structural members. Freeze-thaw testing shall be in accordance with ASTM C 666, Procedure A.

5.0 MISCELLANEOUS INFORMATION

5.1 Field Modifications: Field-cutting and field modifications of the precast structural members are not allowed.

5.2 Openings: Openings shall be supported by conventional construction materials designed in accordance with the code.

5.3 Plumbing and Waste Lines: Plumbing and waste lines are not permitted within the precast concrete wall panels.

5.4 Substitution: No substitution of materials is allowed unless permitted by ICC-ES.

5.5 Sulfate Exposures: The precast structural members shall not be exposed to sulfate-containing solutions or soils.

6.0 QUALITY CONTROL

6.1 The precast cementitious slurry structural members shall be manufactured under an approved quality control program with inspections by an inspection agency accredited by International Accreditation Service (IAS) or otherwise acceptable by ICC-ES.

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

6.3 A policy shall be documented by the manufacturer to assure ongoing product quality by detecting changes in the precast structural member properties that may adversely affect performance of the precast structural members. Testing for quality assurance on cementitious slurry properties shall be conducted in accordance with Section 4.1 and Table 1 of this criteria. The results of ongoing qualification tests on the cementitious slurry shall be recorded and shall match the test results established in the original qualifying tests.

7.0 EVALUATION REPORT RECOGNITION The evaluation report shall include:

7.1 Basic information referenced in Sections 2.1 and A.2.0 of this criteria.

7.2 Allowable loads of the precast cementitious slurry structural members.

7.3 Descriptions with regard to the design of nonload-bearing exterior precast cementitious slurry wall panels. Nonload-bearing wall panels shall be designed to resist wind loads as required by IBC Chapter 16 for components and cladding. In a structure assigned to a Seismic Design Category higher than A, subject to the exemption in ASCE 7 Section 13.1.4, item 1, the nonload-bearing precast cementitious slurry wall panels shall be designed in accordance with ASCE 7 Sections 13.5.1, 13.5.2 and 13.5.3.

7.4 Descriptions with regard to the design of interior precast cementitious slurry nonload-bearing wall panels. In a structure assigned to a Seismic Design Category higher than A, subject to the exemption in ASCE 7 Section 13.1.4, item 1, the nonload-bearing precast cementitious slurry wall panels shall be designed in accordance with ASCE 7 Sections 13.5.1 and 13.5.2, and IBC Section 1607.13.

7.5 Post-installed anchors, when used in the installation, shall be recognized in the ICC-ES evaluation report and must comply with the ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193) and the ICC-ES Acceptance Criteria for Adhesive Anchors in Concrete Elements (AC308), as applicable. The anchors shall be tested in cementitious slurry having the compressive strength at the time of anchor tests that will be specified in the evaluation report.

7.6 Descriptions of the installations of the precast cementitious slurry structural members.

7.7 Weather protection complying with Section 1403.2 of the IBC or Section 3.5 of this criteria.

7.8 The requirements for sealants as specified in Section 2.1.5 of this criteria.

7.9 Load-bearing shearwalls: Load-bearing precast reinforced cementitious slurry wall panels qualified for use as shearwalls, in accordance with Section A.3.5, shall be limited to Seismic Design Categories A and B, with earthquake load resistance determined using the maximum following values:

$$R = 1^1/_2,\ \Omega_o = 2^1/_2,\ C_d = 1^1/_2.$$

7.10 For precast reinforced cementitious slurry nonload-bearing wall panels with dimension stone veneer:

7.10.1 Basic information in accordance with Sections B2.1.1 [descriptions of the dimension veneer properties (e.g., the type, dimensions, density, etc.)], B2.1.2 and B2.1.3.

7.10.2 A statement that the installation of the wall panels shall be limited to Seismic Design Categories A and B, and shall comply with Section 13.1.4, item 1, of ASCE/SEI 7.

7.10.3 Allowable loads of the anchorage system and allowable loads of the dimension stone cladding system when data for compliance with Sections B3.5 and B3.6 of this criteria is submitted. ■

TABLE 1—PHYSICAL PROPERTY TESTS

PROPERTY TESTS	NUMBER OF SPECIMENS	TEST METHOD
Compressive strength at 28 days and at the time of load tests	3	ASTM C 39
Modulus of Elasticity and Poisson's Ratio	3	ASTM C 469
Modulus of Rupture	3	ASTM C 78
Oven Dry Density	3	ASTM C 642
Split-cylinder Tensile Strength	3	ASTM C 496

EXHIBIT A

SEALANT INSTALLER NAME

Completion Date: _____

THE SEALANT INSTALLED IN CONJUNTION WITH PRECAST REINFORCED CEMENTITIOUS SLURRY WALLS ON THE STRUCTURE LOCATED AT THE ADDRESS INDICATED BELOW:

CONFORMS _____

TO [PRECAST REINFORCED CEMENTITIOUS SLURRY WALL PANEL MANUFACTURE'S NAME] AND [SEALANT MANUFACTURER'S NAME] RECOMMENDED INSTALLATION PRACTICES AND SECTION(S) XXXX OF ICC-ES, INC., EVALUATION REPORT ESR-XXXX.

Address of Structure:

_____

_____

_____

_____

Product Component Names:

Primer(s) _____

Sealers _____

Bond Breakers _____

Sealant Materials _____

INSTALLATION CONFORMS TO
A. Designer's requirements, details and instructions _____
B. Sealant manufacturer's details and requirements _____
C. Precast reinforced cementitious slurry wall panels manufacturer's requirements.

Sealant Installer Company Name and Address:

_____

_____

_____

_____

Signature of Responsible Officer: _____
Typed Name and title of Officer: _____
Telephone Number: ( ) _____

cc: Original: Building Department (shall be submitted to the code official)
Copies: Precast Reinforced Cementitious Slurry Wall Panel Manufacturer
Precast Reinforced Cementitious Slurry Wall Panel Contractor
Sealant Manufacturer

ANNEX A

QUALIFICATION FOR PRECAST REINFORCED CEMENTITIOUS SLURRY WALL PANELS AND OTHER MEMBERS FOR LOAD-BEARING APPLICATIONS

A1.0 INTRODUCTION

A1.1 Purpose: The purpose of Annex A is to provide a procedure for recognition of Precast Reinforced Cementitious Slurry Structural Members (i.e., beams, columns, and floor, roof and load-bearing wall panels) for load-bearing structural applications in ICC-ES Evaluation Service, Inc., (ICC-ES) evaluation reports under the 2006 *International Building Code*® (IBC). This Annex A prescribes the testing procedures, evaluation requirements and design requirements for the precast structural members.

A1.2 Member Justification Options:

A1.2.1 Panels may be justified by load tests as described in Section A3.0. Justification by this method limits their use to panel size (e.g., thickness and height), materials, cementitious slurry mix design and compressive strength at 28-days; steel wire reinforcement configuration and orientation, wire grade, size and spacing; and number of reinforcement layers used in the load tests. Allowable loads determined may be used for shorter spans or heights but extrapolation is not permitted.

A1.2.2 Panels may be justified by a rational analysis based on load capacities developed as described in Section A4.0.

A1.2.3 Beams and columns may be justified for use in carrying gravity loadings and in SDC A and B by a rational analysis based on load capacities developed as described in Section A4.0.

A1.3 Factors of Safety:

A1.3.1 Factors of safety are set forth in subsequent sections and are based on the materials involved, test procedure, panel deformation and variation of results.

A1.3.2 Allowable values developed under this criteria are not subject to increase due to duration of loading unless specifically allowed. This includes wind and seismic loads.

A1.3.3 Where loading conditions result in several modes of superimposed stressing, the sum of the ratios of actual loads over allowable loads shall not exceed one. Transverse wind loads on a bearing wall is one example requiring this consideration.

A1.4 Supplementary Information: Supplementary information may be included in the evaluation report, provided it is justified and relates to the IBC. This includes sound transmission information as specified in IBC Section 1207 and thermal transmission data.

A2.0 BASIC INFORMATION

A2.1 Connections: Panels and other members subject to axial or racking shear loads shall have approved values for fasteners, anchors and attachments that provide the connections of the panels and members to the supporting structure. Where no values are recognized by the IBC or ICC-ES evaluation reports, supporting data including test reports deemed necessary by ICC-ES shall be provided to establish the allowable capacity of the connections. Prior to performing the tests, the test plan shall be submitted for ICC-ES consideration.

Allowable values for connections may control allowable panel loads, when they are less than the panel or other member test values.

A2.2 Basic Performance Requirements: All panels and other members shall comply with Sections 3.1 and 3.3 of the criteria. Wind-driven rain tests shall be performed on a load-bearing wall assembly for compliance with IBC Section 1403.2 and shall comply with Section 3.5 of the criteria.

A2.3 Fire-resistance-rated Construction: Reports of tests in accordance with ASTM E 119 shall be submitted for use as fire-resistance-rated construction.

A3.0 PANEL LOAD TEST OPTION

A3.1 Purpose: In lieu of determining structural and mechanical properties of panel components for rational design purposes under Section A4.0, load tests may be conducted under this criteria section to determine reasonable ultimate values to which factors of safety are applied.

A3.2 General:

A3.2.1 The allowable load on a precast reinforced cementitious slurry panel shall be the lowest value established from strength considerations and serviceability considerations.

A3.2.2 Three tests of each type are required with none of the results varying more than 10 percent from the average of the three, unless the lowest test value is used. The average result based on a minimum of six tests may be used regardless of the variations. The results of two tests may be used when the higher value does not exceed the lower value by more than 5 percent and the lower value is used with the required factors of safety.

A3.2.3 Where tests are not conducted to failure, the highest load achieved for each test will be assumed as ultimate.

A3.2.4 A factor of safety of three shall be applied to the ultimate load determined in accordance with Sections A3.2.2 and A3.2.3.

A3.2.5 Allowable loads will be limited by established fastener values except as noted in Section A3.4.2 or deflection limitations if lower than values from panel loading tests.

A3.2.6 Boundary elements or stiffeners, when utilized along the edges of the test panels, shall be only that portion of typical construction that is used for the panel being tested and shall not be supplemented by adjacent panel areas.

A3.3 Wall Panel Axial Load Tests:

A3.3.1 Except as noted in this section, the axial load tests shall be tested in accordance with the general guidelines of ASTM E 72.

A3.3.2 Load-bearing wall panels shall support an axial loading applied with an eccentricity of one-sixth the panel thickness from the centroid of the panel. The test setup shall be capable of accommodating rotation of the test specimen at the top of the wall due to out-of-plane deflection of the specimen with the load applied throughout the duration of the test with the required eccentricity. The eccentricity shall be increased to represent the end use conditions if the end use conditions have a greater load application eccentricity.

A3.3.3 The installation and support conditions of the test specimens shall represent field installation and support conditions including connections, grout, etc.

A3.3.4 The test panel shall have top and bottom edge details and top and bottom connection details matching the field installation. Axial loads shall be applied uniformly along the length of the upper edge of the panel or at the anticipated spacing of the floor or roof framing.

A3.3.5 Where panels are to be field-installed with grout on the interface between panels or between panels and the foundation, such conditions shall be duplicated along the bottom edge of the panel in the tests. Descriptions and specifications of the grout, if used, shall be noted in the test report. The installation method of the grout shall be described and shall be in accordance with the manufacturer's installation instructions.

A3.3.6 All wall panels shall be loaded in increments to failure to obtain deflection and set characteristics. Application of load and duration of load application shall be in accordance with Sections 4.2 and 4.3 of ASTM E 72. Where preloading is applied, the loading, deflection and recovery shall be noted. The amount of preloading shall not exceed 10 percent of the final allowable load.

A3.3.7 The allowable axial load is determined from the axial load at a net axial deformation of 0.125 percent of the panel height or 1/8 inch (3.2 mm), whichever is the smaller of the two; or the ultimate load divided by a factor of safety determined in accordance with Section A3.2.4, whichever is lower. In the case where the applied loads are transferred to the supporting elements by means of fasteners in lieu of the panel being supported directly by the panel support, the capacity of the panel may be limited by the allowable fastener or connection capacity.

A3.3.8 Testing of cementitious slurry compressive strength in accordance with ASTM C 39 shall be determined at the time the axial load tests are performed. Three test specimens shall be used, at a minimum.

A3.3.9 For testing on other installation conditions, the test proposal shall be submitted to ICC-ES for consideration.

A3.4 Wall Panel Transverse Load Tests:

A3.4.1 The tests shall be performed in accordance with Section 4.2.

A3.4.2 The maximum deflection of the wall panels shall be $^{1}/_{240}$ of the span in accordance with IBC Table 1604.3.

A3.5 Wall Panel Racking Shear Tests:

A3.5.1 Racking shear tests shall be conducted in accordance with ASTM E 564 on a minimum of three specimens for each cementitious slurry mix design, type and compressive strength; steel reinforcement size, grade, location and spacing under consideration.

A3.5.2 The test panel shall be constructed and installed as intended in the field, including connections.

A3.5.3 Where panels are to be field-installed with grout on the interface between panels or between panels and the foundation, such conditions shall be duplicated along the bottom edge of the panel in the tests. Descriptions and specifications of the grout, if used, shall be noted in the test report. The installation method of the grout shall be described and shall be in accordance with the manufacturer's installation instructions.

A3.5.4 The allowable shear load is determined from the lowest value of: (1) the racking load at which a net horizontal drift of 0.5% of the panel height occurs; (2) the ultimate load divided by a factor of safety determined in accordance with Section A3.2.4; and (3) the allowable fastener or connection capacity.

A3.5.5 Testing of cementitious slurry compressive strength in accordance with ASTM C 39 shall be determined at the time the racking shear tests are performed. Three test specimens shall be used, at a minimum.

A3.5.6 Shearwalls of the precast reinforced cementitious slurry wall panels are limited to Seismic Design Categories A and B.

A3.6 Roof and Floor Panels:

A3.6.1 Uniform Load Tests:

A3.6.1.1 The installation and support conditions of the test specimen shall represent field installation and support conditions including connections, grout, etc.

A3.6.1.2 Deflection readings are to be taken at mid-span, within three inches (76.2 mm) of each edge and at the center of the panel width. For panels with a width less than 24 inches (609.6 mm), the edge readings shall be taken at a distance from each panel edge not more than ten percent of the width of the panel. Panels tested over continuous spans are to have the same three deflection readings taken at the expected maximum deflection point for each span based on analysis.

A3.6.1.3 Loading in out-of-plane direction may be applied by an air bag system, chamber method or third-point loading. If an air bag is used, air bags shall fully contact the test specimens during testing.

A3.6.1.4 Application of load and duration of load application shall be in accordance with Sections 4.2 and 4.3 of ASTM E 72.

A3.6.1.5 Allowable uniform loads for roof and floor panels shall be based on the following:

A3.6.1.5.1 Allowable loads determined under Sections A3.2.2 through A3.2.5.

A3.6.1.5.2 The maximum deflection shall be $^{1}/_{360}$ of the span.

A3.6.1.5.3 The allowable loads for floor and roof panels shall be greater than the minimum load combinations prescribed in the code.

A3.6.1.6 For roof panels, water accumulation or water ponding shall be addressed in accordance with IBC Section 1611.2.

A3.6.2 Concentrated Live Load Tests:

A3.6.2.1 Floor Panels: Concentrated load tests for floor panels shall be necessary for loads specified in accordance with IBC Section 1607.4.

A3.6.2.1.1 The installation and support conditions of the test specimen shall represent field installation and support conditions.

A3.6.2.1.2 Uniform dead load combined with the concentrated live loads shall be applied to the test panels with the concentrated load applied at such locations as to cause maximum bending moments and maximum shear forces at critical sections.

A3.6.2.1.3 Application of load and duration of load application shall be in accordance with Sections 4.2 and 4.3 of ASTM E 72.

A3.6.2.1.4 Deflection readings are to be taken at mid-span at each edge and at the center of the panel width. Panels tested over continuous spans are to have the same three deflection readings taken at the expected maximum deflection point for each span based on analysis.

A3.6.2.1.5 At the design concentrated live load and uniform dead load, the tested panels shall comply with the deflection requirements noted in IBC Table 1604.3 (i.e., $^{1}/_{360}$ of the span).

A3.6.2.1.6 Roof Panels: Roof panel spans must be evaluated for uniform dead load combined with the 300-pound (1334 N) concentrated design live load required by IBC Section 1607.4 and Table 1607.1. When compliance is demonstrated by load testing, the allowable concentrated load determined in accordance with Sections A3.2.2 through A3.2.5 shall exceed the required 300-pound concentrated design live load, with the required safety factor applied to the uniform dead load. At the design concentrated live load and uniform dead load, the tested panels shall comply with the deflection limitations noted in IBC Table 1604.3 (i.e., $^{1}/_{360}$ of the span).

A4.0 PANEL AND OTHER MEMBER ANALYSIS OPTION

A4.1 Purpose: To establish the design methodology for determination of the load capacity of the precast reinforced cementitious slurry structural members, a proposed design methodology consistent with the provisions of ACI 318 shall be

provided using physical properties of the materials. To verify design methodology, confirmatory tests of full-scale precast reinforced structural members shall be performed. Confirmation test results shall exceed the capacities estimated by the proposed design methodology. The design methodology and confirmation tests need to address effects of variations in precast structural member shapes and sizes; cementitious slurry and steel reinforcement properties; steel wire reinforcement configuration and orientation, wire grade, size and spacing, and number of reinforcement layers.

A4.2 Material Tests: Tests to determine the cementitous slurry material characteristics are as follows:

A4.2.1 Tension: ASTM C 496.

A4.2.2 Compression: ASTM C 109.

A4.2.3 Shear and Shear Modulus: ASTM E 1875 or ASTM E 1876.

A4.2.4 Modulus of Rupture: ASTM C 78 or ASTM C 293.

A4.3 Confirmatory Testing:

A4.3.1 Panels: Axial load, uniform transverse, and racking shear tests in accordance with Sections A3.2, A3.3, A3.4 and A3.5 shall be conducted on full-scale panels to confirm the design procedure. Concentrated load tests of floor and roof panels shall be conducted in accordance with Section A3.6.

A4.3.2 Other Members:

A4.3.2.1 For columns, axial load tests shall be performed in accordance with Section A3.3, except the load shall be applied over the area of the column with an eccentricity of 1/6 the column's maximum cross-sectional dimension.

A4.3.2.2 For beams and one-way slabs, uniform and concentrated load tests shall be performed in accordance with the concepts of Section A3.6 and ASTM E 529 on full-scale members to confirm design procedures. A test plan shall be submitted to ICC-ES for review prior to test commencement.

A4.3.2.3 The loading application conditions shall create failure modes in the structural members to validate the failure modes.

ANNEX B

QUALIFICATION FOR DIMENSION STONE VENEER FACTORY-ATTACHED TO PRECAST REINFORCED CEMENTITIOUS SLURRY NONLOAD-BEARING WALL PANELS

B1.0 INTRODUCTION

B1.1 Purpose: The purpose of Annex B is to provide a procedure to allow recognition of precast reinforced cementitious slurry non-load bearing wall panels with dimension stone veneer in ICC-ES Evaluation Service, Inc. (ICC-ES), evaluation reports under the 2006 *International Building Code* (IBC).

B1.2 Scope: Annex B is applicable to dimension stone veneer, complying with ASTM C 503, ASTM C 568, ASTM C 615 and ASTM C 616, factory-attached to precast reinforced cementitious slurry non-load bearing wall panels with mechanical anchorage system. The installation of the wall assembly is limited to the installation in Seismic Design Categories A and B. The additional load caused by the dimension stone, including the material used for connection to the walls, shall comply with the load limitation for nonload-bearing walls required by the IBC Section 202. The veneer units shall be individually supported and not bear on the successive veneer units below.

B1.3 Definitions

B1.3.1 Dimension Stone Veneer: A veneer or facing made from natural stone that has been selected and fabricated to specific sizes or shapes.

B1.3.2 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 panel.

B1.3.3 Veneer System: The combination of the veneer units with the supporting materials used to affix the veneer to the supporting wall panel, including epoxy adhesive, joint sealants, and mechanical anchorage.

B2.0 BASIC INFORMATION

B2.1 General: The following information shall be submitte

B2.1.1 Product Description:

B2.1.1.1 Precast Reinforced Cementitious Slurry Nonload-bearing Wall Panels: Complete information concerning the precast nonload-bearing wall panels shall be in accordance with Section 2.1.1.1.

B2.1.1.2 Dimension Stone Veneer: Descriptions and specifications shall be provided of the dimension stone veneer complying with ASTM C 503, ASTM C 568, ASTM C 615 or ASTM C 618, including the coefficient of thermal expansion of the dimension stones. The dimension stone sizes and manufacturing tolerances shall be specified. The dimension stone shape shall be rectangular, with minimum and maximum thicknesses of $^5/_8$ inch (15.9 mm) and 2 inches (51 mm), respectively. The area of the veneer units shall be maximum 20 square feet (1.9 m^2).

B2.1.1.3 Epoxy Adhesive: Descriptions and specifications shall be provided for the epoxy adhesive used to bond the veneer to the wall panel. The thickness ranges of the adhesive setting bed and tolerances shall be specified. The minimum thickness shall be $^5/_{64}$ inch (2 mm). The installation instructions for the adhesive application shall be provided in the quality documentation and shall include the following:

1. Complete mixing instructions for the adhesive.
2. Application instructions, including the application method, the thickness of wet and dry film, and a notation as to whether the adhesive is to be applied to one or both contact surfaces.
3. Assembly conditions, including temperature, humidity and time limitations, and the dimension stone veneer and precast wall panel conditions.
4. Curing conditions, including recommended curing temperature, pressure, time under pressure and temperature of the assembly under pressure.
5. Pot life, storage temperature and maximum storage life.

B2.1.1.4 Anchorage System: Descriptions and specifications for the veneer anchorage system shall be provided, such as generic or trade name, shape, dimensions, appropriate referenced standards for the materials, physical and mechanical properties, corrosion protective coatings, and allowable strength. The specifications (e.g., types, number, location, spacing, and minimum edge and end distances) and attachment methods for preinstalled anchorages shall be included in the quality documentation. Anchors shall be proven as corrosion-resistant to the satisfaction of ICC-ES.

B2.1.1.5 Joint Sealants: Sealants used at control joints, intersections or terminations of the veneer at dissimilar materials, wall/eave interfaces, penetrations and openings shall be minimum Type S or M, minimum Grade NS, minimum Class 25, and Use O, in compliance with ASTM C 920, and be compatible with the stone veneer. Under the Use O classification, the sealant needs to be qualified for each of the materials to which the sealant will be applied, such as the veneer, copper piping, galvanized steel and vinyl window frames, by the adhesion and cohesion under cyclic movement test and adhesion-in-peel tests of Sections 8.8 and 8.9 of ASTM C 920. The details of sealant installation, including the width and thickness of the sealant, shall be designed by the registered design professional, designer, builder, or cementitious slurry evaluation report applicant, in that order, to the satisfaction of the code official.

B2.1.1.6 Flashing: Corrosion-resistant flashing shall be provided as part of the weather-resistant exterior wall envelope as set forth in Section 1405.3 of the IBC The flashing shall extend to the surface of the veneer and be installed in such a manner to prevent water entry into the building interior, wall cavity, or wall framing structural components. Flashing installation shall be as determined and specified by the registered design professional; where a registered design professional is not involved, the designer, builder, or applicant shall be responsible. As a minimum, approved corrosion-resistant flashing shall be installed at the following locations:

1. The heads, jambs, and sills of all window and door openings.
2. The wall and roof intersections.
3. The intersection of chimneys or other concrete or masonry construction with frame walls.
4. Where exterior porches, decks, or stairs intersect exterior walls.
5. At built-in gutters.
6. Continuously above all projecting trim.
7. Penetrations and terminations of exterior wall assemblies.

B2.1.2 Installation Instructions: The installation instructions for wall panels with dimension stone veneer shall comply with IBC Section 1403.2 and Section 6.1.5 of ACI 530/ASCE 5/TMS 402. Installation instructions shall describe the methods used to attach the precast cementitious slurry nonload-bearing wall with dimension stone veneer to the other wall panel and to the supporting structures; the minimum and maximum width for joints between veneer units attached to wall panels (including tolerances); the location of veneer anchorages; joint treatment and any special requirements related to the installation of wall panels with dimension stone veneer. Installation instructions shall include requirements for product handling and storage.

B2.1.3 Product Identification and Labeling: In addition to the requirements of Section 2.1.6, a label on the packaging of the dimension stone veneer wall panels shall include the weight of the wall panel assembly.

B2.2 Test Reports:

B2.2.1 General: Test reports shall comply with AC85. For each type of stone veneer qualified in accordance with Section B3.0, the test report shall also include the following information: quarry source, rift orientation and stone finish.

B2.2.2 Structural load and Wind-driven Rain Test Reports: In addition to Section B2.2.1, test reports on structural load and wind-driven rain tests shall also include the following:

1. A statement that production, fabrication, transportation, and installation of the wall panels with dimension stone veneer have been witnessed by the testing laboratory. The statement shall describe each material used and the manufacturing process used in fabricating the product.
2. Preparation of wall panels for application of veneer, and description of veneer before and after testing. Descriptions shall be supported by photographs.
3. Description of test procedures, along with details.
4. Age of wall panels and of veneer at time of testing. Testing shall be conducted within 45 days of veneer installation.
5. Description of the dimension stone veneer sampled.
6. A statement as to whether the test results satisfy the conditions of acceptance as given in Annex B.

B2.3 Product sampling shall comply with Section 3.1 of AC85. If the test specimen is an assembly, Section 3.3 of AC85 shall be applicable. The production of the precast reinforced cementitious slurry nonload-bearing wall with the dimension stone veneer shall be witnessed by a representative of an accredited testing laboratory or an accredited inspection agency and shall be sampled from each manufacturing facility which is to be recognized in the evaluation report.

B3.0 TEST AND PERFORMANCE REQUIREMENTS

B3.1 General: Dimension stone specimens used in all tests shall be taken from the same location within the same quarry, except where additional tests are conducted on materials from other locations to determine the effects of variations on performance.

B3.2 Precast Reinforced Cementitious Nonload-bearing Wall Panels: Qualification tests and performance requirements for the precast nonload-bearing wall panels shall be in accordance with applicable subsections of Section 3.0.

B3.3 Dimension Stone Property Tests: Material property tests for the dimension stone shall be performed in accordance with ASTM C 503, ASTM C 568, ASTM C 615 or ASTM C 616. For modulus of rupture, compressive and flexural strength tests, the test specimens shall be tested dry and wet. The thickness of the test specimens for the modulus of rupture and flexural strength tests shall be representative of the dimension stone thickness for which recognition is sought. The results of the material property tests shall comply with the applicable specifications (i.e., ASTM C 503, ASTM C 568, ASTM C 615 or ASTM C 616).

B3.4 Adhesive Property Tests: Adhesives shall comply with the ICC-ES Acceptance Criteria for Sandwich Panel Adhesives (AC05).

B3.5 Individual Stone Anchorage Tests:

B3.5.1 A qualification test plan may be submitted to ICC-ES for each type of anchorage system for review and acceptance prior to testing. ASTM C 1242 and C 1354 may be used as guides provided the qualification test plan is submitted before testing commencement. The test plan shall be a complete document, and shall include specifications of the anchorage system, the stone veneer and the precast wall panel, a description of the test method, test setup, loading directions, loading rates, drawings, and methods to establish the allowable loads. The test shall be performed on each configuration of the veneer test assembly for which recognition is sought and shall be conducted without the use of the epoxy adhesive bonding the veneer to the precast wall panel. Anchor types shall comply with requirements in Section 9.0 of ASTM C 1242.

B3.5.2 Test specimens shall consist of a connection consisting of the stone veneer, anchorage system, and a precast wall panel representative of field conditions.

B3.5.3 As a minimum, a series of five identical tests shall be performed for each combination of variables that affect the performance of the anchorage system.

B3.5.4 Dimension stone property tests shall be performed in accordance with Section B3.3.

B3.5.5 Testing of cementitious slurry compressive strength in accordance with ASTM C 39 shall be determined at the time the load tests are performed. Three cylinders shall be used, at a minimum.

B3.5.6 A factor of safety of five, as a minimum, shall be used to establish the allowable loads of the anchorage system. A higher safety factor may need to be assigned based on the materials involved and variation of the test results.

B3.6 Structural Load Tests:

B3.6.1 For recognition in the evaluation report, a qualification test plan to determine the structural performance of the dimension stone cladding systems may be submitted to ICC-ES for review and comment. ASTM C 1201, Procedure B and ASTM C 1242 Section 8.6 may be used as guides, provided the qualification test plan is submitted before testing commencement (If testing in accordance with ASTM C 1201 is performed, the test load at each increment shall be applied and maintained for a minimum of one minute in lieu of 10 seconds). The test plan shall be a complete document, and shall include the sufficient test details for each assembly; such as: sampling methodology, descriptions and specifications of components (material properties and sizes) used in the wall panel assembly, drawings illustrating the assembly, installation pattern of the dimension stone, mechanical anchor location and spacing, description of the test method, descriptions of loading directions and deflection gage locations, and test setup.

B3.6.2 The test shall be performed on each configuration of the veneer test assembly for which recognition is sought and shall be conducted without the use of the epoxy adhesive bonding the veneer to the wall panel. Test specimens shall consist of a connection consisting of the stone veneer, anchorage system, and a precast wall panel representative of field conditions. Minimum of five identical test specimens shall be used for each combination of variables that affect the performance of the dimension stone cladding systems.

B3.6.3 Dimension stone property tests shall be performed in accordance with Section B3.3.

B3.6.4 Testing of cementitious slurry compressive strength in accordance with ASTM C 39 shall be determined at the time the load tests are performed. Three cylinders shall be used, at a minimum.

B3.6.5 Allowable loads shall be determined in accordance with Section 7.3 and Table 3 of ASTM C 1242. Higher safety factors may need to be assigned as set forth in Section 7.3.3 of ASTM C 1242 based on the materials and conditions involved and variations of the test results.

B3.7 Freezing and Thawing: Veneer to be recognized for exterior exposures shall have its resistance to freezing and thawing tested in accordance with Section B4.1 of Annex B. Test samples shall not break or disintegrate, and weight loss shall be limited to 3 percent of the original weight of the dry specimen.

B3.8 Wind-driven Rain Tests: Tests on the wall assemblies shall be conducted in accordance with Section 1403.2, Exception 2, of the IBC. At least one test sample for each wall envelope assembly configuration is needed. The configuration is determined by the veneer size and thickness, cementitious slurry wall panel thickness, openings, joints, penetrations, system terminations, wall/eave conditions, and wall sill joint configuration used in the test samples. Control joints, intersections or terminations of the veneer at dissimilar materials, wall/eave interface, configuration and methods of making the veneer at penetrations and openings waterproof (including the veneer interface at doors and windows), as used in the tests, shall be the basis for the evaluation report. Sealants shall comply with Section B2.1.1.5 and shall be installed with the width and thickness intended for recognition. If a range of sealant widths is to be recognized, the tested assembly shall include penetrations with minimum and maximum sealant widths. Flashing shall comply with Section B2.1.1.6. Windows shall be the intended brand and model of window, unless the tests are conducted on an assembly configuration that is not dependent on a sealant and not dependent on the water penetration resistance capability of the window, such as a window flashing system tested in an arrangement similar to that shown in Figure 1 and include the intended flashing system, or the evaluation report will need to include dimensioned drawings of the type of window and door frame used in the tests.

The precast reinforced cementitious slurry wall panel age shall be a minimum of 28 days before testing.

The conditions of acceptance shall comply with IBC Section 1403.2, Exception 2, and the water shall not penetrate to the interior face of the dimension stone veneer.

B3.9 Interior Wall Finishes: For the dimension stone veneer to be recognized for use as an interior finish, reports of tests showing complying with IBC Section 803 shall be submitted.

B3.10 Coefficient of Thermal Expansion of the Dimension Stone: Coefficient of thermal expansion of dimension stone veneer shall be determined in accordance with ASTM E 831.

B4.0 TEST PROCEDURES

B4.1 Freezing and-thawing Test:

Freezing and thawing testing of veneer specimens shall be conducted, and results reported, in accordance with the procedures described in Section 4.2 of the ICC-ES Acceptance Criteria for Precast Stone Veneer (AC51).

B5.0 QUALITY CONTROL

B5.1 The precast reinforced cementitious slurry nonload-bearing wall panel with dimension stone veneer shall be manufactured under an approved quality control program with inspections by an inspection agency accredited by International Accreditation Service (IAS) or otherwise acceptable to ICC-ES.

B5.2 Quality documentation complying with the ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted.

B5.3 The policy to assure ongoing product quality of the precast reinforced cementitious nonload-bearing wall panels shall be in accordance with Section 6.3.

B5.4 Ongoing quality control for the incoming dimension stone veneer in accordance with Sections B3.3 and B3.11 shall be performed, and the test results shall be documented and shall be made available for review during the follow up inspection. A sampling method whereby samples represent the population of the incoming dimension stone veneer shall be noted in the quality documentation.