Technical Evaluation Report

TO ASSIST WITH CODE COMPLIANCE

Cultured Stone® & ProStone®
Applications Over Continuous Insulation

TER No. 1302-01

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Division: 04 00 00 – MASONRY
Section: 04 70 00 – Manufactured Masonry
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1. **Products Evaluated:**
   - **1.1.** Cultured Stone® and ProStone®
2. **Applicable Codes and Standards:**[1]
   - **2.1.** *2006*, *2009 and 2012 International Building Code (IBC)*
   - **2.2.** *2006*, *2009 and 2012 International Residential Code (IRC)*
   - **2.3.** *ASTM C150, Standard Specification for Portland Cement*
   - **2.4.** *ASTM C1063, Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster*
3. **Performance Evaluation:**
   - **3.1.** The Cultured Stone® and ProStone® products were evaluated for:
     - **3.1.1.** Use as an exterior finish in new or existing wood-framed and light gage steel-framed, walls in accordance with 2012 *IBC* Section 1405.10[2] and 2012 *IRC* Section R703.12[3].
     - **3.1.2.** Use as an exterior finish over wood structural sheathing (WSP) with the addition of continuous insulation installed between the WSP and the Cultured Stone® and ProStone® products.
     - **3.1.3.** Use in applications requiring a fire-resistance rating are outside the scope of this evaluation.

[1] Unless otherwise noted, code references are from the 2012 versions of the codes.
[2] *2009 IBC* Section 1404.4
[3] *2009 IRC* Section R703.7

The *IBC* defines:

- **APPROVED SOURCE** – "An independent person, firm or corporation, *approved* by the *building official*, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses."

DrJ's building construction professionals meet the competency requirements as defined in the *IBC* and can seal their work. DrJ is regularly engaged in conducting and providing engineering evaluations of single-element and full-scale building systems tests. This TER is developed from test reports complying with *IBC* Section 104.11.1 Research reports, which states, "Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from *approved* sources."

4. Product Description and Materials:

4.1. Cultured Stone® and ProStone® is a manufactured, precast, artificial veneer product made from Portland cement, aggregate and mineral oxide colors used as adhered, non-bearing exterior veneer or as an interior finish.

4.2. Cultured Stone® and ProStone® products have the following characteristics:

4.2.1. Color and texture similar to various stone surfaces. Examples are shown in Figure 1.

Figure 1: Examples of Cultured Stone® & ProStone® Finishes

4.2.2. Patterns have a maximum area of 720 square inches (0.464 m^2)

4.2.3. Patterns have a maximum dimension of 36" (914 mm).

4.2.4. Patterns have a maximum veneer weight of 15 pounds per square foot (73.2 kg/m^2).

4.2.5. The total cladding system weight, including the mortar setting bed, lath and scratch coat, is up to 25 pounds per square foot (122 kg/m^2).

5. Applications:

5.1. Cultured Stone® and ProStone® is used as an exterior wall covering in accordance with the applicable sections of *IBC* Chapter 14 and *IRC* Section R703 and is installed over wood or steel framed walls and wood structural panels (WSP) capable of supporting the imposed loads in accordance with *IBC* Section 1609 and *IRC* Section R301.2.1 including all required transverse wind loads.

5.2. Cultured Stone® and ProStone® is used as an exterior wall covering installed over wood or steel framed walls where the wood structural panels are over sheathed with continuous insulation. The maximum foam thickness for various fastener sizes and types are as shown in Table 1.

Lath Fastener Through Continuous Insulation Into:	Lath Fastener – Type & Minimum Size	Max. Veneer Weight (includes lath & mortar setting bed)	Maximum Thickness of Foam Plastic Insulating
Wood Framing	0.131" diameter nail	25 psf	0.5"
	0.148" diameter nail	25 psf	0.75"
	0.162" diameter nail	25 psf	1.5"
Steel Framing	#8 (0.164" dia.) into 33 mil steel	25 psf	1.5"
	#10 (0.19" dia.) screws into 33 mil steel	25 psf	2.0"
	#8 (0.164" dia.) screws into 43 mil steel	25 psf	2.5"
	#10 (0.19" dia.) screws into 43 mil steel	25 psf	3"

1. Screws shall be self-drilling, self-tapping and have a wafer or pancake head with a minimum $^5/_{16}$" diameter.
2. Nails shall penetrate wood framing a minimum of $1^1/_4$".
3. Screws shall penetrate steel framing a minimum of $^3/_8$".
4. Maximum stud spacing is 16" o.c. Lath shall be attached vertically along each stud a maximum of 6" o.c
5. Wood studs shall have a minimum specific gravity of 0.42
6. For thicker continuous insulation applications, design is required in accordance with accepted engineering practice.
7. Lath shall be attached in accordance with Section 6.8.

Table 1: Fastener Requirements to Support Cladding Weight for Cultured Stone® & ProStone® Installation Over Continuous Insulation

5.3. Cultured Stone® and ProStone® are used as an exterior wall covering installed over wood- or steel-framed walls, where the furring is attached over the continuous insulation. For this application, the maximum foam thickness for various fastener sizes and types are as shown in Table 2.

Furring Material	Framing Member	Fastener Type & Minimum Size	Minimum Penetration into Wall Framing (in)	Fastener Spacing in Furring (in)	Maximum Thickness of Foam Plastic Insulating Sheathing (in)
Minimum 1x3 Wood Furring	Minimum 2x Wood Stud	Nail (0.120" shank; 0.271" head)	1¼"	8	0.5
		Nail (0.131" shank; 0.281" head)	1¼"	8	1
		#8 wood screw	1"	12	0.5
		¼" lag screw	1½"	12	1
Minimum 33mil Steel Hat Channel or Minimum 1x3 Wood Furring	43 mil or thicker Steel Stud	#10 screw (0.333" head)	Steel thickness +3 threads	12	1.5
				16	0.5

1. Maximum Cultured Stone® and ProStone® weight including lath and mortar bed is 25 psf.
2. Maximum furring spacing is 16".
3. Minimum ¾"-thick wood furring and wood studs with a minimum specific gravity of 0.42.
4. Minimum 33 mil steel hat channel (33ksi) with ⅞" depth.
5. Minimum steel stud framing – 43 mil (33ksi).
6. Self-drilling, self-tapping screw fasteners for connection of siding to steel framing shall comply with the requirements of AISI S200. Other approved fasteners of equivalent or greater diameter and bending strength shall be permitted.
7. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.
8. Furring shall be spaced a maximum of 16" o.c. in a vertical or horizontal orientation. In a vertical orientation, furring shall be located over wall studs and attached with the required fastener spacing. Furring strips installed in a horizontal direction shall be fastened at each stud with a number of fasteners equivalent to that required by the fastener spacing. [e.g., If the required nail spacing is 12" o.c. and the studs are 16" o.c., then two (2) nails would be required at each stud (16/12=1.33, round up to 2)]. In no case shall fasteners be spaced more than 16" apart.
9. Lag screws shall be installed with a standard cut washer.
10. Lag screws and wood screws shall be pre-drilled in accordance with *AF&PA/NDS*. Approved self-drilling screws of equal or greater shear and withdrawal strength shall be permitted without pre-drilling.
11. A minimum 2x wood furring shall be used where the required siding fastener penetration into wood material exceeds ¾" (19.1 mm) and is not more than 1½" (38.1 mm), unless approved deformed shank siding nails or siding screws are used to provide equivalent withdrawal strength allowing the siding connection to be made to a 1x wood furring.
12. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C 578 or ASTM C 1289.

Table 2: Furring Minimum Fastening Requirements for Application Over Foam Plastic Insulating Sheathing to Support Cladding System Weight

5.4. Cultured Stone® and ProStone® shall not be installed in areas where the design wind pressure exceeds the capacity of the cladding and its attachment to resist the load in accordance with Table 3

5.5. For additional information or use in other applications, consult the manufacturer's installation instructions.

Exposure Category	Maximum Wind Speed (mph) (V_{ult}/V_{asd})[1]	Wind Pressure (psf)[2]
B	≤ 200/155	105
C	≤ 180/140	116
D	≤ 160/125	107

1. Listed wind speed is V_{ult}, per *ASCE 7-10*, and is the maximum allowed wind speed for the Exposure Category shown with a maximum Mean Roof Height (MRH) of 40'. The second wind speed capacity shown for each exposure category is the *ASCE 7-10* ultimate wind speed converted to V_{asd} for allowable stress design and rounded to the nearest 5 mph.
2. Design wind pressure per *ASCE 7-10* for components and cladding, Method 1 for the condition shown.
3. Maximum allowable wind speeds are based on the average ultimate loads tested for each condition divided by 1.5.
4. Pressure Equalization factor in accordance with ASTM D5206, Procedure B equals 1.0
5. Cultured Stone® and ProStone® installation shall be in accordance with the manufacturers installation instructions and this TER.

Table 3: Maximum Wind Speeds for Cultured Stone® & ProStone®

6. Installation:

6.1. Cultured Stone® and ProStone® shall be installed in accordance with the manufacturer's published installation instructions and this TER. Where a discrepancy exists, this TER shall govern.

6.2. Installation is subject to the conditions of use set forth in Section 9.

6.3. Veneer must be applied to studs spaced a maximum of 16" o.c. (406 mm).

6.4. Cultured Stone® and ProStone® may be installed over WSP with an intervening layer of continuous insulation and attached in accordance with Table 1.

6.5. Cultured Stone® and ProStone® may be installed over continuous insulation with no WSP and attached in accordance with Table 1.

6.5.1. Where WSPs are used, they shall be installed in accordance with the applicable building code and shall comply with one of the following minimum requirements:

6.5.1.1. Minimum $^{7}/_{16}$" Structural 1, Exposure 1 OSB complying with U.S. DOC PS-2.

6.5.1.2. Minimum ½" Structural 1 rated, exterior grade plywood complying with U.S. DOC PS-1.

6.6. Cultured Stone® and ProStone® must be over two (2) layers of a water resistant barrier (WRB) in accordance with *IBC* Section 1404.2 and *IRC* Section 703.2. The base layer WRB may be liquid-applied, a sheet material or a rigid continuous insulation with taped joints where the continuous insulation is approved for use as a WRB.

6.7. Weep screeds and code-compliant flashing must be installed at the bottom of walls and at all horizontal terminations of the veneer.

6.7.1. The weep screed must comply with and be installed in accordance with *IBC* Section 2312.1.2 or *IRC* Section R703.6.2.1.

6.8. Veneer must be installed over 2.5 pound-per-square-yard (1.4 kg/m^2) galvanized diamond mesh metal lath,3.4 pound-per-square-yard (1.8 kg/m^2) $^{3}/_{8}$"-thick (9.5 mm) paper-backed galvanized expanded metal lath No. 18 gage [0.051"-thick (1.30 mm)] galvanized woven wire mesh applied or other code-approved lath of equal or better performance:

6.8.1. Per the manufacturer’s installation instructions

6.8.2. Over the WRB

6.8.3. Fastened through continuous insulation to studs at 6" o.c. (152 mm) vertically.

6.8.4. Fasteners for wood studs (minimum specific gravity of 0.42) must be a minimum of 0.131" -shank-diameter galvanized nails

6.8.5. Fasteners for steel studs must be a minimum $^{5}/_{16}$"-head-diameter (8 mm) corrosion resistant self-drilling and self-tapping pancake head screw of sufficient length to penetrate studs a minimum of $^{3}/_{8}$" (9.5 mm)

6.9. Alternately, installation over 3.4 pound-per-square-yard (1.8 kg/m^2) $^{3}/_{8}$"-thick (9.5 mm galvanized expanded metal lath without a paper backing is allowed, provided two (2) separate WRB layers are provided and all other requirements of section 6.8 are met.

6.10. Cultured Stone® and ProStone® shall be adhered to the supporting walls with a ½"-thick to ¾"-thick (12.7 to 19.1 mm) mortar setting bed

6.10.1. The mortar must comply with *IBC* Section 2103.9 (2012) Section 2103.8 (2009) or *IRC* Table R607.1 for the application.

6.10.2. Other mortars of equal or greater performance shall be permitted, when installed in accordance with the manufacturer's installation instructions.

6.11. All other installation and flashing details germane to the project shall be in accordance with the applicable building code and the manufacturer’s installation instructions.

7. Substantiating Data:

7.1. Report showing compliance with the following ASTM standards for the physical and mechanical properties of the product:

7.1.1. C33 – Standard Specification for Concrete Aggregates.

7.1.2. C67 – Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.

7.1.3. C150 – Standard Specification for Portland Cement.

7.1.4. C330 – Standard Specification for Lightweight Aggregates for Structural Concrete.

7.1.5. C331 – Standard Specification for Lightweight Aggregates for Concrete Masonry Units.

7.1.6. C348 – Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.

7.1.7. C482 – Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste.

7.1.8. C567 – Standard Test Method for Determining Density of Structural Lightweight Concrete.

7.2. Quality Control Manual for the Manufacturing of Boral Stone Products.

7.3. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate as it undertakes its engineering analysis.

7.3.1. DrJ does not assume responsibility for the accuracy of data provided by testing facilities, but relies on each testing agency's accuracy and accepted engineering procedures, experience, and good technical judgment.

7.4. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through the codes and standards listed in Section 2, to undertake the review of test data that is comparative or shows equivalency to an intended end use application. DrJ undertakes its engineering evaluation based on code-adopted design values, code-adopted installation details and all code-based and new product test data and analysis provided.

7.4.1. DrJ does not assume responsibility for the accuracy of any code-adopted design values but relies upon their accuracy for engineering evaluation.

7.4.2. DrJ relies upon the fact that the manufacturers of code-adopted products stand behind these legally established design values that have been created by the manufacturer of those products or the members of the associations that publish a given set of code-based design values for a given commodity.

7.4.3. DrJ evaluates all equivalency testing and related analysis using this engineering foundation.

8. Findings:

8.1. Cultured Stone® and ProStone® is a suitable alternative to the products listed in the applicable building code for use as an exterior wall covering in accordance with *IBC* Section 1404.10 and the *IRC* Section 703.10.

8.2. Cultured Stone® and ProStone® is a suitable for use as an exterior wall covering assembly when installed over WSP with an additional layer(s) of continuous insulation installed between the Cultured Stone® and ProStone® and the WSP in accordance with Table 1.

8.3. Cultured Stone® and ProStone® is suitable for use as an exterior wall covering assembly when installed continuous insulation without WSP in accordance with Table 1.

8.4. *IBC* Section 104.11 and *IRC* Section R104.11 specifically state that:

> The provisions of this code are not intended to prevent the installation of any material 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.

9. Conditions of Use:

9.1. The Cultured Stone® and ProStone® products described in this TER comply with, or are a code compliant alternative material that specified in the codes described in Section 2, subject to the following conditions.

9.2. Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, this TER governs.

9.3. Installation shall be on exterior walls consisting of wood framing or steel framing capable of supporting the imposed loads, including transverse wind loads.

9.4. Two layers of WRB are required over the framing and WSP sheathing (where present). The base layer may be of sheet goods or rigid FPIS.

9.5. Where the seismic provisions of *IRC* Section R301.2.2 apply, the Cultured Stone® and ProStone® wall assembly shall not exceed the weight limits of Section R301.2.2.1 unless an engineered design is provided in accordance with Section R301.1.3.

9.6. Walls shall be braced to resist shear (racking) load by other means in accordance with the applicable code.

9.7. Exterior wall framing shall be limited to a maximum out of plane deflection of H/360.

9.8. Design

9.8.1. Building Designer

9.8.1.1. The Construction Documents shall be prepared by a Building Designer for the Building and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in detail conformance to the building code.

9.8.1.2. The Construction Documents shall provide information sufficiently accurate and reliable to be used for facilitating the supply of Cultured Stone® and ProStone® and shall provide the following:

9.8.1.2.1. The location, direction and magnitude of all dead, live and lateral loads applicable to Cultured Stone® and ProStone®, and any other loads that are going to be applied to Cultured Stone® and ProStone®.

9.8.1.2.2. All foundation anchorage designs required to resist uplift, gravity, and lateral loads.

9.8.2. Design loads shall not exceed the allowable loads as defined in this TER.

9.8.3. Construction Documents

9.8.3.1. Construction Documents shall be submitted to the Building Official for approval prior to construction.

9.8.3.2. Construction Documents shall contain the plans, specifications and details needed for the Building Official to approve such documents.

10. Identification:

10.1. Cultured Stone® products described in this TER are identified by the initials "C.S.V." on each piece.

10.2. Cultured Stone® and ProStone® products described in this TER are identified by a label on the packaging material bearing the manufacturer's name, product name, manufacturing plant location, product code, and other information to confirm code compliance.

10.3. Additional technical information can be found at culturedstone.com.

11. Review Schedule:

11.1. This TER is subject to periodic review and revision.

11.2. For information on the current status of this report, contact DrJ.

Responsibility Statement

The information contained herein is a product, engineering or building code compliance research report performed in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering procedures, experience and good technical judgment. Product, design and code compliance quality control is the responsibility of the referenced company. Consult the referenced company for the proper detailing and application for the intended purpose. Consult your local jurisdiction or design professional to assure compliance with the local building code. DrJ (drjengineering.org) research reports are not to be construed as representing aesthetics or any other attributes not specifically addressed, nor are they to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by DrJ, express or implied, as to any finding or other matter in this report or as to any product covered by this report.

Appendix A:
TERs Are Comparable to, Compatible with, and Equivalent to the Purpose of an ICC-ES ESR

1. Technical Evaluation Reports (TERs), drafted and maintained by DrJ (professional engineering firm and ISO Guide 65 applicant through ANSI/ACLASS), assess how specific products comply with the provisions of the building code. DrJ is a code-defined "approved source", and DrJ employs professional engineers and follows state professional engineering rules and regulations.

2. TERs are comparable to, compatible with, and equivalent to the purpose of an ICC Evaluation Service (ICC-ES) Evaluation Service Reports (ESRs).

2.1. ICC Evaluation Service does not provide an engineer's seal on any of it ESRs.

2.2. Furthermore, the ICC-ES Evaluation Report Purpose is defined as follows:

ICC EVALUATION SERVICE

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ICC EVALUATION SERVICE, LLC,
RULES OF PROCEDURE FOR EVALUATION REPORTS

1.0 PURPOSE

These rules set forth procedures governing ICC Evaluation Service, LLC (ICC-ES), issuance and maintenance of evaluation reports on building materials and products, methods of construction, prefabricated building components, and prefabricated buildings.

ICC-ES evaluation reports assist those enforcing model codes in determining whether a given subject complies with those codes. An evaluation report is not to be construed as representing a judgment about aesthetics or any other attributes not specifically addressed in the report, nor as an endorsement or recommendation for use of the subject of the report. Approval for use is the prerogative and responsibility of the Code Official; ICC-ES does not intend to assume, nor can ICC-ES assume, that prerogative and responsibility.

2.3. ICC ESR Disclaimer:

ICC-ES Evaluation Reports are not to be construed as representing aesthetics or any other attributes not specifically addressed, nor are they to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by ICC Evaluation Service, LLC, express or implied, as to any finding or other matter in this report, or as to any product covered by the report.

3. DrJ Sealed Engineering

3.1. DrJ engineers have undertaken the rigorous engineering and analysis work to determine the subject of this report's compliance with the codes and standards referenced in Section 2.

3.2. DrJ work:

3.2.1. Complies with accepted engineering procedures, experience and good technical judgment.

3.2.2. Is the work of an independent person, firm or corporation who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

3.3. A Technical Evaluation Report generated by DrJ is in all "code-compliance-evaluation-processing" respects equivalent to an ICC-ES ESR, as ICC-ES defines its approach, with one material difference.

3.3.1. DrJ will seal all TERs, as needed, so that responsibility for the work is well-defined.

3.3.2. The DrJ responsibility statement is identical to that provided in ICC-ES ESRs.

DrJ (drjengineering.org) research reports are not to be construed as representing aesthetics or any other attributes not specifically addressed, nor are they to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by DrJ express or implied as to any finding or other matter in this report or as to any product covered by this report.

Appendix B:
Legal Aspects of Product Approval

1. Product Approval

1.1. In general, the model and local codes provide for the use of alternative materials, designs and methods of construction by having a legal provision that states something similar to:

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

1.2. In concert with preserving "free and unfettered competition as the rule of trade", should this alternative material, design or method of construction not be approved, the building official shall respond in writing, stating the specific reasons for non-code-compliance and/or for non-professional engineering regulation compliance.

> Congress passed the first antitrust law, the Sherman Act, in 1890 as a "comprehensive charter of economic liberty aimed at preserving free and unfettered competition as the rule of trade." In 1914, Congress passed two additional antitrust laws: the Federal Trade Commission Act, which created the FTC, and the Clayton Act. With some revisions, these are the three core federal antitrust laws still in effect today.
>
> …Yet for over 100 years, the antitrust laws have had the same basic objective: to protect the process of competition for the benefit of consumers, making sure there are strong incentives for businesses to operate efficiently, keep prices down, and keep quality up….
>
> The Sherman Act outlaws "every contract, combination, or conspiracy in restraint of trade," and any "monopolization, attempted monopolization, or conspiracy or combination to monopolize." For instance, in some sense, an agreement between two individuals to form a partnership restrains trade, but may not do so unreasonably, and thus may be lawful under the antitrust laws. On the other hand, certain acts are considered so harmful to competition that they are almost always illegal.
>
> The penalties for violating the Sherman Act can be severe. Although most enforcement actions are civil, the Sherman Act is also a criminal law, and individuals and businesses that violate it may be prosecuted by the Department of Justice.[4]

2. Legal Validity of this TER

2.1. This TER is a code-defined (e.g., *2009 IBC* and *IRC* Section 104.11.1 and *2009 IBC* Section 1703.4.2) "research report" that provides supporting data to assist in the approval of materials, designs or assemblies not specifically provided for in this code.

2.2. Therefore, this TER is a valid research report from a professional engineering company that complies with the code definition of "approved source." If required by the authority having jurisdiction, this TER can also be sealed to comply with professional engineering laws and regulations.

[4] http://www.ftc.gov/bc/antitrust/antitrust_laws.shtm