



Technical Evaluation Report

TO ASSIST WITH CODE COMPLIANCE

Cultured Stone® & ProStone®
Applications Using Continuous Insulation
Over Concrete or Masonry Walls

TER No. 1312-02

Issue Date: February 11, 2014

Updated: March 31, 2014

Subject to Renewal: April 1, 2015

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DIVISION: 04 00 00 – MASONRY

Section: 04 70 00 – Manufactured Masonry

Section: 04 73 00 – Manufactured Stone Masonry

1. Products Evaluated:

- 1.1. Cultured Stone®
- 1.2. ProStone®
- 1.3. For the most recent version of this report, visit drjengineering.org.

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. 2008 and 2012 AWC NDS – National Design Specification for Wood Construction
- 2.4. 2008 AWC SPDWS – Special Design Provisions for Wind and Seismic
- 2.5. 2012 AISI – North American Specification for the Design of Cold-Formed Steel Structural Members

¹ Unless otherwise noted, all references in this TER are from the 2012 version of the codes and the standards referenced therein, including, but not limited to, ASCE 7, SDPWS and WFCM. This product is also approved for use with the 2000-2009 versions of the IBC and IRC and the standards referenced therein.

DrJ is a Professional Engineering Approved Source

Learn more about DrJ's Accreditation

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. This TER is developed from data 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.”

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- 2.6. ASTM C150 – Standard Specification for Portland Cement
- 2.7. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
- 2.8. ASTM C1063 – Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
- 2.9. ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- 2.10. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- 2.11. ASTM F1667 – Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

3. Performance Evaluation:

3.1. The Cultured Stone[®] and ProStone[®] products were evaluated:

- 3.1.1. For use as an exterior wall covering on new or existing concrete or masonry walls in accordance with [IBC Section 1405.10²](#) and [IRC Section R703.12³](#).
- 3.1.2. For use as a weather-resistant covering in accordance with [IBC Section 1403.2](#) and [IRC Section R703.1.1](#).
- 3.1.3. To determine the ability of the product to resist wind loads in accordance with [IBC Section 1609](#) and [IRC Section R703.1.2](#).
- 3.1.4. For use as an exterior finish over concrete or masonry walls with the addition of continuous insulation installed between the concrete or masonry walls and the Cultured Stone[®] and ProStone[®] products.
- 3.1.5. To determine the ability of various fasteners to support the gravity and transverse loads induced by the products when installed over concrete and masonry construction with the addition of continuous insulation installed between the framing and the Cultured Stone[®] and ProStone[®] products.

3.2. Use in applications requiring a fire-resistance rating are outside the scope of this evaluation.

4. Product Description and Materials:

- 4.1. Cultured Stone[®] and ProStone[®] are manufactured, precast, artificial veneer products 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](#).

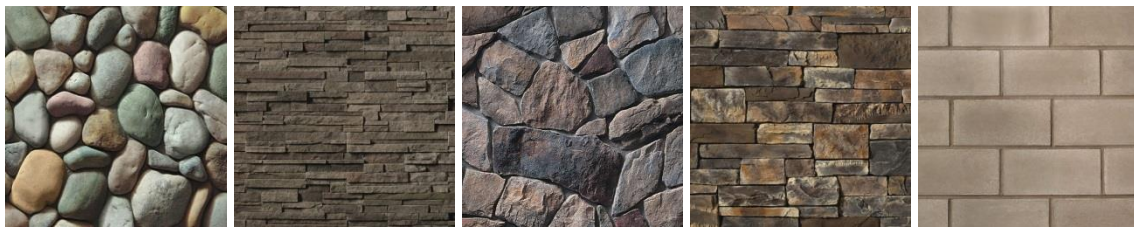


Figure 1: Examples of Cultured Stone[®] & ProStone[®] Finishes

- 4.2.2. Patterns have a maximum area of 720 square inches (0.464 m²).
- 4.2.3. Patterns have a maximum dimension of 36" (914 mm).
- 4.2.4. Patterns have a maximum veneer weight of 15 lbs per square foot (73.2 kg/m²).
- 4.2.5. The total cladding system weight, including the mortar setting bed, lath and scratch coat, is up to 25 lbs per square foot (122 kg/m²).

² [2009 IBC Section 1404.4](#)

³ [2009 IRC Section R703.7](#)

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5. Applications:

- 5.1. Cultured Stone[®] and ProStone[®] are used as an exterior wall covering in accordance with the applicable sections of [IBC Chapter 14](#) and [IRC Section R703](#) and are installed over concrete or masonry walls 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[®] are used as an exterior wall covering installed over concrete or masonry walls, which 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	Maximum Thickness of Continuous Insulation	Lath Fastener – Minimum Size
Masonry (Medium/normal weight per ASTM C90 – Hollow CMU)	Tapcon Hex Screw	2.0"	1/4" x 4"
Concrete (minimum 2,500 psi)	Tapcon Hex Screw	0.5"	3/16" x 3"
		1.5"	1/4" x 3.5"
		2"	1/4" x 4"
		3"	5/16" x 5"

1. Maximum veneer weight including lath and mortar is 25 psf.
2. Lath shall be minimum 2.5 lb metal lath having a minimum 0.020" thickness be attached in accordance with [Section 6.7](#). Tensile strength of the lath steel shall be minimum 43,900 psi.
3. Lath shall be attached vertically a maximum of 7" o.c. and horizontally a maximum of 16" o.c.
4. Masonry fasteners shall penetrate a minimum of 1". Concrete fasteners shall penetrate a minimum of 1 1/2".
5. For thicker continuous insulation applications, design is required in accordance with accepted engineering practice.
6. Not all fasteners are commonly available in the lengths specified. Proprietary fasteners of equal strength and size are permitted.
7. Table values are based on the manufacturer's published fastener properties. The methodology for reducing the fastener capacities to account for the insulation are based on the NDS allowable lateral loads for fasteners as modified by APA TR12 for use with a gap parameter for gravity load only (i.e., fasteners sized to support weight of cladding, while cantilevered from framing a distance equal to the foam sheathing thickness).
8. Maximum thickness of continuous insulation shall include any rain screen material, sheathing that does not serve as a nail base, and airspace between the cladding and the continuous insulation, where present.

Table 1: Fastener Requirements to Support Cladding Weight of Cultured Stone[®] & ProStone[®] Installation Over Continuous Insulation in Concrete or Masonry Construction

- 5.3. Cultured Stone[®] and ProStone[®] are used as an exterior wall covering installed over concrete or masonry walls, where 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 Fastener Through Continuous Insulation Into:	Furring Material	Maximum Thickness of Continuous Insulation (in)	Furring Fastener Type	Furring Fastener Minimum Size
Masonry (lightweight per ASTM C90 – hollow CMU)	Minimum 1" x 3" Wood Furring or Steel Hat Channel (Minimum 33 mil)	1.5"	Masonry Nail	0.148" x 2.75"
Masonry (medium/normal per ASTM C90 – hollow CMU)		0.5"	Tapcon Hex Screw	3/16" x 3"
		2.0"		1/4" x 5"
Concrete		2.0"		1/4" x 5"
		4.0"		1/4" x 6"

1. Maximum veneer weight including lath and mortar is 25 psf.
2. Maximum furring spacing is 16" o.c. for vertical applications and 7" o.c. for horizontal applications.
3. Wood furring shall be a minimum 3/4"-thick. Wood furring shall have a minimum specific gravity of 0.42.
4. Steel hat channel furring shall be a minimum 33 mil (33 ksi) thick steel with a 7/8" depth.
5. A minimum 2x wood furring shall be used where the required wall covering fastener penetration into wood material exceeds 3/4" (19.1 mm) and is not more than 1 1/2" (38.1 mm), unless approved deformed shank siding nails or siding screws are used to provide equivalent withdrawal strength allowing the wall covering connection to be made to a 1x wood furring.
6. Masonry fasteners shall penetrate a minimum of 1". Concrete fasteners shall penetrate a minimum of 1 1/2".
7. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.
8. Not all fasteners are commonly available in the lengths specified. Proprietary fasteners of equal strength and size are permitted.
9. Masonry nails shall be manufactured in accordance with ASTM F1667.
10. Tools used for driving pneumatic or powder actuated fasteners shall be adjusted to avoid over driving the fasteners and damaging the panel.

Table 2: Furring Minimum Fastening Requirements for Application Over Continuous Insulation to Support Cladding System Weight in Concrete or Masonry Construction

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5.4. Transverse wind loads

- 5.4.1. 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](#).
- 5.4.2. [Table 3](#) provides the maximum design wind pressure allowed for the installation of this product. The maximum wind speed that corresponds with this wind pressure is provided to aid the user in determining where the product can be used. See the applicable building code for the maximum design wind speed allowed for the location of the building. The wind speed listed in [Table 3](#) shall exceed the required design wind speed from the applicable code.

Exposure Category	Allowable Design Wind Pressure (psf) ²	Maximum Wind Speed (mph) (V _{ult} /V _{asd}) ¹
B	76	≤ 195/155
C		≤ 165/130
D		≤ 155/120
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 30', zone 4 and an effective wind area of 10 ft ² . 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 manufacturer's installation instructions and this TER.		

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

- 5.5. For additional information or use in other applications, consult the [manufacturer's installation instructions](#).

6. Installation:

6.1. General

- 6.1.1. Cultured Stone[®] and ProStone[®] shall be installed in accordance with the [manufacturer's installation instructions](#) and this TER. Where a discrepancy exists, this TER shall govern.
- 6.1.2. Installation is subject to the conditions of use set forth in [Section 9](#).
- 6.1.3. All other installation and flashing details germane to the project shall be in accordance with the applicable building code, the building designer's details and the [manufacturer's installation instructions](#)

6.2. Concrete and Masonry Walls

- 6.2.1. Cultured Stone[®] and ProStone[®] may be installed over concrete or masonry walls with an intervening layer of continuous insulation and attached in accordance with [Table 1](#).
- 6.2.2. Cultured Stone[®] and ProStone[®] may be installed over furring and continuous insulation and attached in accordance with [Table 2](#).
- 6.2.3. Veneer must be installed over 2.5 lb-per-square-yard (1.4 kg/m²) galvanized diamond mesh metal lath, 3.4 lb-per-square-yard (1.8 kg/m²) 3/8"-rib (9.5 mm) 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:
- 6.2.3.1. Fastened through continuous insulation to concrete or masonry walls at a maximum of 7" o.c. (152 mm) vertically and 16" o.c. (406 mm) horizontally.
- 6.2.3.2. A water-resistive barrier (WRB) is not required in this application; however, a WRB is permitted and may be mechanically attached, liquid applied or taped FPIS seams.
- 6.2.4. Cultured Stone[®] and ProStone[®] shall be adhered to the supporting walls with a 1/2"-thick to 3/4"-thick (12.7 to 19.1 mm) mortar setting bed.
- 6.2.4.1. The mortar must comply with [2012 IBC Section 2103.9](#), [2009 Section 2103.8](#) or [IRC Table R607.1](#) for the application.
- 6.2.4.2. Other mortars of equal or greater performance shall be permitted.

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7. Substantiating Data:

- 7.1. Report by CTL Group, May 2006, 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. Report by TEI Consulting Engineers for testing of transverse loads, November 1990
- 7.3. Foam Sheathing Committee Tech Matters, *Guide to Attaching Exterior Wall Coverings through Foam Sheathing to Wood or Steel Framing*, 2012.
- 7.4. New York State Energy Research and Development Authority, *Fastening Systems for Continuous Insulation*, 2010.
- 7.5. Masonry Veneer Manufacturers Association Installation Guide, 2010.
- 7.6. Quality Control Manual for the Manufacturing of Boral Stone Products.
- 7.7. 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.
- 7.8. DrJ has reviewed and found the data provided by other professional sources are credible. This information has been approved in accordance with DrJ's procedure for acceptance of data from approved sources.
- 7.9. DrJ's responsibility for data provided by approved sources is in accordance with professional engineering law.
- 7.10. Where appropriate, DrJ relies on the derivation of design values, which have been codified into law through the codes and standards (e.g., *IRC, WFCM, IBC, SDPWS*, etc.), to undertake the review of test data that is comparative or shows equivalency to an intended end-use application.

8. Findings:

- 8.1. Cultured Stone[®] and ProStone[®] are suitable alternatives 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 R703.10](#).
- 8.2. Cultured Stone[®] and ProStone[®] are suitable for use as an exterior wall covering assembly when installed over concrete or masonry walls with an additional layer(s) of continuous insulation installed between the Cultured Stone[®] and ProStone[®] and the concrete or masonry walls in accordance with [Table 1](#) and [2](#).
- 8.3. [IBC Section 104.11 and IRC Section R104.11 \(IFC Section 104.9 is similar\)](#) state:

104.11 Alternative materials, design and methods of construction and equipment. 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. ... Where the alternative material, design or method of construction is not *approved*, the *building official* shall respond in writing, stating the reasons the alternative was not *approved*.⁴

⁴ The last sentence is adopted language in the 2015 codes.

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9. Conditions of Use:

- 9.1. Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this report and the installation instructions shall be submitted at the time of permit application.
- 9.2. The Cultured Stone[®] and ProStone[®] products described in this TER comply with, or are a code-compliant alternative material to, that specified in the codes described in [Section 2](#), subject to the following conditions.
 - 9.2.1. Installation shall comply with [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.
 - 9.2.2. Installation shall be on exterior walls consisting of concrete or masonry walls capable of supporting the imposed loads, including transverse wind loads.
 - 9.2.3. 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](#).
 - 9.2.4. Concrete or masonry walls shall be designed to resist shear (racking) load in accordance with the applicable code.
 - 9.2.5. Exterior walls shall be limited to a maximum out of plane deflection of H/360.
- 9.3. Design
 - 9.3.1. Building Designer Responsibility
 - 9.3.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer (e.g., Owner, Registered Design Professional, etc.) for the Building and shall be in accordance with [IRC Section R106](#) and [IBC Section 107](#).
 - 9.3.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with [IRC Section 301](#) and [IBC Section 1603](#).
 - 9.3.2. Construction Documents
 - 9.3.2.1. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.
- 9.4. Responsibilities
 - 9.4.1. 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.
 - 9.4.2. Product, design and code compliance quality control are 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.
 - 9.4.3. DrJ research reports provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated section.
 - 9.4.4. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work

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.

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11. Review Schedule:

- 11.1. This TER is subject to periodic review and revision. For the most recent version of this report, visit drjengineering.org.
- 11.2. For information on the current status of this report, contact [DrJ Engineering](#).



Scope of Responsibility / Work, Operations Policies, and Legal Responsibilities

- [Mission and Scope of Responsibility](#)
- [Product Evaluation Operations Concepts and Policies](#)
- [TERs Are Comparable to, Compatible with, and Equivalent to the Purpose of an ICC-ES ESR, IAPMO UES ER, Intertek IRR, Architectural Testing CCRR, etc.](#)
- [Legal Aspects of Product Approval](#)