



Boral Stone – Adhered Masonry Veneer  
Applications Over Continuous Insulation

TER No. 1312-01

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**DrJ is a Professional Engineering Approved Source**

**Learn more about DrJ's Accreditation**

- DrJ is an ISO/IEC 17065 accredited product certification body through ANSI Accreditation Services.
- DrJ provides certified evaluations that are signed and sealed by a P.E.
- DrJ's work is backed up by professional liability insurance.
- DrJ is fully compliant with IBC Section 1703.

## Technical Evaluation Report (TER)

### 1. Products Evaluated:

- 1.1. Boral Stone Adhered Masonry Veneer<sup>1</sup>
- 1.2. For the most recent version of this Technical Evaluation Report (TER), visit [drjcertification.org](http://drjcertification.org). For more detailed state professional engineering and code compliance legal requirements and references, visit [drjcertification.org/statelaw](http://drjcertification.org/statelaw). DrJ is fully compliant with all state professional engineering and code compliance laws.
- 1.3. This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found [here](#)) and covered by an [IAF MLA Evaluation](#) per the [Purpose of the MLA](#) (as an example, see [letter to ANSI](#) from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other [IAF MLA Signatory Countries](#) and have their products readily approved by authorities having jurisdiction using [DrJ's ANSI accreditation](#).
- 1.4. Building code regulations require that evaluation reports are provided by an approved agency meeting specific requirements, such as those found in [IBC Section 1703](#). Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI's scope of accreditation. For a list of accredited agencies, visit ANSI's [website](#). For more information, see [drjcertification.org](http://drjcertification.org).
- 1.5. Requiring an evaluation report from a specific private company (i.e. ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.
- 1.6. DrJ's code compliance work:
  - 1.6.1. Conforms to code language adopted into law by individual states and any relevant consensus based standard such as an ANSI or ASTM standard.
  - 1.6.2. Complies with accepted engineering practice, all professional engineering laws and by providing an engineer's seal DrJ take professional responsibility for its specified scope of work.

### 2. Applicable Codes and Standards:<sup>2</sup>

- 2.1. *2012, 2015 and 2018 International Building Code (IBC)*
- 2.2. *2012, 2015 and 2018 International Residential Code (IRC)*
- 2.3. *AWC NDS – National Design Specification for Wood Construction*
- 2.4. *AWC SPDWS – Special Design Provisions for Wind and Seismic*
- 2.5. *AISI – North American Specification for the Design of Cold-Formed Steel Structural Members*
- 2.6. *ASCE/SEI 7 – Minimum Design Loads for Buildings and Other Structures*
- 2.7. *ASTM C90 – Standard Specification for Loadbearing Concrete Masonry Units*
- 2.8. *ASTM C150 – Standard Specification for Portland Cement*
- 2.9. *ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*
- 2.10. *ASTM C1063 – Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster*
- 2.11. *ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board*
- 2.12. *ASTM D5206 – Standard Test Method for Windload Resistance of Rigid Plastic Siding*
- 2.13. *ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*
- 2.14. *ASTM F1667 – Standard Specification for Driven Fasteners: Nails, Spikes, and Staples*

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<sup>1</sup> The adhered masonry veneer products manufactured by the listees noted above are part of this evaluation and are used interchangeably for the Boral Stone name throughout this document subject to the conditions herein.

<sup>2</sup> Unless otherwise noted, all references in this code compliant technical evaluation report (TER) are from the 2018 version of the codes and the standards referenced therein, including, but not limited to, *ASCE 7*, *SDPWS* and *WFCM*. This product also complies with the 2000-2015 versions of the *IBC* and *IRC* and the standards referenced therein. As required by law, where this TER is not approved, the building official shall respond in writing, stating the reasons this TER was not approved. For variations in state and local codes, if any see [Section 8](#).

## Technical Evaluation Report (TER)

### 2.15. WFCM – Wood Frame Construction Manual

### 3. Performance Evaluation:

#### 3.1. The Boral Stone products were evaluated to determine:

- 3.1.1. The ability of various fasteners to support the gravity and transverse loads induced by the products when installed over wood or steel light-frame construction with the addition of continuous insulation installed between the framing and the Boral Stone products.
- 3.1.2. 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 Boral Stone products.
- 3.1.3. Use in applications requiring a fire-resistance rating are outside the scope of this evaluation.

#### 3.2. Evaluation of these products for code compliance is limited to the scope defined in this section. For other code compliance information, see the manufacturer's product literature.

#### 3.3. Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

### 4. Product Description and Materials:

#### 4.1. Boral Stone products are manufactured, precast, concrete veneer products made from Portland cement, aggregate, water, admixtures and coloring used as adhered, non-bearing exterior veneer or as an interior finish.

#### 4.2. Boral Stone products have the following characteristics:

##### 4.2.1. Color and texture similar to various stone or brick surfaces. Examples are shown in [Figure 1](#).



Figure 1: Examples of Boral Stone Product Finishes

##### 4.2.2. Patterns have a maximum per unit area of 720 square inches (0.464 m<sup>2</sup>).

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

##### 4.2.4. Patterns have a maximum average thickness of 1.65" (42 mm).

##### 4.2.5. Patterns have a nominal oven dry density less than 105 lb./ft.<sup>3</sup> (1362 kg/m<sup>3</sup>) and a maximum saturated weight not to exceed 15 lbs./ft.<sup>2</sup> (73.2 kg/m<sup>2</sup>).

##### 4.2.6. The total cladding system weight, including the mortar setting bed, lath and scratch coat, is a maximum of 25 lbs. per square foot (122 kg/m<sup>2</sup>) when fully saturated.

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### 5. Applications:

- 5.1. Boral Stone products are used as an exterior wall covering in accordance with the applicable sections of [IBC Chapter 14](#) and [Chapter 25](#), and [IRC Section R703](#) and are 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. Boral Stone products are used as an exterior wall covering installed over wood- or steel-framed walls; (1) where the WSP is over sheathed with continuous insulation, or (2) onto masonry or concrete walls that are sheathed with continuous insulation. The maximum foam thickness for various framing and fastener types are as shown in [Table 1a](#) and [Table 1b](#).

**Table 1a: Fastener Requirements to Support Cladding Weight for Boral Stone Products  
Installation Over Continuous Insulation – Wood**

Fastener Penetration Into:	Fastener Type	Substrate	Min. Fastener Length (in)	Max Dist from Face of Framing to Underside of Fastener Head (in)(GAP)	Maximum Vertical Spacing (inches) of fasteners along each stud						
					Maximum Cladding Weight (psf)						
					5	10	15	18	22	25	
Wood	8d nail (0.131 in. dia.)	Lath/Mortar	See footnote 4	≤ 1.125	7	7	7	7	7	7	
			2.5	1.625	7	7	7	7	6	5	
	12d nail (0.148 in. dia.)		3.25	≤ 1.625	7	7	7	7	7	7	
	Trufast® SIPTP		See footnote 4	≤ 3.625	7	7	7	7	7	7	7
			6	4.125	7	7	7	7	7	6	
			6.5	4.625	7	7	7	7	7	6	
			See footnote 4	≤ 3.625	7	7	7	7	7	7	7
	Trufast® SIPLD HeadLOK®		See footnote 4	≤ 3.125	7	7	7	7	7	7	7
			Permabase or Durarock	2.5	≤ 0.875	8	8	8	8	8	8
	3			1.125	8	8	8	8	8	8	7
	3.5			1.625	8	8	8	8	8	7	6
	4			2.125	8	8	8	7	6	5	
	4.5	2.625		8	8	7	6	5	4		
	5	3.125		8	8	7	5	4	4		
	5.5	3.625		8	8	6	5	4	-		
	6	4.125		8	8	5	4	-	-		
	6.5	4.625		8	7	5	4	-	-		
	Trufast® SIPLD	See footnote 4		≤ 0.875	8	8	8	8	8	8	8
		4		1.125	8	8	8	8	8	8	7
		4.5		1.625	8	8	8	8	7	6	
		5		2.125	8	8	8	7	6	5	
		5.5		2.625	8	8	8	6	5	4	
		6		3.125	8	8	7	5	4	4	
		6.5		3.625	8	8	6	5	4	-	
		See footnote 4		≤ 2.125	8	8	8	8	8	8	8
	HeadLOK®	6		2.625	8	8	8	8	8	8	7
		6.5	3.125	8	8	8	8	7	6		

1. Lath shall be minimum 2.5-lb. metal lath having a minimum 0.020" thickness and shall be attached in accordance with [Section 6.8](#). Tensile strength of the lath steel shall be minimum 43,900 psi.

2. Maximum stud spacing is 16" o.c. Expanded metal lath shall be attached with fasteners, vertically, along each stud a maximum of 7" o.c.

3. Wood studs shall have a minimum specific gravity of 0.42.

4. Screws shall be corrosion-resistant, self-drilling, self-tapping and have a wafer or pancake head or a washer with a diameter sufficient to prevent the head from pulling through the openings in the lath and shall be in accordance with *ASTM C954* or *C1002*. Screws shall penetrate the studs a minimum of 1¼" in addition to the tapered point.

5. For thicker continuous insulation applications, design is required in accordance with accepted engineering practice.

6. The total distance from the face of the stud, to the underside of the fastener head shall not be more than that listed above. This includes any additional sheathing materials such as OSB, Gypsum, DensGlass®, plywood, lath, rain screen or airspace incorporated in the design of the wall assembly. Where OSB or plywood is separately attached directly to the stud, the distance from framing to the underside of fastener head may be calculated from the face of the OSB or plywood.

(See notes on following page)

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7. Not all fasteners are commonly available in the lengths specified. Proprietary fasteners of equal strength and size are permitted.
8. This table provides some options evaluated by DrJ for the attachment of Boral Stone products over foam plastic insulating sheathing. Other methods, such as Cascadia clips or Knight Wall Systems, may be considered, but have not been evaluated by DrJ.
9. HeadLOK® screws are proprietary fasteners manufactured by OMG®, Inc. (dba FastenMaster®). For HeadLOK® fastener code compliance issues, see the manufacturer's product literature and code compliance reports.
10. TRUFAST® fasteners are proprietary fasteners manufactured by TRUFAST®, LLC. For TRUFAST® fastener code compliance issues, see the manufacturer's product literature and code compliance reports.
11. Framing is defined as wood studs.
12. Continuous insulation shall be foam plastic sheathing with a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.
13. Values were calculated considering only gravity (lateral) loads. Where transverse load resistance is required, withdrawal resistance of the fastener shall be additionally considered.

**Table 1b: Fastener Requirements to Support Cladding Weight for Boral Stone Products  
Installation Over Continuous Insulation – Steel**

Fastener Penetration Into:	Fastener Type	Substrate	Min. Fastener Length (in)	Max Dist from Face of Framing to Underside of Fastener Head (in)(GAP)	Maximum Vertical Spacing (inches) of fasteners along each stud						
					Maximum Cladding Weight (psf)						
					5	10	15	18	22	25	
Steel Framing (33 mil, 20 ga, 33 ksi)	# 6 screw	Lath/Mortar	1	0.625	7	7	7	7	7	6	
			1	0.875	7	7	7	7	6	6	
			1.5	1.125	7	7	7	7	6	6	
			2	1.625	7	7	7	6	4	4	
			2.5	2.125	7	7	6	4	4	-	
			3	2.625	7	4	-	-	-	-	
	#8 screw		3.5	3.125	4	-	-	-	-	-	
			1	0.625	7	7	7	7	7	7	
			1	0.875	7	7	7	7	7	6	
			1.5	1.125	7	7	7	7	7	6	
			2	1.625	7	7	7	7	6	4	
			2.5	2.125	7	7	7	6	4	4	
			3	2.625	7	7	6	4	4	-	
			3.5	3.125	7	6	4	-	-	-	
			4	3.625	6	-	-	-	-	-	
			#10 screw	See footnote 3	≤ 1.125	7	7	7	7	7	7
	2			1.625	7	7	7	7	6	6	
	2.5			2.125	7	7	7	7	6	4	
	3			2.625	7	7	7	6	4	4	
	3.5			3.125	7	7	6	4	4	-	
	4			3.625	7	6	4	-	-	-	
	4.5			4.125	7	4	-	-	-	-	
	See footnote 3			≤ 1.125	7	7	7	7	7	7	
	#12 screw			2	1.625	7	7	7	7	7	6
				2.5	2.125	7	7	7	7	6	6
			3	2.625	7	7	7	7	6	4	
			3.5	3.125	7	7	7	6	4	4	
			4	3.625	7	7	6	4	4	-	
			4.5	4.125	7	6	4	-	-	-	
			5	4.625	7	4	-	-	-	-	
			See footnote 3	≤ 1.625	7	7	7	7	7	7	
	#14 screw		See footnote 3	≤ 1.625	7	7	7	7	7	7	
	2.5		2.125	7	7	7	7	7	7	6	

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**Table 1b: Fastener Requirements to Support Cladding Weight for Boral Stone Products  
Installation Over Continuous Insulation – Steel**

Fastener Penetration Into:	Fastener Type	Substrate	Min. Fastener Length (in)	Max Dist from Face of Framing to Underside of Fastener Head (in)(GAP)	Maximum Vertical Spacing (inches) of fasteners along each stud						
					Maximum Cladding Weight (psf)						
					5	10	15	18	22	25	
			3	2.625	7	7	7	7	6	6	
			3.5	3.125	7	7	7	7	6	4	
Steel Framing (33 mil, 20 ga, 33 ksi)	#14 screw	Lath/Mortar	4	3.625	7	7	7	6	4	4	
			4.5	4.125	7	7	6	4	4	-	
			5	4.625	7	6	4	4	-	-	
			3	≤ 0.875	7	7	7	7	7	7	
	TruFast® SIPLD		3	1.125	7	7	7	7	7	7	6
			3	1.625	7	7	7	7	6	4	
			3	2.125	7	7	6	6	4	4	
			3	2.625	7	7	4	4	4	-	
			3.5	3.125	7	6	4	-	-	-	
			4	3.625	6	-	-	-	-	-	
Steel Framing (43 mil, 18ga., 33 ksi)	#6 screw	See footnote 3	≤ 1.125	7	7	7	7	7	7		
		2	1.625	7	7	7	7	7	6		
		2.5	2.125	7	7	7	6	6	4		
		3	2.625	7	7	4	4	4	-		
		3.5	3.125	7	4	-	-	-	-		
	#8 screw	See footnote 3	≤ 1.625	7	7	7	7	7	7		
		2.5	2.125	7	7	7	7	7	6		
		3	2.625	7	7	7	6	6	4		
		3.5	3.125	7	7	6	4	4	-		
		4	3.625	7	4	-	-	-	-		
	#10 screw	See footnote 3	≤ 2.125	7	7	7	7	7	7		
		3	2.625	7	7	7	7	7	6		
		3.5	3.125	7	7	7	6	6	4		
		4	3.625	7	7	6	4	4	-		
		4.5	4.125	7	4	-	-	-	-		
	#12 screw	See footnote 3	≤ 2.625	7	7	7	7	7	7		
		3.5	3.125	7	7	7	7	7	6		
		4	3.625	7	7	7	6	6	4		
		4.5	4.125	7	7	6	4	4	4		
		5	4.625	7	6	4	-	-	-		
	#14 screw	See footnote 3	≤ 3.125	7	7	7	7	7	7		
		4	3.625	7	7	7	7	7	6		
		4.5	4.125	7	7	7	7	6	4		
		5	4.625	7	7	6	6	4	4		
		3	≤ 1.625	7	7	7	7	7	7		
	TruFast® SIPLD	3	2.125	7	7	7	7	7	6		
		3	2.625	7	7	7	6	6	4		

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**Table 1b: Fastener Requirements to Support Cladding Weight for Boral Stone Products  
Installation Over Continuous Insulation – Steel**

Fastener Penetration Into:	Fastener Type	Substrate	Min. Fastener Length (in)	Max Dist from Face of Framing to Underside of Fastener Head (in)(GAP)	Maximum Vertical Spacing (inches) of fasteners along each stud						
					Maximum Cladding Weight (psf)						
					5	10	15	18	22	25	
			3.5	3.125	7	7	6	4	4	-	
			4	3.625	7	4	-	-	-	-	
Steel Framing (54 mil, 16 ga., 50 ksi)	#6 screw	Lath/Mortar	See footnote 3	≤ 1.625	7	7	7	7	7	7	
			2.5	2.125	7	7	7	7	7	6	
			3	2.625	7	7	7	6	4	4	
			3.5	3.125	7	4	-	-	-	-	
	#8 screw		See footnote 3	≤ 2.125	7	7	7	7	7	7	7
			3	2.625	7	7	7	7	7	6	
			3.5	3.125	7	7	7	6	6	4	
			4	3.625	7	6	4	4	-	-	
	#10 screw		See footnote 3	≤ 2.625	7	7	7	7	7	7	7
			3.5	3.125	7	7	7	7	7	6	
			4	3.625	7	7	7	6	6	4	
			4.5	4.125	7	7	4	4	-	-	
	#12 screw		See footnote 3	≤ 3.625	7	7	7	7	7	7	7
			4.5	4.125	7	7	7	7	6	4	
			5	4.625	7	7	6	4	4	-	
			See footnote 3	≤ 4.125	7	7	7	7	7	7	
	#14 screw		5	4.625	7	7	7	7	6	6	
			3	≤ 2.125	7	7	7	7	7	7	
			3	2.625	7	7	7	7	7	6	
			3.5	3.125	7	7	7	6	4	4	
TruFast® SIPLD	4	3.625	7	6	4	-	-	-			

1. Lath shall be minimum 2.5-lb. metal lath having a minimum 0.020" thickness and shall be attached in accordance with [Section 6.8](#). Tensile strength of the lath steel shall be minimum 43,900 psi.
2. Maximum stud spacing is 16" o.c. Expanded metal lath shall be attached with fasteners, vertically, along each stud a maximum of 7" o.c.
3. Screws shall be corrosion-resistant, self-drilling, self-tapping and penetrate a minimum of 3/8" and have a wafer or pancake head or a washer with a diameter sufficient to prevent the head from pulling through the openings in the lath and shall be in accordance with *ASTM C954* or *C1002*.
4. For thicker continuous insulation applications, design is required in accordance with accepted engineering practice.
5. The total distance from the face of the stud, to the underside of the fastener head shall not be more than that listed above. This includes any additional sheathing materials such as OSB, plywood, Gypsum, DensGlass®, lath, rain screen or airspace incorporated in the design of the wall assembly.
6. Not all fasteners are commonly available in the lengths specified. Proprietary fasteners of equal strength and size are permitted.
7. This table provides some options evaluated by DrJ for the attachment of Boral Stone products over foam plastic insulating sheathing. Other methods, such as Cascadia clips or Knight Wall Systems, may be considered, but have not been evaluated by DrJ.
8. Framing is defined as steel studs.
9. Continuous insulation shall be foam plastic sheathing with a minimum compressive strength of 15 psi in accordance with *ASTM C578* or *ASTM C1289*.
10. Values were calculated considering only gravity (lateral) loads. Where transverse load resistance is required, withdrawal resistance of the fastener shall be additionally considered.

**Technical Evaluation Report (TER)**

**Table 1c: Fastener Requirements to Support Cladding Weight for Boral Stone Products  
Installation Over Continuous Insulation – Masonry & Concrete**

Lath Fastener Through Continuous Insulation Into:	Lath Fastener Type	Max Veneer Weight (includes lath, scratch coat & mortar setting bed)	Maximum Distance from Face of Framing <sup>10</sup> to Underside of Fastener Head	Lath Fastener – Minimum Size (dia. x length)		
Concrete (minimum 2,500 psi)	TRUFAST® TRUGRIP, TRUFAST® SIP TP or Tapcon® Hex Screw	15 psf	1.375"	TRUFAST® SIP LD or TRUFAST® TRUGRIP 3" or Tapcon® Hex Screw 3/16" x 3.25"		
			1.875"	TRUFAST® SIP LD or TRUFAST® TRUGRIP 3.5" or Tapcon® Hex Screw 1/4" x 3.75"		
			2.375"	TRUFAST® SIP LD or TRUFAST® TRUGRIP 4" or Tapcon® Hex Screw 1/4" x 4"		
			3.375"	TRUFAST® TRUGRIP 4.5" or Tapcon® Hex Screw 1/4" x 5"		
		18 psf	1.375"	TRUFAST® SIP LD or TRUFAST® TRUGRIP 3" or Tapcon® Hex Screw 3/16" x 3.25"		
			1.875"	TRUFAST® SIP LD or TRUFAST® TRUGRIP 3.5" or Tapcon® Hex Screw 1/4" x 3.75"		
			2.375"	TRUFAST® SIP LD or TRUFAST® TRUGRIP 4" or Tapcon® Hex Screw 1/4" x 4"		
			3.375"	Tapcon® Hex Screw 1/4" x 5"		
		22 psf	1.375"	TRUFAST® SIP LD or TRUFAST® TRUGRIP 3" or Tapcon® Hex Screw 1/4" x 3.25"		
			1.875"	TRUFAST® TRUGRIP 3.5" or Tapcon® Hex Screw 1/4" x 3.75"		
			2.375"	TRUFAST® TRUGRIP 4" or Tapcon® Hex Screw 1/4" x 4"		
			3.375"	Tapcon® Hex Screw 1/4" x 5"		
		25 psf	1.375"	TRUFAST® TRUGRIP 3" or Tapcon® Hex Screw 1/4" x 3.25"		
			1.875"	TRUFAST® TRUGRIP 3.5" or Tapcon® Hex Screw 1/4" x 3.75"		
			2.375"	Tapcon® Hex Screw 1/4" x 4"		
			3.375"	Tapcon® Hex Screw 5/16" x 5"		
		Masonry (medium/normal Hollow CMU per ASTM C90)	TRUFAST® SIP LD or Tapcon® Hex Screw	15 psf	1.375"	TRUFAST® SIP LD 3" or Tapcon® Hex Screw 3/16" x 2.75"
					1.875"	TRUFAST® SIP LD 3.5" or Tapcon® Hex Screw 3/16" x 3.25"
					2.375"	Tapcon® Hex Screw 1/4" x 3.75"
					3.375"	Tapcon® Hex Screw 1/4" x 5"
18 psf	1.375"			TRUFAST® SIP LD 2.5" or Tapcon® Hex Screw 3/16" x 2.75"		
	1.875"			Tapcon® Hex Screw 3/16" x 3.25"		
	2.375"			Tapcon® Hex Screw 1/4" x 3.75"		
22 psf	3.375"			Tapcon® Hex Screw 1/4" x 5"		
	1.375"			Tapcon® Hex Screw 1/4" x 2.75"		
	1.875"			Tapcon® Hex Screw 1/4" x 3.25"		
	2.375"			Tapcon® Hex Screw 1/4" x 3.75"		
25 psf	3.375"			Tapcon® Hex Screw 5/16" x 5"		
	1.375"			Tapcon® Hex Screw 1/4" x 2.75"		
	1.875"			Tapcon® Hex Screw 1/4" x 3.25"		
	2.375"			Tapcon® Hex Screw 1/4" x 3.75"		

(See notes on following page)

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1. Lath shall be minimum 2.5-lb. metal lath having a minimum 0.020" thickness and shall be attached in accordance with [Section 6.8](#). Tensile strength of the lath steel shall be minimum 43,900 psi.
2. Maximum fastener spacing in masonry and concrete is 16" o.c. horizontally and 7" o.c. vertically.
3. Masonry Construction – Tapcon® fasteners shall penetrate a minimum of 1". TRUFAST® SIP HD and TRUGRIP fasteners shall penetrate a minimum of 1 1/2".
4. Concrete Construction – Tapcon® fasteners shall penetrate a minimum of 1 1/2". TRUFAST® SIP HD and TRUGRIP 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. The total distance from concrete or masonry to the underside of the fastener head shall not be more than that listed above. This includes any additional sheathing materials such as OSB, plywood, Gypsum, DensGlass®, rain screen or airspace incorporated in the design of the wall assembly.
7. Not all fasteners are commonly available in the lengths specified. Proprietary fasteners of equal strength and size are permitted.
8. This table provides some options evaluated by Dr.J for the attachment of Boral Stone products over foam plastic insulating sheathing. Other methods, such as Cascadia clips or Knight Wall Systems, may be considered, but have not been evaluated by Dr.J.
9. Tapcon® fasteners are proprietary fasteners manufactured by ITW Buildex. For Tapcon® fastener code compliance issues, see the manufacturer's product literature and code compliance reports.
10. TRUFAST® fasteners are proprietary fasteners manufactured by TRUFAST®, LLC. For TRUFAST® fastener code compliance issues, see the manufacturer's product literature and code compliance reports.
11. Continuous insulation shall be foam plastic sheathing with a minimum compressive strength of 15 psi in accordance with *ASTM C578* or *ASTM C1289*.

**5.3.** Boral Stone products are used as an exterior wall covering installed over furring. The furring is placed over the continuous insulation and fastened to the wood or steel studs or concrete or masonry substrate. The maximum foam thickness for various fastener sizes and types is listed in [Table 2](#).

**Technical Evaluation Report (TER)**

Table 2: Maximum Foam Thickness for Fastener Type & Size					
Furring Material	Framing Member	Min Fastener Penetration into Wall Framing (in.)	Cladding Weight	Max Distance from the Face of Framing <sup>19</sup> to the Underside of the Furring Material	Fastener Type & Minimum Size (dia. x length)
Minimum 1x3 Wood Furring	Minimum 2x Wood Stud	1 1/2"	15 psf	1"	0.148" x 3.25" Nail or HeadLOK® 4.5" or TRUFAST® SIP (LD or TP) 4"
				1.5"	HeadLOK® 4.5" or TRUFAST® SIP (LD or TP) 4.5"
				2"	HeadLOK® 5" or TRUFAST® SIP (LD or TP) 5"
				3"	HeadLOK® 6" or TRUFAST® SIP (LD or TP) 7"
			18 psf	1"	0.148" x 3.25" Nail or HeadLOK® 4.5" or TRUFAST® SIP (LD or TP) 4"
				1.5"	HeadLOK® 4.5" or TRUFAST® SIP (LD or TP) 4.5"
				2"	HeadLOK® 5" or TRUFAST® SIP (LD or TP) 5"
				3"	HeadLOK® 6" or TRUFAST® SIP (LD or TP) 7"
			22 psf	1"	0.148" x 3.25" Nail or HeadLOK® 4.5" or TRUFAST® SIP (LD or TP) 4"
				1.5"	HeadLOK® 4.5" or TRUFAST® SIP (LD or TP) 4.5"
				2"	HeadLOK® 5" or TRUFAST® SIP (LD or TP) 6"
				3"	HeadLOK® 6" or TRUFAST® SIP (LD or TP) 7"
			25 psf	1"	0.148" x 3.25" Nail or HeadLOK® 4.5" or TRUFAST® SIP (LD or TP) 4"
				1.5"	HeadLOK® 4.5" or TRUFAST® SIP (LD or TP) 5.5"
				2"	HeadLOK® 5" or TRUFAST® SIP (LD or TP) 6"
				3"	NONE
Steel Hat Channel (minimum 33 mil, 33 ksi)	Steel Stud (33 mil or thicker, 33 ksi)	Steel Thickness + 3 Threads	15 psf	1"	#4 (0.112" x 1.5") or TRUFAST® SIP LD 1.5"
				1.5"	#6 (0.138" x 2") or TRUFAST® SIP LD 2"
				2"	#6 (0.138" x 2.5") or TRUFAST® SIP LD 2.5"
				3"	#10 (0.186" x 3.5") or TRUFAST® SIP LD 3.5"
			18 psf	1"	#4 (0.112" x 1.5") or TRUFAST® SIP LD 1.5"
				1.5"	#6 (0.138" x 2") or TRUFAST® SIP LD 2"
				2"	#8 (0.164" x 2.5") or TRUFAST® SIP LD 2.5"
				3"	#12 (0.216" x 3.5") or TRUFAST® SIP LD 3.5"
			22 psf	1"	#6 (0.138" x 1.5") or TRUFAST® SIP LD 1.5"
				1.5"	#8 (0.164" x 2") or TRUFAST® SIP LD 2"
				2"	#10 (0.186" x 2.5") or TRUFAST® SIP LD 2.5"
				3"	#14 (0.242" x 3.5") or TRUFAST® SIP LD 3.5"
			25 psf	1"	#8 (0.164" x 1.5") or TRUFAST® SIP LD 1.5"
				1.5"	#10 (0.186" x 2") or TRUFAST® SIP LD 2"
				2"	#12 (0.216" x 3.5") or TRUFAST® SIP LD 2.5"
				3"	#16 (0.268" x 3.5") or TRUFAST® SIP LD 3.5"
Steel Hat Channel (minimum 33 mil, 33 ksi)	Steel Stud (43 mil or thicker, 33 ksi) Steel Stud	Steel Thickness + 3 Threads	15 psf	1"	#4 (0.112" x 1.5") or TRUFAST® SIP LD 1.5"
				1.5"	#6 (0.138" x 2") or TRUFAST® SIP LD 2"
				2"	#6 (0.138" x 2.5") or TRUFAST® SIP LD 2.5"
				3"	#8 (0.164" x 3.5") or TRUFAST® SIP LD 3.5"
			18 psf	1"	#4 (0.112" x 1.5") or TRUFAST® SIP LD 1.5"

**Technical Evaluation Report (TER)**

Table 2: Maximum Foam Thickness for Fastener Type & Size								
Furring Material	Framing Member	Min Fastener Penetration into Wall Framing (in.)	Cladding Weight	Max Distance from the Face of Framing <sup>19</sup> to the Underside of the Furring Material	Fastener Type & Minimum Size (dia. x length)			
Steel Hat Channel (minimum 33 mil, 33 ksi)	Steel Stud (43 mil or thicker, 33 ksi)	Steel Thickness + 3 Threads	18 psf	1.5"	#6 (0.138" x 2") or TRUFAST® SIP LD 2"			
				2"	#6 (0.138" x 2.5") or TRUFAST® SIP LD 2.5"			
				3"	#10 (0.186" x 3.5") or TRUFAST® SIP LD 3.5"			
			22 psf	1"	#6 (0.138" x 1.5") or TRUFAST® SIP LD 1.5"			
				1.5"	#6 (0.138" x 2") or TRUFAST® SIP LD 2"			
				2"	#8 (0.164" x 2.5") or TRUFAST® SIP LD 2.5"			
			25 psf	3"	#10 (0.186" x 3.5") or TRUFAST® SIP LD 3.5"			
				1"	#6 (0.138" x 1.5") or TRUFAST® SIP LD 1.5"			
				1.5"	#8 (0.164" x 2") or TRUFAST® SIP LD 2"			
			Steel Hat Channel (minimum 33 mil, 33 ksi)	Masonry (medium/normal hollow CMU per ASTM C90)	1"	15 psf	1"	3/16" x 2.25" Tapcon® Hex Screw or TRUFAST® SIP LD 2.5"
							1.5"	3/16" x 2.75" Tapcon® Hex Screw or TRUFAST® SIP LD 3"
							2"	3/16" x 3.25" Tapcon® Hex Screw or TRUFAST® SIP LD 3.5"
18 psf	3"	1/4" x 5" Tapcon® Hex Screw or TRUFAST® SIP LD 4"						
	1"	3/16" x 2.25" Tapcon® Hex Screw or TRUFAST® SIP LD 2.5"						
	1.5"	3/16" x 2.75" Tapcon® Hex Screw or TRUFAST® SIP LD 3"						
22 psf	2"	1/4" x 3.25" Tapcon® Hex Screw or TRUFAST® SIP LD 3.5"						
	3"	1/4" x 5" Tapcon® Hex Screw						
	1"	3/16" x 2.25" Tapcon® Hex Screw or TRUFAST® SIP LD 2.5"						
25 psf	1.5"	1/4" x 2.75" Tapcon® Hex Screw or TRUFAST® SIP LD 3"						
	2"	1/4" x 3.25" Tapcon® Hex Screw or TRUFAST® SIP LD 3.5"						
	3"	1/4" x 5" Tapcon® Hex Screw						
Steel Hat Channel (minimum 33 mil, 33 ksi)	Concrete (minimum 2,500 psi)	1.5"	22 psf	1"	3/16" x 2.75" Tapcon® Hex Screw or TRUFAST® SIP TP or TRUFAST® TRUGRIP 3"			
				1.5"	3/16" x 3.25" Tapcon® Hex Screw or TRUFAST® SIP TP or TRUFAST® TRUGRIP 3.5"			
				2"	3/16" x 3.75" Tapcon® Hex Screw or TRUFAST® SIP TP or TRUFAST® TRUGRIP 4"			
			25 psf	3"	3/16" x 5" Tapcon® Hex Screw or TRUFAST® SIP TP or TRUFAST® TRUGRIP 5"			
				1"	3/16" x 2.75" Tapcon® Hex Screw or TRUFAST® SIP TP or TRUFAST® TRUGRIP 3"			
				1.5"	3/16" x 3.25" Tapcon® Hex Screw or TRUFAST® SIP TP or TRUFAST® TRUGRIP 3.5"			
			2"	3/16" x 3.75" Tapcon® Hex Screw or TRUFAST® SIP TP or TRUFAST® TRUGRIP 4"				

## Technical Evaluation Report (TER)

Table 2: Maximum Foam Thickness for Fastener Type & Size					
Furring Material	Framing Member	Min Fastener Penetration into Wall Framing (in.)	Cladding Weight	Max Distance from the Face of Framing <sup>19</sup> to the Underside of the Furring Material	Fastener Type & Minimum Size (dia. x length)
Steel Hat Channel (minimum 33 mil, 33 ksi)	Concrete (minimum 2,500 psi)	1.5"	25 psf	3"	1/4" x 5" Tapcon® Hex Screw or TRUFAST® SIP TP or TRUFAST® TRUGRIP 5"

1. Lath shall be minimum 2.5-lb. metal lath having a minimum 0.020" thickness and shall be attached in accordance with [Section 6.8](#). Tensile strength of the lath steel shall be minimum 43,900 psi.
2. Where furring is installed vertically, it shall be installed directly over wall studs spaced a maximum of 16" o.c. Furring shall be attached to the studs at a maximum of 7" o.c. along the length of the stud. Where furring is attached vertically to concrete or masonry walls, it shall be spaced a maximum of 16" o.c. and fastened a maximum of 7" o.c. vertically. Where furring is attached horizontally to concrete or masonry, it shall be spaced a maximum of 7" o.c. and shall be fastened to the concrete or masonry with fasteners spaced a maximum of 16" o.c.
3. Where furring is installed horizontally, it shall be installed at a maximum 7" o.c. along the length of the stud and attached to each wall stud. Maximum stud spacing is 16" o.c.
4. Wood furring shall be a minimum 3/4"-thick. Wood furring and wood studs shall have a minimum specific gravity of 0.42.
5. Nails supporting the furring strips shall penetrate the studs a minimum of 1 1/2". Steel hat channel furring shall be a minimum 33 mil (33 ksi) thick steel with a 7/8" depth.
6. Wood Construction – Nails shall penetrate wood framing a minimum of 1 1/2" and have a head size or a washer with a diameter sufficient to prevent the head from pulling through the openings in the lath. Screws shall penetrate the studs a minimum of 1 1/4".
7. Steel Framing – Screws shall be corrosion-resistant, self-drilling, self-tapping and penetrate a minimum of 3/8" and have a wafer or pancake head or a washer with a diameter sufficient to prevent the head from pulling through the openings in the lath.
8. Masonry Construction – Fasteners shall penetrate a minimum of 1".
9. Concrete Construction – Tapcon® fasteners shall penetrate a minimum of 1 1/2". TRUFAST® TRUGRIP fasteners shall penetrate a minimum of 1".
10. Corrosion-resistant, 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.
11. Nail fasteners shall be common or box nails and shall comply with *ASTM F1667*, except nail length shall be permitted to exceed *ASTM F1667* standard lengths. Minimum bending yield strength for nails with a diameter up to 0.148", 0.162" and 0.225" shall be 90,000; 90,000 and 80,000 psi respectively.
12. 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 placed into 1x wood furring.
13. Continuous insulation shall be foam plastic sheathing with a minimum compressive strength of 15 psi in accordance with *ASTM C578* or *ASTM C1289*.
14. The total distance from the face of the stud, concrete or masonry to the underside of the furring shall not be more than the maximum thickness listed above. This includes any additional sheathing materials such as OSB, plywood, Gypsum, Densglass®, rain screen or airspace incorporated in the design of the wall assembly. Cladding shall be attached to the furring in accordance with the manufacturer's installation instructions. Not all fasteners are commonly available in the lengths specified. Proprietary fasteners of equal strength and size are permitted.
15. This table provides some options evaluated by DrJ for the attachment of Boral Stone products over foam plastic insulating sheathing. Other methods, such as Cascadia clips or Knight Wall Systems, may be considered, but have not been evaluated by DrJ.
16. Materials in the assembly, other than the veneer, lath and mortar setting bed and furring are assumed to be separately attached and are not included in the fastener size calculations. Furring weight shall be included as part of the listed cladding weight.
17. HeadLOK® Screws are proprietary fasteners manufactured by OMG®, Inc. (dba FastenMaster®). For HeadLOK® fastener code compliance issues, see the manufacturer's product literature and code compliance reports.
18. Tapcon® fasteners are proprietary fasteners manufactured by ITW Buildex. For Tapcon® fastener code compliance issues, see the manufacturer's product literature and code compliance reports.
19. TRUFAST® fasteners are proprietary fasteners manufactured by TRUFAST®, LLC. For TRUFAST® fastener code compliance issues, see the manufacturer's product literature and code compliance reports.
20. Framing is defined as wood studs, steel studs, concrete or masonry substrates.

### 5.4. Transverse Wind Loads

- 5.4.1. Boral Stone products 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.
- 5.4.3. Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience and technical judgment.
- 5.4.4. For additional information or use in other applications, consult the [manufacturer's installation instructions](#).

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Table 3: Maximum Wind Speeds for Boral Stone Product Lath Fasteners		
Exposure Category	Maximum Wind Speed (mph) ( $V_{ult}/V_{asd}$ ) <sup>1</sup>	Maximum Allowable Wind Pressure (psf) <sup>2</sup>
B	$\leq 190/145$	70
C	$\leq 165/130$	
D	$\leq 150/115$	
1. The first wind speed listed is $V_{ult}$ , per <i>ASCE 7-10</i> , and is the maximum allowed wind speed for the Exposure Category shown with a maximum Mean Roof Height (MRH) of 30'. The second wind speed capacity shown for each exposure category is the <i>ASCE 7-10</i> ultimate wind speed converted to $V_{asd}$ for allowable stress design and rounded to the nearest 5 mph. 2. Design wind pressure is per <i>ASCE 7-10</i> 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 an allowable stress design reduction factor of 1.6, in accordance with <i>SDPWS</i> Section 3.2.1. 4. Pressure Equalization factor in accordance with <i>ASTM D5206</i> , Procedure B equals 1.0. 5. Wind pressure resistance is based on the lowest published withdraw capacity for the fasteners shown. Fasteners of equal or greater withdrawal resistance and equal or greater head size are permitted.		

Table 3: Maximum Wind Speeds for Boral Stone Product Lath Fasteners

### 6. Installation:

- 6.1. Boral Stone products shall be installed in accordance with the [manufacturer's published installation instructions](#), the [Masonry Veneer Manufacturer Association's Installation Guide](#), and this TER. In the event of a conflict between the manufacturer's installation instructions, the Masonry Veneer Manufacturer Association's Installation Guide and this TER, the more restrictive shall govern.
- 6.2. Installation is subject to the conditions of use set forth in [Section 9](#).
- 6.3. Veneer must be applied to a wall framing system in which the studs are spaced a maximum of 16" o.c. (406 mm).
- 6.4. Boral Stone products may be installed over continuous insulation on wood- or steel-framed walls, with or without WSP sheathing, and attached in accordance with [Table 1a](#), [Table 1b](#) or [Table 2](#).
  - 6.4.1. Where WSP sheathing is used, it shall be installed in accordance with the applicable building code or other standards as permitted by the building code (such as *SDPWS* or *WFCM*) and shall comply with one of the following minimum requirements:
    - 6.4.1.1. Minimum  $7/16$ " Structural 1, Exposure 1 OSB complying with *U.S. DOC PS-2*.
    - 6.4.1.2. Minimum  $1/2$ " Structural 1 rated, exterior grade plywood complying with *U.S. DOC PS-1*.
- 6.5. Boral Stone products may be installed over continuous insulation on masonry or concrete walls and attached in accordance with [Table 1c](#) or [Table 2](#).
- 6.6. Boral Stone products must be installed over two (2) layers of a water-resistant barrier (WRB) in accordance with [IBC Section 1403.2](#)<sup>3</sup>, [Section 2510.6](#) and [IRC Section R703.2](#). The base layer WRB may be a liquid-applied, a sheet material, or a rigid continuous insulation with taped joints where the continuous insulation is approved for use as a WRB.
  - 6.6.1. Exception: Where installed over concrete or masonry substrate, the WRB may not be required.
- 6.7. Weep screeds and code compliant flashing must be installed at the bottom of walls; the top of windows, doors and other fenestrations; 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 1404.10.1.2.1](#)<sup>4</sup> and [Section 2512.1.2](#) or [IRC Section R703.7.2.1](#)<sup>5</sup>.
  - 6.7.2. Exception: Where installed over concrete or masonry substrate, the weep screed is not required.

<sup>3</sup> [2015 IBC Section 1404.2](#)

<sup>4</sup> [2012 IBC Section 1405.10.1.2](#), [2015 IBC Section 1405.10.1.2.1](#)

<sup>5</sup> [2012 IRC Section R703.6.2.1](#)

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- 6.8. Veneer must be installed over 2.5 lb.-per-square-yard (1.4 kg/m<sup>2</sup>) galvanized diamond mesh metal lath, 3.4 lb.-per-square-yard (1.8 kg/m<sup>2</sup>) 3/8"-thick (9.5 mm) galvanized expanded metal lath, 18 gage [0.051"-thick (1.30 mm)] galvanized woven wire mesh, or other code-approved lath of equal or better performance.
- 6.9. Lath shall be:
- 6.9.1. Installed per the manufacturer's installation instructions or *ASTM C1063*.
  - 6.9.2. Installed over the two (2) WRB layers, unless the following conditions are met:
    - 6.9.2.1. Lath is paper-backed, in which case only one (1) additional layer of WRB is required, except as noted in [Section 6.7](#).
    - 6.9.2.2. If the foam sheathing has been qualified by the manufacturer to perform as a layer of WRB, then only one (1) additional layer of WRB is required.
    - 6.9.2.3. If a rain screen is used, only one (1) additional layer of WRB is required, in accordance with [IBC Section 2510.6](#).
  - 6.9.3. Fastened through continuous insulation to each stud at 7" o.c. (152 mm) vertically along the stud or as shown in [Table 1b](#) and [Table 2](#).
  - 6.9.4. Attached to wood, steel or concrete substrates with fasteners in accordance with [Table 1a](#), [Table 1b](#) and [Table 1c](#).
  - 6.9.5. When the lath is installed over furring, the furring shall be fastened to the wood, steel or concrete substrate in accordance with [Table 2](#).
- 6.10. Boral Stone products 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.
- 6.10.1. The mortar shall comply with [IBC Section 2103.2](#)<sup>6</sup> or [IRC Table R606.2.7](#)<sup>7</sup> 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. Test and Engineering Substantiating Data:

- 7.1. Test report for wind load resistance by Architectural Testing.
- 7.2. Foam Sheathing Committee Tech Matters, *Guide to Attaching Exterior Wall Coverings through Foam Sheathing to Wood or Steel Framing*.
- 7.3. New York State Energy Research and Development Authority, *Fastening Systems for Continuous Insulation*.
- 7.4. American Wood Council Technical Report TR-12, *General Dowel Equations for Calculating Lateral Connection Values*.
- 7.5. Quality Control Manual for the Manufacturing of Boral Stone Products.
- 7.6. Masonry Veneer Manufacturers Association Installation Guide.
- 7.7. The product(s) evaluated by this TER fall within the scope of one or more of the model, state or local building codes for building construction. The testing and/or substantiating data used in this TER is limited to buildings, structures, building elements, construction materials and civil engineering related specifically to buildings.
- 7.8. The provisions of model, state or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineering mechanics based means of compliance. This TER assesses compliance with defined standards, accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.

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<sup>6</sup> [2012 IBC Section 2103.9](#)

<sup>7</sup> [2012 IRC Table R607.1](#)

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- 7.9. 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.
- 7.10. DrJ has reviewed and found the data provided by other professional sources are credible. The information in this TER conforms to DrJ's procedure for acceptance of data from approved sources.
- 7.11. DrJ's responsibility for data provided by approved sources conforms to [IBC Section 1703](#) and any relevant professional engineering law.
- 7.12. Where appropriate, DrJ's analysis is based on design values that have been codified into law through codes and standards (e.g., *IRC*, *WFCM*, *IBC*, *SDPWS*, *NDS*<sup>®</sup>, *ACI*<sup>®</sup>, *AISI*, *PS-20*, *PS-2*, etc.). This includes review of code provisions and any related test data that aids comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g. lumber, steel, concrete, etc), DrJ relies upon grade/properties provided by the raw material supplier to be accurate and conforming to the mechanical properties defined in the relevant material standard.

### 8. Findings:

- 8.1. Fasteners used in accordance with [Table 1a](#), [Table 1b](#) and [Table 2](#) are adequate for the support of Boral Stone products in applications where there is a layer of continuous insulation installed between the products and the underlying substrate (e.g., light-frame wood- or steel-framed walls or concrete or masonry walls).
- 8.2. Fasteners used in accordance with [Table 1a](#), [Table 1b](#) and [Table 2](#) are adequate to resist the transverse wind loads as shown in [Table 3](#).
- 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, not less than 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*.
- 8.4. This product has been evaluated in the context of the codes listed in [Section 2](#), and is compliant with all known state and local building codes. Where there are known variations in state or local codes that are applicable to this evaluation, they are listed here:
  - 8.4.1. No known variations
- 8.5. This TER uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its acceptance criteria for all testing and engineering analysis. DrJ's professional engineering work falls under the jurisdiction of each state Board of Professional Engineers, when signed and sealed.

### 9. Conditions of Use:

- 9.1. Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.
- 9.2. Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.
- 9.3. Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.
- 9.4. The Boral Stone products described in this TER comply with, or are a code compliant alternative material as specified in the codes listed in [Section 2](#), subject to the following conditions:
  - 9.4.1. Where required by the jurisdiction in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of permit application.

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- 9.4.2. 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, the more restrictive shall govern.
  - 9.4.3. Installation shall be on exterior walls consisting of wood framing, steel framing, masonry or concrete capable of supporting the imposed loads, including transverse wind loads.
  - 9.4.4. Where the seismic provisions of [IRC Section R301.2.2](#) apply, the 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](#).
  - 9.4.5. Walls shall be braced to resist shear (racking) load by other means and in accordance with the applicable code.
  - 9.4.6. Exterior wall framing shall be limited to a maximum out-of-plane deflection of H/360 (H equals the height of the wall).
- 9.5. Design
- 9.5.1. Building Designer Responsibility
    - 9.5.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer for the Building and shall be in accordance with [IRC Section R106](#) and [IBC Section 107](#).
    - 9.5.1.2. 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 R301](#) and [IBC Section 1603](#).
  - 9.5.2. Construction Documents
    - 9.5.2.1. 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.
- 9.6. Responsibilities
- 9.6.1. The information contained herein is a product, material, detail, design and/or application TER evaluated in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering practice, experience and technical judgment.
  - 9.6.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.
  - 9.6.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
  - 9.6.4. This product is manufactured under a third-party quality control program in accordance with [IRC Section R104.4](#) and [R109.2](#) and [IBC Section 104.4](#) and [110.4](#).
  - 9.6.5. The actual design, suitability and use of this TER, for any particular building, is the responsibility of the Owner or the Owner's authorized agent, and the TER shall be reviewed for code compliance by the Building Official.
  - 9.6.6. The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the Building Official's inspection and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

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### 10. Identification:

- 10.1. Boral Stone 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.
- 10.2. Additional technical information can be found at [boralamerica.com/stone/](http://boralamerica.com/stone/).

### 11. Review Schedule:

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



- [Mission, Belief and Independence](#)
- [Product Evaluation Policies](#)
- [Product Approval – Building Code, Administrative Law and P.E. Law](#)

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### Appendix A:

CULTURED STONE			
Product Style	Stone Saturated Weight (psf)	Saturated Density Stone and Scratch and Lath and Bonding Mortar (psf)	Saturated Density Stone and Cement Board and Bonding Mortar (psf)
Ancient Villa Ledgerstone	11.4	21.4	18.1
Cast-Fit 12x24	12.0	22.0	18.7
Cast-Fit 8x16	13.8	23.8	20.5
Cobblefield	13.9	23.9	20.6
Coral Stone	10.1	20.1	16.8
Country Ledgerstone	12.6	22.6	19.3
Cultured Brick Veneer-Handmade Brick	10.2	20.2	16.9
Cultured Brick Veneer-Used Brick	11.2	21.2	17.9
Del Mare Ledgerstone	12.3	22.3	19.0
Dressed Fieldstone	14.3	24.3	21.0
Drystack Ledgerstone	14.7	24.7	21.4
European Castle Stone	10.0	20.0	16.7
Hewn Stone 308	14.2	24.2	20.9
Hewn Stone 314	14.7	24.7	21.4
Hewn Stone 514	14.5	24.5	21.2
Hewn Stone 522	13.9	23.9	20.6
Hewn Stone 822	13.0	23.0	19.7
Limestone	13.6	23.6	20.3
Old Country Fieldstone	13.5	23.5	20.2
Pro-Fit Alpine Ledgerstone	13.3	23.3	20.0
Pro-Fit Ledgerstone	10.3	20.3	17.0
Pro-Fit Modera Ledgerstone	12.0	22.0	18.7
Pro-Fit Terrain Ledgerstone	12.2	22.2	18.9
River Rock	13.4	23.4	20.1
Rock Face	12.5	22.5	19.2
Southern Ledgerstone	12.6	22.6	19.3
Split Face	13.3	23.3	20.0
Stream Stone	9.6	19.6	16.3

This table is provided by the manufacturer to aid in selecting fasteners. DrJ Engineering has not independently verified the values in these tables.

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### Appendix B:

ELDORADO STONE		
Profile Name	Weight of Total Façade Includes Lath, Scratch, Bond Mortar & Stone, Saturated (psf)	Weight of Total Façade Includes 1/2" Cement Board, Bond Mortar & Stone, Saturated (psf)
Ashlar	20.4	17.1
Bluff Stone	19.3	16.1
Brick, Adobe	21.1	17.8
Brick, Arabian	18.5	15.3
Brick, Modena	17.0	13.7
Brick, Roma	19.6	16.3
Brick, Tundra	16.8	13.6
Brick, Via	18.4	15.1
Broken Top	22.4	19.2
Castlestone, English	20.0	16.7
Cliffstone	20.7	17.4
Coarsed Stone	21.3	18.0
Coastal Reef	20.6	17.3
Cobblestone	22.8	19.6
Country Rubble	21.0	17.7
Country Rubble, Oversized	24.9	21.7
Cut Coarsed Stone	22.2	19.0
Cypress Ridge	19.6	16.3
European Ledge Cut	22.2	18.9
Field Ledge	19.2	15.9
Top Rock	20.4	17.1
Hillstone	22.0	18.8
Latitude30	21.6	18.3
Ledgecut33	22.3	19.0
Limestone	21.2	18.0
Longitude24	21.6	18.3
Mountain Ledge Panel	22.0	18.8
Mountain Ledge	22.1	18.9
Ridgetop 18	21.6	18.3
River Rock, Northwest	21.7	18.5
River Rock, Creek Cobble	16.7	13.5
River Rock, Streamstone	22.5	19.3
River Rock, White Water	20.2	16.9
Rough Cut	22.2	18.9
Rustic Ledge	20.1	16.9
Shadow Rock	23.3	20.1
Sierra Cut24	27.3	24
Stack Stone	19.4	16.1
Vantage30	21.6	18.3
Vintage Ranch	20.5	17.2
Weathered Edge	22.0	18.8
Zen24	21.6	18.3

This table is provided by the manufacturer to aid in selecting fasteners. DrJ Engineering has not independently verified the values in these tables.

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### Appendix C:

DUTCH QUALITY STONE		
Profile Name	Weight of Total Façade Includes Lath, Scratch, Bond Mortar & Stone, Saturated (psf)	Weight of Total Façade Includes 1/2" Cement Board, Bond Mortar & Stone, Saturated (psf)
CastleStone	20.0	16.8
Drystack	20.5	17.3
FieldStone	19.6	16.3
Ledgestone	20.1	16.8
Limestone	20.7	17.5
Michigan Split Granite	22.0	18.8
River Rock	20.5	17.3
Stack Ledge	21.3	18.1
Tuscan Ridge	21.4	18.1
Tuscany Veneer	20.2	16.9
Weather Ledge	20.5	17.3

This table is provided by the manufacturer to aid in selecting fasteners. DrJ Engineering has not independently verified the values in these tables.

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### Appendix D:

STONECRAFT		
Stonecraft Profile ID	Weight of Total Façade Includes Lath, Scratch, Bond Mortar & Stone, Saturated (psf)	Weight of Total Façade Includes 1/2" Cement Board, Bond Mortar & Stone, Saturated (psf)
Cobble	24.4	21.2
Dutchcraft	24.5	21.3
Farmledge	21.6	18.4
Fieldstone	20.7	17.5
Heritage	24.2	20.9
Laurel Cavern	22.3	19.0
Ledgestone	23.7	20.5
Monarch	20.9	17.7
River Rock	23.2	19.9
Top Rock	21.6	18.4

This table is provided by the manufacturer to aid in selecting fasteners. DrJ Engineering has not independently verified the values in these tables.

### Appendix E:

ProStone		
Profile Name	Weight of Total Façade Includes Lath, Scratch, Bond Mortar & Stone, Saturated (psf)	Weight of Total Façade Includes 1/2" Cement Board, Bond Mortar & Stone, Saturated (psf)
Tuscan Cobble	15	12
Carolina Collection Field Rubble	18	15
Carolina Collection Ledgestone	19	16
Carolina Collection Rough Ledge	19	16
Fieldstone	15	12
Aged Limestone	16	13
Ledgestone	16	13
River Rock	16	13
Easy Fit Savannah Ledgestone	22	19

This table is provided by the manufacturer to aid in selecting fasteners. DrJ Engineering has not independently verified the values in these tables.