Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

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Use of EcoSmart™ Studs in Wood Framed Construction

Trade Secret Report Holder:

ViCa3 Ventures

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CSI Designations:

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

Section: 06 10 00 - Rough Carpentry Section: 06 11 00 - Wood Framing Section: 06 17 00 - Shop-Fabricated Structural Wood

1 Innovative Product Evaluated[1]

1.1 EcoSmart Stud

2 Product Description and Materials

2.1 The innovative product evaluated in this report is shown in **Figure 1** and **Figure 2**, and is described in **Table 1**.

2 x 6 EcoSmart Stud

2 x 8 EcoSmart Stud

2 x 6 Auxiliary EcoSmart Stud

Figure 1. EcoSmart Stud Products

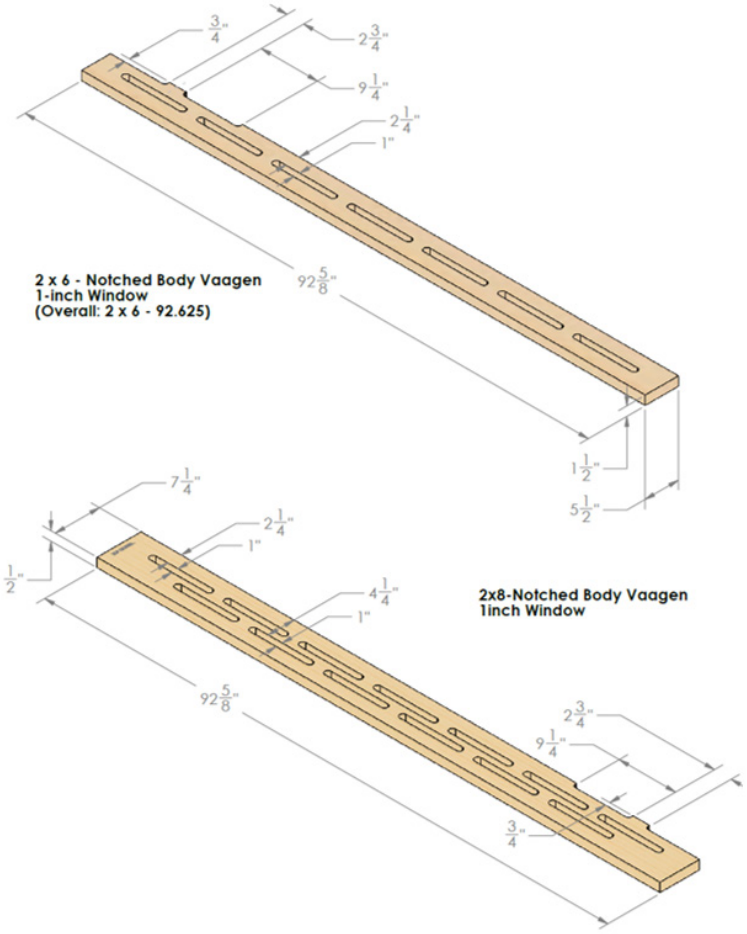

Figure 2. EcoSmart Stud Products - EcoSmart Vaagen Jack Studs

Table 1. Product Information

Product	Description	Thickness
2 x 6 EcoSmart Stud	EcoSmart Stud (2 x 6) is a specially cut lumber framing member that provides the ability to increase thermal resistance in wall assemblies and are lighter weight than solid sawn lumber. One row of slots cut through the stud allows for insulation and wiring to be installed without boring and drilling. Additionally, nubs incorporated in the exterior side of the EcoSmart Stud allow insulation to be installed around the stud.	1.5"
2 x 6 EcoSmart Vaagen Jack Stud	EcoSmart Vaagen Jack Stud (2 x 6) is a specially cut lumber framing member that provides the ability to increase thermal resistance in wall assemblies and are lighter weight than solid sawn lumber. One row of slots cut through the stud allows for insulation and wiring to be installed without boring and drilling. Additionally, two cutouts incorporated in the exterior side of the EcoSmart Stud allow easily installation of a header.	1.5"
2 x 8 EcoSmart Stud	EcoSmart Stud (2 x 8) is a specially cut lumber framing member that provides the ability to increase thermal resistance in wall assemblies and are lighter weight than solid sawn lumber. Two rows of slots cut through the stud allow for insulation and wiring to be installed without boring and notching of the studs. Additionally, nubs incorporated in the exterior side of the EcoSmart Stud allow insulation to be installed around the stud.	1.5"
2 x 8 EcoSmart Vaagen Jack Stud	EcoSmart Vaagen Jack Stud (2 x 8) is a specially cut lumber framing member that provides the ability to increase thermal resistance in wall assemblies and are lighter weight than solid sawn lumber. Two rows of slots cut through the stud allow for insulation and wiring to be installed without boring and notching of the studs. Additionally, two cutouts incorporated in the exterior side of the EcoSmart Stud allow easily installation of a header.	1.5"
2 x 6 Auxiliary EcoSmart Stud	2 x 6 Auxiliary EcoSmart Stud is a specially cut lumber framing member that provides the ability to increase thermal resistance in wall assemblies and are lighter weight than solid sawn lumber. Two rows of slots cut through the stud allow insulation and wiring to be installed without additional boring or drilling. There are no nubs on the Auxiliary EcoSmart Stud allow use as rough opening framing where a solid surface is needed for nailing fins on windows and doors.	1.5"

2.2 When EcoSmart Studs of a specific size (e.g., 2 x 6) are referenced in this report, it may be assumed that Vaagen Jack Studs of the same size are being referenced too.

2.3 As needed, review material properties for design in **Section 6** and the regulatory evaluation in **Section 8**.

3 Definitions[2]

3.1 New Materials[3] are defined as building materials, equipment, appliances, systems, or methods of construction, not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.[4] The design strength and permissible stresses shall be established by tests[5] and/or engineering analysis.[6]

3.2 Duly authenticated reports[7] and research reports[8] are test reports and related engineering evaluations that are written by an approved agency[9] and/or an approved source.[10]

3.2.1 These reports utilize intellectual property and/or trade secrets to create public domain material properties for commercial end-use.

3.2.1.1 This report protects confidential Intellectual Property and trade secretes under the regulation, 18.US.Code.90, also known as Defend Trade Secrets Act of 2016 (DTSA).[11]

3.3 An approved agency is *"approved"* when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is accredited and listed in the ANAB directory.

3.4 An approved source is *"approved"* when a professional engineer (i.e., Registered Design Professional, hereinafter RDP) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[12]

3.5 Testing and/or inspections conducted for this duly authenticated report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed RDP.

3.5.1 The Center for Building Innovation (CBI) is ANAB[13] ISO/IEC 17025 and ISO/IEC 17020 accredited.

3.6 The regulatory authority shall enforce[14] the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing[15] stating the nonconformance and the path to its cure.

3.7 The regulatory authority shall accept duly authenticated reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.[16]

3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory. Therefore, recognition of certificates and validation statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope shall be approved.[17] Thus, all ANAB ISO/IEC 17065 duly authenticated reports are approval equivalent,[18] and can be used in any country that is an MLA signatory found at this link: https://iaf.nu/en/recognised-abs/

3.9 Approval equity is a fundamental commercial and legal principle.[19]

4 Applicable Local, State, and Federal Approvals; Standards; Regulations[20]

4.1 *Local, State, and Federal*

4.1.1 Approved in all local jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which includes, but is not limited to, the following featured local jurisdictions: Austin, Baltimore, Broward County, Chicago, Clark County, Dade County, Dallas, Detroit, Denver, DuPage County, Fort Worth, Houston, Kansas City, King County, Knoxville, Las Vegas, Los Angeles City, Los Angeles County, Miami, Nashville, New York City, Omaha, Philadelphia, Phoenix, Portland, San Antonio, San Diego, San Jose, San Francisco, Seattle, Sioux Falls, South Holland, St. Louis County, Texas Department of Insurance, and Wichita.[21]

4.1.2 Approved in all state jurisdictions pursuant to ISO/IEC 17065 duly authenticated report use, which includes, but is not limited to, the following featured states: California, Florida, New Jersey, Oregon, New York, Texas, Washington, and Wisconsin.[22]

4.1.3 Approved by the Code of Federal Regulations Manufactured Home Construction: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[23] and Part 3280[24] pursuant to the use of ISO/IEC 17065 duly authenticated reports.

4.1.4 Approved means complying with the requirements of local, state, or federal legislation.

4.2 *Regulations*

4.2.1 *IBC – 18, 21, 24: International Building Code®*

4.2.2 *IRC – 18, 21, 24: International Residential Code®*

4.2.3 *IECC – 18, 21, 24: International Energy Conservation Code®*

4.3 *Standards*

4.3.1 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*

4.3.2 *ANSI/AWC SDPWS: Special Design Provisions for Wind and Seismic*

4.3.3 *ASTM D198: Standard Test Methods of Static Tests of Lumber in Structural Sizes*

4.3.4 *ASTM D2395: Standard Test Methods for Density and Specific Gravity (Relative Density) of Wood and Wood-Based Materials*

4.3.5 *ASTM D4442: Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials*

4.3.6 *ASTM D5456: Standard Specification for Evaluation of Structural Composite Lumber Products*

4.3.7 *ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*

4.4 Structural performance for shear wall assemblies used as lateral force resisting systems in Seismic Design Categories A through F have been tested and evaluated in accordance with the following standards:

4.4.1 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

4.4.2 *ASTM D7989: Standard Practice for Demonstrating Equivalent In-Plane Lateral Seismic Performance to Wood-Frame Shear Walls Sheathed with Wood Structural Panels*

4.4.2.1 ASTM D7989 is accepted engineering practice used to establish Seismic Design Coefficients (SDC).

4.4.2.2 Tested data generated by ISO/IEC 17025 approved agencies and/or professional engineers, which use ASTM D7989 as their basis, are defined as intellectual property and/or trade secrets.

4.4.2.3 All professional engineering evaluations are defined as an independent design review (i.e., listings, certified reports, duly authenticated reports from approved agencies, and/or research reports, are prepared independently by approved agencies and/or approved sources, when signed and sealed by licensed professional engineer pursuant to registration law.

4.4.3 *ASTM E564: Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*

4.4.4 *ASTM E2126: Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*

5 Listed[25]

5.1 Equipment, materials, products, or services included in a List published by a nationally recognized testing laboratory (i.e., CBI), an approved agency (i.e., CBI and DrJ), and/or and approved source (i.e., DrJ), or other organization(s) concerned with product evaluation (i.e., DrJ), that maintains periodic inspection (i.e., CBI) of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 *General Provisions*

6.1.1 Except as otherwise described in this report, EcoSmart Studs shall be installed in accordance with the applicable building codes listed in **Section 4**.

6.2 *Prescriptive Provisions*

6.2.1 Wall assemblies constructed with EcoSmart Studs are an alternative to solid sawn lumber wall assemblies.

6.2.2 EcoSmart Studs used as wall framing members shall be fastened as specified in the IRC Table R602.3(1).

6.2.3 EcoSmart Studs may be used on braced wall lines with $^{7}/_{16}$" Wood Structural Panel (WSP) sheathing as an equivalent alternative to Method WSP and CS-WSP (Continuously Sheathed Wood Structural Panel) of the IRC, when installed in accordance with IRC Section R602.10 and this report.

6.2.4 Holes and notches in the flange material are not permitted.

6.2.5 The Auxiliary 2 x 6 EcoSmart Studs are designed to be used for rough opening framing where a solid surface is required for nailing fenestration (windows and doors) flanges to the face of the wall. Use Auxiliary 2 x 6 EcoSmart Studs at all window and door rough opening jambs when flanged fenestrations are used.

6.2.6 The minimum aspect ratio shall be 3.5:1 or minimum panel width shall be 27", whichever is greater.

6.2.7 *Simplified IRC Bracing Provisions:*

6.2.7.1 EcoSmart Stud is permitted to be used in accordance with the IRC simplified bracing method of IRC Section R602.12 and **Table 2**.

Table 2. EcoSmart Stud Simplified Bracing Table for Wall Assemblies Constructed with Wood Structural Panels[1,2,3,4,5,6,7,8]

Wall Framing Product	Ultimate Design Wind Speed (mph)	Story Level	Eave to Ridge Height (ft)	Minimum Number of Bracing Units Required (Long Side)						Minimum Number of Bracing Units Required (Short Side)					
				Length of Short Side (ft)						Length of Long Side (ft)					
				10	20	30	40	50	60	10	20	30	40	50	60
EcoSmart Stud	115	One Story or Top of Two or Three Story	10	1	2	2	3	4	4	1	2	2	3	4	4
		First of Two Story or Second of Three Story		2	3	4	5	6	7	2	3	4	5	6	7
		First of Three Story		3	4	6	7	9	11	3	4	6	7	9	11
		One Story or Top of Two or Three Story	15	1	2	3	4	5	5	1	2	3	4	5	5
		First of Two Story or Second of Three Story		2	3	5	6	7	9	2	3	5	6	7	9
		First of Three Story		3	5	6	8	10	12	3	5	6	8	10	12
	130	One Story or Top of Two or Three Story	10	1	2	3	4	4	5	1	2	3	4	4	5
		First of Two Story or Second of Three Story		2	4	5	7	8	9	2	4	5	7	8	9
		First of Three Story		3	5	7	9	11	14	3	5	7	9	11	14
		One Story or Top of Two or Three Story	15	2	3	4	5	5	7	2	3	4	5	5	7
		First of Two Story or Second of Three Story		2	4	6	7	9	10	2	4	6	7	9	10
		First of Three Story		3	6	8	10	13	15	3	6	8	10	13	15

Table 2. EcoSmart Stud Simplified Bracing Table for Wall Assemblies Constructed with Wood Structural Panels[1,2,3,4,5,6,7,8]

Wall Framing Product	Ultimate Design Wind Speed (mph)	Story Level	Eave to Ridge Height (ft)	Minimum Number of Bracing Units Required (Long Side)						Minimum Number of Bracing Units Required (Short Side)					
				Length of Short Side (ft)						Length of Long Side (ft)					
				10	20	30	40	50	60	10	20	30	40	50	60

SI: 1 in = 25.4 mm

1. This simplified bracing table is based on the provisions of IRC Section R602.12. All provisions therein shall be observed, except that this table shall replace IRC Table R602.12.4, and EcoSmart Stud shall replace the wall stud framing.
2. Interpolation shall not be permitted.
3. Cripple walls or wood-framed basement walls in a walk-out condition shall be designated as the first story and the stories above shall be re-designated as the second and third stories respectively, and shall be prohibited in a three-story structure.
4. Actual lengths of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using **Table 2**.
5. For Exposure Category C, multiply bracing units by a factor of 1.20 for a one-story building, 1.30 for a two-story building, and 1.40 for a three-story building. Actual length of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using **Table 2**.
6. Maximum stud spacing is 24" o.c.
7. $^{7}/_{16}$" wood structural panels attached with minimum $2^{3}/_{8}$" x 0.113" nails fastened 6" o.c. at panel edges and 12" o.c. in the field.
8. Minimum $^{1}/_{2}$" Gypsum Wallboard (GWB) attached to the interior side of the wall in accordance with IRC Section R702.3.5 and IRC Table R702.3.5.

6.2.8 *IRC WSP and CS-WSP Bracing Methods Using EcoSmart Stud Equivalency Factor:*

6.2.8.1 Required braced wall panel lengths for wall assemblies constructed with EcoSmart Studs shall be as determined by the equivalency factor shown in **Table 3**, IRC Table R602.10.3(1), and IRC Table R602.10.3(2), including all footnotes.

6.2.8.2 The braced wall line length equivalency factors in **Table 3** are based on equivalency testing and are used to comply with Method WSP and CS-WSP of the IRC.

6.2.8.3 EcoSmart Stud tested equivalency factors in **Table 3** allow the user to determine the length of bracing required, by multiplying the factor from **Table 3** by the length shown in the WSP or CS columns in IRC Table R602.10.3(1), as modified by all applicable factors in IRC Table R602.10.3(2), respectively.

6.2.8.4 All IRC prescriptive bracing minimums, spacing requirements, and rules must also be met.

6.2.8.5 Where a building, or portion thereof, does not comply with one or more of the bracing requirements within the prescriptive section of the IRC, those portions shall be designed and constructed in accordance with IRC Section R301.1.

Table 3. IRC Braced Wall Panel Equivalency for EcoSmart Stud Wall Assembies[1,2]

Product	Maximum Stud Spacing (in)	Sheathing Fastener	Maximum Fastener Spacing (edge:field) (in)	Gypsum Wallboard[3] Fastening Spacing (blocked or unblocked) (edge:field)	Wind
					SPF Framing
					Equivalency Factors[3] to IRC WSP or CS-WSP
EcoSmart Stud	24 o.c.	2 3/8" x 0.113" Nails	6:12	As required by IRC Table R702.3.5	1.39

SI: 1 in = 25.4 mm

1. EcoSmart Stud tested equivalency factors allow the user to determine the length of bracing required, by multiplying the factor by the length of bracing shown in the WSP or CS-WSP columns in IRC Table R602.10.3(1) and IRC Table R602.10.3(3) as modified by all applicable factors in IRC Table R602.10.3(2) and IRC Table R602.10.3(4), respectively.
2. Valid for single top plate (advanced framing method) wall installations or double top plate wall installations.
3. When used, GWB shall be installed according to the provision listed in IRC Table R702.3.5.

6.2.9 *IRC WSP and CS-WSP Bracing Methods Using EcoSmart Stud Prescriptive Bracing Table:*

6.2.9.1 EcoSmart Studs may be used on braced wall lines as an equivalent alternative to IRC Method WSP when installed in accordance with IRC Section R602.10 and this report.

6.2.9.2 Wind design, required braced wall panel lengths for EcoSmart Stud wall assemblies shall be as shown in **Table 4** and shall be used in conjunction with IRC Table R602.10.3(2), which provides the required adjustments.

6.2.9.3 For seismic design, EcoSmart Stud wall assemblies are permitted in all buildings constructed under the provisions of the IRC in Seismic Design Categories (SDC) A and B. In addition, EcoSmart Stud wall assemblies are permitted in detached buildings constructed under the provisions of the IRC in SDC C using the bracing lengths in **Table 4**.

Table 4. Required Bracing Lengths for EcoSmart Stud Wall Assemblies – Wind[1,2,3,4]

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line											
		Intermittent Sheathing						Continuous Sheathing					
		Ultimate Design Wind Speed, V_{ult} (mph)											
		< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140	< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140
One Story or the Top of Two or Three Stories	10	2.1	2.8	2.8	3.5	3.5	4.2	2.1	2.1	2.8	2.8	3.5	3.5
	20	3.5	4.9	4.9	5.6	7.0	7.6	3.5	4.2	4.9	4.9	5.6	7.0
	30	5.6	7.0	7.6	8.3	9.7	11.1	4.9	6.3	6.3	7.0	8.3	9.7
	40	7.0	9.0	9.7	11.1	12.5	14.6	5.6	7.6	8.3	9.0	10.4	12.5
	50	8.3	11.1	12.5	13.2	15.3	18.1	7.0	9.7	10.4	11.1	13.2	15.3
	60	9.7	13.2	14.6	16.0	18.1	20.9	8.3	11.1	12.5	13.2	15.3	18.1

Table 4. Required Bracing Lengths for EcoSmart Stud Wall Assemblies – Wind[1,2,3,4]

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line											
		Intermittent Sheathing						Continuous Sheathing					
		Ultimate Design Wind Speed, V_{ult} (mph)											
		< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140	< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140
First Story of Two Stories or Second Story of Three Stories	10	4.2	4.9	5.6	6.3	7.0	8.3	3.5	4.2	4.9	4.9	6.3	7.0
	20	7.0	9.0	10.4	11.1	13.2	15.3	6.3	7.6	9.0	9.7	11.1	12.5
	30	9.7	13.2	14.6	16.0	18.8	21.5	8.3	11.1	12.5	13.2	16.0	18.1
	40	13.2	17.4	18.8	20.9	24.3	27.8	11.1	14.6	16.0	17.4	21.5	23.6
	50	16.0	21.5	22.9	25.0	29.9	34.1	13.9	18.1	19.5	21.5	25.0	29.2
	60	18.8	25.0	27.8	29.9	34.8	40.3	16.0	21.5	23.6	25.7	29.9	34.8
First Story of Three Stories	10	5.6	7.6	8.3	9.0	10.4	11.8	4.9	6.3	7.0	7.6	9.0	10.4
	20	10.4	13.9	15.3	16.0	18.8	22.2	9.0	11.8	12.5	13.9	16.0	18.8
	30	14.6	19.5	21.5	23.6	27.1	32.0	12.5	16.7	18.1	20.2	23.6	27.1
	40	18.8	25.7	27.8	30.6	35.4	41.0	16.0	21.5	23.6	25.7	30.6	34.8
	50	23.6	31.3	34.1	37.5	43.8	50.7	20.2	26.4	29.2	32.0	36.8	43.1
	60	27.8	36.8	40.3	44.5	52.1	59.8	23.6	32.0	34.8	37.5	43.8	50.7

SI: 1 in = 25.4 mm, 1 mph = 1.61 km/h

1. Assemblies consist of EcoSmart Studs spaced a maximum of 24" o.c. and fastened with 2⅜" x 0.113" nails spaced 6":12" (edge:field) per **Section 9**.
2. Demonstrates equivalency to IRC Table R602.10.3(1). All adjustment factors from IRC Table R602.10.3(2) shall be applied. A minimum of ½" gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or 1¼" #6 types W or S screws In accordance with IRC Section R703.2.
3. Bracing lengths are the results of comparative equivalency testing and analysis using both tested and published design values as points of comparison. DrJ relies upon the design values published in the codes and standards listed in **Section 4** that are adopted into law and that the manufacturer of those products stand behind. DrJ performs all equivalency analysis based on legally defined design values, the responsibility for which is the manufacturer of those products or the members of the associations that publish those design values.
4. Linear interpolation is permitted.

6.3 *Performance-Based Wood-Frame Construction*

6.3.1 Wall assemblies using EcoSmart Studs shall be designed using the properties shown in **Table 5** or as otherwise permitted in this report.

6.3.2 The design provisions for wood construction noted in IBC Section 2302.1 and IRC Section R301.1.3 apply to EcoSmart Studs for Allowable Stress Design (ASD), unless otherwise noted in this report.

6.3.3 Design of connections using EcoSmart Studs shall be in accordance with the NDS.

6.3.4 Reference design values for EcoSmart Studs are specified in **Table 5**.

6.3.5 Reference design values for EcoSmart Studs shall be multiplied by the adjustment factors specified in NDS Section 4.3, except that the size factor, C_F, shall be taken as 1.0.

Table 5. EcoSmart Stud Allowable Design Values

Product	F_b (psi)	F_t (psi)	F_v (psi)	F_c (psi)	$F_{c\perp}$ (psi)	EI (lb-in^2)	MOE (psi)	I (in^4)	S (in^3)
Auxiliary 2 x 6	470	455	20	1265	425	18,331,000	868,600	20.8	7.6
2 x 6	440	335	20	1265	425	14,903,000	686,700	20.8	7.6
2 x 8	830	475	25	1210	425	31,056,000	641,000	47.6	13.1

1. A single EcoSmart Stud has a bearing surface of 4.8 sq. in. when in the vertical orientation.
2. Values are based on full wall assembly tests with EcoSmart Studs spaced a maximum of 24" on center and are reported on a per stud basis.
3. Values include size factor adjustments as appropriate.
4. Values may be adjusted by NDS adjustment factors except the size Factor, C_F, shall be taken as 1.0.
5. 2 x 6 and 2 x 8 EcoSmart Vaagen Jack Studs have the same allowable design values as the 2 x 6 and 2 x 8 studs, respectively.

6.3.6 EcoSmart Studs used in wall assemblies designed as shear walls are permitted to be designed in accordance with the methodology used in SDPWS for WSP using the capacities shown in **Table 6**.

Table 6. Allowable Unit Shear Capacity for EcoSmart Stud Framed Walls (Wind)[1]

Product	Exterior Sheathing[1]	Interior Sheathing	Maximum Stud Spacing (in)	Allowable Unit Shear Capacity (plf)	Internal Shear Stiffness (kip/in)
Wall Assembly with 2 x 6 EcoSmart Stud	$^7/_{16}$ OSB	None	24	175	7.5

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/ft = 0.0146 kN/m, 1 psf = 0.0479 kN/m^2, 1 psi = 0.00689 MPa, 1 mph = 1.61 km/h, 1 F-ft^2-h/Btu = 0.1761 K-m^2/W

1. OSB sheathing fastened with 2$^3/_8$" x 0.113" diameter nails, 6" on center at panel edged and 12" on center at intermediate studs.

6.3.7 Wall assemblies using EcoSmart Studs shall be designed to resist uplift load forces using accepted engineering practices.

6.3.8 Wall assemblies using EcoSmart Studs shall be designed to resist transverse wind load forces using accepted engineering practices.

6.4 *Spray Foam Wall Construction*

6.4.1 EcoSmart Studs used in wall assemblies designed as shear walls with spray foam applied to studs are permitted to be designed in accordance with the methodology used in SDPWS for WSP using the capacities shown in **Table 8**, provided that the requirements of **Section 6.4.2** be met.

6.4.2 The spray foam applied must be a closed cell Spray Polyurethane Foam (SPF) and have properties equal to or greater than those of the XCELUS® XLS 2000 spray foam insulation found in **Table 7** and installed in accordance with **Section 6.4.3**.

6.4.3 *Spray Foam Installation:*

6.4.3.1 Spray foam shall be installed with a 2" picture frame fillet sprayed around stud and plate edges that completely fills voids between OSB and the EcoSmart Stud. The remaining area within each cavity shall be filled to a minimum 1" thickness.

Table 7. XCELUS XLS 2000 Spray Foam Properties[1]

Product	Density (lb/cf)	Compressive Strength (psi)
XLS 2000 Spray Foam	3.0	38.0

Table 8. Allowable Unit Shear Capacity and Pressure for EcoSmart Stud Framed Walls with Spray Foam Insulation (Wind)[1]

Product	Exterior Sheathing[1]	Interior Sheathing[2]	Maximum Stud Spacing (in)	Allowable Unit Shear Capacity (plf)	Internal Shear Stiffness (kip/in)	Allowable Pressure (psf)		EI (lb-in²)
						Positive	Negative	
Wall Assembly with 2 x 6 EcoSmart Stud and Spray Foam Insulation	7/16" OSB	1/2" Lightweight GWB	24	495	18.7	95	85	130,000,000

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 lb/ft = 0.0146 kN/m, 1 psf = 0.0479 kN/m², 1 psi = 0.00689 MPa, 1 mph = 1.61 km/h, 1 F-ft²-h/Btu = 0.1761 K-m²/W

1. OSB sheathing fastened with 2 3/8" x 0.113" diameter nails, 6" on center at panel edged and 12" on center at intermediate studs.
2. GWB sheathing fastened with #6 1 1/4" type W screws, 16":16" on center (edge:field).

6.4.4 *Simplified IRC Bracing Provisions for Spray Foam Wall Construction:*

6.4.4.1 EcoSmart Studs with spray foam are permitted to be used in accordance with the IRC simplified bracing method of IRC Section R602.12 and **Table 9**.

Table 9. EcoSmart Stud with Spray Foam Simplified Bracing Table for Wall Assemblies Constructed with Wood Structural Panels[1,2,3,4,5,6,7,8]

Wall Framing Product	Ultimate Design Wind Speed (mph)	Story Level	Eave to Ridge Height (ft)	Minimum Number of Bracing Units Required (Long Side)						Minimum Number of Bracing Units Required (Short Side)					
				Length of Short Side (ft)						Length of Long Side (ft)					
				10	20	30	40	50	60	10	20	30	40	50	60
EcoSmart Stud	115	One Story or Top of Two or Three Story	10	1	1	1	2	2	2	1	1	1	2	2	2
		First of Two Story or Second of Three Story		1	2	2	3	3	3	1	2	2	3	3	3
		First of Three Story		1	2	3	3	4	5	1	2	3	3	4	5
		One Story or Top of Two or Three Story	15	1	1	1	3	3	3	1	1	1	3	3	3
		First of Two Story or Second of Three Story		1	2	2	3	3	3	1	2	2	3	3	3
		First of Three Story		1	2	3	3	4	6	1	2	3	3	4	6

Table 9. EcoSmart Stud with Spray Foam Simplified Bracing Table for Wall Assemblies Constructed with Wood Structural Panels[1,2,3,4,5,6,7,8]

Wall Framing Product	Ultimate Design Wind Speed (mph)	Story Level	Eave to Ridge Height (ft)	Minimum Number of Bracing Units Required (Long Side)						Minimum Number of Bracing Units Required (Short Side)					
				Length of Short Side (ft)						Length of Long Side (ft)					
				10	20	30	40	50	60	10	20	30	40	50	60
	130	One Story or Top of Two or Three Story	10	1	1	2	2	2	2	1	1	2	2	2	2
		First of Two Story or Second of Three Story		1	2	3	3	4	4	1	2	3	3	4	4
		First of Three Story		2	3	3	4	5	6	2	3	3	4	5	6
		One Story or Top of Two or Three Story	15	1	1	3	3	3	3	1	1	3	3	3	3
		First of Two Story or Second of Three Story		1	2	3	3	5	5	1	2	3	3	5	5
		First of Three Story		2	3	3	4	6	7	2	3	3	4	6	7

SI: 1 in = 25.4 mm

1. This simplified bracing table is based on the provisions of IRC Section R602.12. All provisions therein shall be observed, except that this table shall replace IRC Table R602.12.4, and EcoSmart Studs shall replace the wall stud framing.
2. Interpolation shall not be permitted.
3. Cripple walls or wood-framed basement walls in a walk-out condition shall be designated as the first story and the stories above shall be redesignated as the second and third stories respectively, and shall be prohibited in a three-story structure.
4. Actual lengths of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using **Table 9**.
5. For Exposure Category C, multiply bracing units by a factor of 1.20 for a one-story building, 1.30 for a two-story building, and 1.40 for a three-story building. Actual length of the sides of the circumscribed rectangle shall be rounded to the next highest unit of 10 when using **Table 9**.
6. Maximum stud spacing is 24" o.c.
7. $^{7}/_{16}$" wood structural panels attached with minimum $2^{3}/_{8}$" x 0.113" nails fastened 6" o.c. at panel edges and 12" o.c. in the field.
8. Minimum $^{1}/_{2}$" GWB attached to the interior side of the wall in accordance with IRC Section R702.3.5 and IRC Table R702.3.5.

6.4.5 *IRC WSP and CS-WSP Bracing Methods Using EcoSmart Stud with Foam Equivalency Factor:*

6.4.5.1 Required braced wall panel lengths for wall assemblies constructed with EcoSmart Studs with spray foam shall be as determined by the equivalency factor shown in **Table 10**, IRC Table R602.10.3(1) and IRC Table R602.10.3(2), including all footnotes.

6.4.5.2 The braced wall line length equivalency factors in **Table 10** are based on equivalency testing and are used to comply with Method WSP and CS-WSP of the IRC.

6.4.5.3 EcoSmart Stud with spray foam tested equivalency factors in **Table 10** allow the user to determine the length of bracing required, by multiplying the factor from **Table 10** by the length shown in the WSP or CS columns in IRC Table R602.10.3(1), as modified by all applicable factors in IRC Table R602.10.3(2).

6.4.5.4 All IRC prescriptive bracing minimums, spacing requirements, and rules must also be met.

6.4.5.5 Where a building, or portion thereof, does not comply with one or more of the bracing requirements within the prescriptive section of the IRC, those portions shall be designed and constructed in accordance with IRC Section R301.1.

Table 10. IRC Braced Wall Panel Equivalency for EcoSmart Stud with Spray Foam Wall Assemblies[1,2]

Product	Maximum Stud Spacing (in)	Exterior OSB Sheathing[3]	Maximum Fastener Spacing (edge:field) (in)	Gypsum Sheathing[4]	GWB[3] Fastening Spacing (Blocked or Unblocked) (edge:field)	Wind
						SPF Framing
						Equivalency Factors[3] to IRC WSP or CS-WSP
EcoSmart Stud	24 o.c.	7/16"	6:12	1/2" GWB	16:16	0.6

SI: 1 in = 25.4 mm

1. EcoSmart Stud tested equivalency factors allow the user to determine the length of bracing required, by multiplying the factor by the length of bracing shown in the WSP or CS-WSP columns in IRC Table R602.10.3(1) and IRC Table R602.10.3(3), as modified by all applicable factors in IRC Table R602.10.3(2) and IRC Table R602.10.3(4), respectively.
2. Valid for single top plate (advanced framing method) wall installations or double top plate wall installations.
3. OSB sheathing fastened with 2 3/8" x 0.113" diameter nails, 6" on center at panel edged and 12" on center at intermediate studs.
4. GWB sheathing fastened with #6 1 1/4" type W screws, 16":16" on center (edge:field).
5. GWB shall be installed according to the provision listed in IRC Table R702.3.5.

6.4.6 *IRC WSP and CS-WSP Bracing Methods Using EcoSmart Stud with Spray Foam Prescriptive Bracing Table:*

6.4.6.1 EcoSmart Studs with spray foam may be used on braced wall lines as an equivalent alternative to IRC Method WSP when installed in accordance with IRC Section R602.10 and this report.

6.4.6.2 Wind design, required braced wall panel lengths for EcoSmart Stud with spray foam wall assemblies shall be as shown in **Table 11** and shall be used in conjunction with IRC Table R602.10.3(2), which provides the required adjustments.

6.4.6.3 For seismic design, EcoSmart Stud with spray foam wall assemblies are permitted in all buildings constructed under the provisions of the IRC in SDC A and B. In addition, EcoSmart Stud with spray foam wall assemblies are permitted in detached buildings constructed under the provisions of the IRC in SDC C using the bracing lengths in **Table 11**.

Table 11. Required Bracing Lengths for EcoSmart Stud Wall Assemblies with Specified Spray Foam – Wind[1,2,3,4]

Condition	Braced Wall Line Spacing (ft)	Minimum Total Length (ft) of Braced Wall Panels Required Along Each Braced Wall Line											
		Intermittent Sheathing						Continuous Sheathing					
		Ultimate Design Wind Speed, V_{ult} (mph)											
		< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140	< 95	≤ 110	≤ 115	≤ 120	≤ 130	≤ 140
One Story or the Top of Two or Three Stories	10	0.9	1.2	1.2	1.5	1.5	1.8	0.9	0.9	1.2	1.2	1.5	1.5
	20	1.5	2.1	2.1	2.4	3.0	3.3	1.5	1.8	2.1	2.1	2.4	3.0
	30	2.4	3.0	3.3	3.6	4.2	4.8	2.1	2.7	2.7	3.0	3.6	4.2
	40	3.0	3.9	4.2	4.8	5.4	6.3	2.4	3.3	3.6	3.9	4.5	5.4
	50	3.6	4.8	5.4	5.7	6.6	7.8	3.0	4.2	4.5	4.8	5.7	6.6
	60	4.2	5.7	6.3	6.9	7.8	9.0	3.6	4.8	5.4	5.7	6.6	7.8
First Story of Two Stories or Second Story of Three Stories	10	1.8	2.1	2.4	2.7	3.0	3.6	1.5	1.8	2.1	2.1	2.7	3.0
	20	3.0	3.9	4.5	4.8	5.7	6.6	2.7	3.3	3.9	4.2	4.8	5.4
	30	4.2	5.7	6.3	6.9	8.1	9.3	3.6	4.8	5.4	5.7	6.9	7.8
	40	5.7	7.5	8.1	9.0	10.5	12.0	4.8	6.3	6.9	7.5	9.3	10.2
	50	6.9	9.3	9.9	10.8	12.9	14.7	6.0	7.8	8.4	9.3	10.8	12.6
	60	8.1	10.8	12.0	12.9	15.0	17.4	6.9	9.3	10.2	11.1	12.9	15.0
First Story of Three Stories	10	2.4	3.3	3.6	3.9	4.5	5.1	2.1	2.7	3.0	3.3	3.9	4.5
	20	4.5	6.0	6.6	6.9	8.1	9.6	3.9	5.1	5.4	6.0	6.9	8.1
	30	6.3	8.4	9.3	10.2	11.7	13.8	5.4	7.2	7.8	8.7	10.2	11.7
	40	8.1	11.1	12.0	13.2	15.3	17.7	6.9	9.3	10.2	11.1	13.2	15.0
	50	10.2	13.5	14.7	16.2	18.9	21.9	8.7	11.4	12.6	13.8	15.9	18.6
	60	12.0	15.9	17.4	19.2	22.5	25.8	10.2	13.8	15.0	16.2	18.9	21.9

SI: 1 in = 25.4 mm, 1 mph = 1.61 km/h

1. Assemblies consist of EcoSmart Studs spaced a maximum of 24" o.c. and fastened with 2⅜" x 0.113" nails spaced 6":12" (edge:field), exterior OSB sheathing, interior GWB sheathing and spray foam per **Section 6.4**.
2. Demonstrates equivalency to IRC Table R602.10.3(1). All adjustment factors from IRC Table R602.10.3(2) shall be applied. A minimum of ½" gypsum sheathing shall be applied to the interior side of the wall assembly and fastened with a minimum 5d cooler nails or 1¼" #6 types W or S screws In accordance with IRC Section R703.2.
3. Bracing lengths are the results of comparative equivalency testing and analysis using both tested and published design values as points of comparison. DrJ relies upon the design values published in the codes and standards listed in **Section 4** that are adopted into law and that the manufacturer of those products stand behind. DrJ performs all equivalency analysis based on legally defined design values, the responsibility for which is the manufacturer of those products or the members of the associations that publish those design values.
4. Linear interpolation is permitted.

6.5 Where the application falls outside of the performance evaluation, conditions of use, and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science, and fire science.

7 Certified Performance[26]

7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.[27]

7.2 The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.[28]

8 Regulatory Evaluation and Accepted Engineering Practice

8.1 EcoSmart Stud complies with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 Lateral force resisting systems for use in both wind and seismic applications follow the performance-based provisions of IBC Section 2306.1, IBC Section 2306.3, and/or SDPWS Section 4.3 for light-frame wood wall assemblies.

8.2 This report examines EcoSmart Stud for the following:

8.2.1 Use as wall studs in wood framed construction in accordance with IBC Chapter 23 and IRC Chapter 6.

8.2.2 Use in IRC braced wall applications in accordance with IBC Section 2305 and IRC Section R602.10.

8.2.3 Use as an alternative material to that described in IBC Chapter 23, in particular, compliance with requirements for the design and construction of wood-based products as described in IBC Section 2301.2 for ASD.

8.2.4 Structural performance under lateral load conditions for use with the IBC performance-based provisions, IBC Section 2306.1 and IBC Section 2306.3 for light-frame wood wall assemblies.

8.2.5 Structural performance under lateral load conditions for use as an alternative to SDPWS Section 4.3 Wood Frame Shear Walls.

8.2.6 Compliance with IBC Section 2308, IBC Section 2304, and IRC Chapter 6 for conventional light-frame construction applications.

8.2.7 Use as an alternative material and method of construction in compliance with IBC Section 104.2.3[29] and IRC Section R104.2.2.[30]

8.2.8 When used in an application that exceeds the limits of IBC Section 2308 or IRC Section R301, an engineered design submitted in accordance with IRC Section R301.1.3 and this report is required.

8.3 Any building code, regulation and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ, which is an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP or approved sources. DrJ is qualified[31] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise,[32] respectively.

8.4 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which is also its areas of professional engineering competence.

8.5 Any regulation specific issues not addressed in this section are outside the scope of this report.

9 Installation

9.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report, and the applicable building code.

9.2 In the event of a conflict between the manufacturer installation instructions and this report, contact the manufacturer for counsel on the proper installation method.

9.3 *Installation Procedure*

9.3.1 EcoSmart Stud is designed to be used as a replacement of nominal solid sawn lumber as wall studs using the material properties and provisions defined in this report.

9.3.2 Install EcoSmart Studs in the same manner as solid sawn lumber, except as noted herein.

9.3.2.1 EcoSmart Stud should be installed with the *"nubs"* (see **Figure 1** and **Figure 2**) facing the exterior portion of the wall.

9.3.2.2 EcoSmart Auxiliary Studs may be used for door and window applications.

9.4 *Drilling and Notching*

9.4.1 Most applications allow plumbing and electrical to be run through the EcoSmart Stud without notching or drilling.

9.4.2 Where notching or drilling is required, reinforcement of the stud is required using accepted engineering practice or guidance provided by the manufacturer.

9.4.2.1 Alternately, EcoSmart Stud may be replaced with solid sawn lumber using the provisions of the applicable code for drilling and notching.

9.4.3 Additional detailed information can be found on the EcoSmart Stud website at ecosmartstud.com/how-to-install.

10 Substantiating Data

10.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

10.1.1 Lateral shear testing for shear strength and shear stiffness in accordance with ASTM E564

10.1.2 Beam Flexure Test for moment and flexural rigidity in accordance with ASTM D198

10.1.3 Tensile strength in accordance with ASTM D198

10.1.4 Compression strength in accordance with ASTM D198

10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or an RDP. Accuracy of external test data and resulting analysis is relied upon.

10.3 Where applicable, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

10.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, or duly authenticated reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this duly authenticated report, may be dependent upon published design properties by others.

10.5 *Testing and Engineering Analysis*

10.5.1 The strength, rigidity, and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.[33]

10.6 Where additional condition of use and/or regulatory compliance information is required, please search for EcoSmart Stud on the DrJ Certification website.

11 Findings

11.1 As outlined in **Section 6**, EcoSmart Stud has performance characteristics that were tested and/or meet applicable regulations. In addition, they are suitable for use pursuant to its specified purpose.

11.2 When used and installed in accordance with this duly authenticated report and the manufacturer installation instructions, EcoSmart Stud shall be approved for the following applications:

11.2.1 An alternate to solid wood studs for wall structural members. Any design incorporating EcoSmart Stud is permitted, in accordance with accepted engineering procedures, experience and technical judgement. Reference allowable design values as specified in **Table 5** shall be used in accordance with accepted engineered design.

11.3 Unless exempt by state statute, when EcoSmart Stud is to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.

11.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from ViCa3 Ventures.

11.5 IBC Section 104.2.3[34] (IRC Section R104.2.2[35] and IFC Section 104.2.3[36] are similar) in pertinent part state:

> **104.2.3 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 is not specifically prohibited by this code and has been approved.

11.6 **Approved:**[37] Building regulations require that the building official shall accept duly authenticated reports.[38]

11.6.1 An approved agency is *"approved"* when it is ANAB ISO/IEC 17065 accredited.

11.6.2 An approved source is *"approved"* when an RDP is properly licensed to transact engineering commerce.

11.6.3 Federal law, Title 18 US Code Section 242, requires that, where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.

11.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB Accredited Product Certification Body – Accreditation #1131.

11.8 Through the IAF Multilateral Arrangement (MLA), this duly authenticated report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 duly authenticated reports are equivalent.[39]

12 Conditions of Use

12.1 Material properties shall not fall outside the boundaries defined in **Section 6**.

12.2 As defined in **Section 6**, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.

12.3 As listed herein, EcoSmart Stud shall be limited to use with wind design controls. Use in buildings constructed in accordance with the IRC in SDC A, B, and detached dwellings in SDC C are also permitted.

12.4 When required by adopted legislation and enforced by the building official, also known as the Authority Having Jurisdiction (AHJ) in which the project is to be constructed:

12.4.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.

12.4.2 This report and the installation instructions shall be submitted at the time of permit application.

12.4.3 This innovative product has an internal quality control program and a third-party quality assurance program.

12.4.4 At a minimum, this innovative product shall be installed per **Section 9**.

12.4.5 The review of this report by the AHJ shall comply with IBC Section 104.2.3.2 and IBC Section 105.3.1.

12.4.6 This innovative product has an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.7.2, IBC Section 110.4, IBC Section 1703, IRC Section R104.7.2, and IRC Section R109.2.

12.4.7 The application of this innovative product in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2, and any other regulatory requirements that may apply.

12.5 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, *"the building official shall make, or cause to be made, the necessary tests and investigations; or the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in Section 104.2.3"*, all of IBC Section 104, and IBC Section 105.3.

12.6 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).

12.7 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

13 Identification

13.1 EcoSmart Stud, as listed in **Section 1.1**, is identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number, and other information to confirm code compliance.

13.2 Additional technical information can be found at ecosmartstud.com.

14 Review Schedule

14.1 This report is subject to periodic review and revision. For the latest version, visit www.drjcertification.org.

14.2 For information on the status of this report, please contact DrJ Certification.

Notes

1 For more information, visit drjcertification.org or call us at 608-310-6748.

2 Capitalized terms and responsibilities are defined pursuant to the applicable building code, applicable reference standards, the latest edition of TPI 1, the NDS, AISI S202, US professional engineering law, Canadian building code, Canada professional engineering law, Qualtim External Appendix A: Definitions/Commentary, Qualtim External Appendix B: Project/Deliverables, Qualtim External Appendix C: Intellectual Property and Trade Secrets, definitions created within Design Drawings and/or definitions within Reference Sheets. Beyond this, terms not defined shall have ordinarily accepted meanings as the context implies. Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

3 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1702

4 Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review https://www.justice.gov/atr/mission and https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.2.3

5 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1706.2:~:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests

6 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1706.1:~:text=Conformance%20to%20Standards-,The%20design%20strengths%20and%20permissible%20stresses,-of%20any%20structural

7 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20make%2C%20or%20cause%20to%20be%20made%2C%20the%20necessary%20tests%20and%20investigations%3B%20or%20the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.2.3.

8 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1703.4.2

9 https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved_agency

10 https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#approved_source

11 https://www.law.cornell.edu/uscode/text/18/1832 (b) Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of $5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The federal government and each state have a public records act. To follow DTSA and comply state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please review this website: Intellectual Property and Trade Secrets.

12 https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

13 https://www.cbitest.com/accreditation/

14 https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.1:~:text=directed%20to%20enforce%20the%20provisions%20of%20this%20code

15 https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#104.2.3 AND https://up.codes/viewer/mississippi/ibc-2024/chapter/1/scope-and-administration#105.3.1

16 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1

17 https://iaf.nu/en/about-iaf-mla/#:~:text=Once%20an%20accreditation%20body%20is%20a%20signatory%20of%20the%20IAF%20MLA%2C%20it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

18 True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

19 https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission

20 Unless otherwise noted, the links referenced herein use un-amended versions of the 2024 International Code Council (ICC) 2024 International Code Council (ICC) model codes as foundation references. Mississippi versions of the IBC 2024 and the IRC 2024 are un-amended. This material, product, design, service and/or method of construction also complies with the 2000-2012 versions of the referenced codes and the standards referenced therein. As pertinent to this technical and code compliance evaluation, CBI and/or DrJ staff have reviewed any state or local regulatory amendments to assure this report is in compliance.

21 See Adoptions by Publisher for the latest adoption of a non-amended or amended model code by the local jurisdiction. https://up.codes/codes/general

22 See Adoptions by Publisher for the latest adoption of a non-amended or amended model code by state. https://up.codes/codes/general

23 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14

24 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280

25 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2(Listed%20or%20certified); https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#listed AND https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#labeled

26 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1703.4

27 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%2C%20livable%2C%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades

28 https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur

29 2021 IBC Section 104.11

30 2021 IRC Section R104.11

31 Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Board (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited product certification body.

32 https://anabpd.ansi.org/Accreditation/product-certification/AllDirectoryDetails?prgID=1&orgID=2125&statusID=4#:~:text=Bill%20Payment%20Date-,Accredited%20Scopes,-13%20ENVIRONMENT.%20HEALTH

33 See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition: https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280

34 2021 IBC Section 104.11

35 2021 IRC Section R104.11

36 2018: https://up.codes/viewer/wyoming/ifc-2018/chapter/1/scope-and-administration#104.9 AND 2021: https://up.codes/viewer/wyoming/ibc-2021/chapter/1/scope-and-administration#104.11

37 Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 (https://up.codes/viewer/mississippi/ibc-2024/chapter/2/definitions#201.4) where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

38 https://up.codes/viewer/mississippi/ibc-2024/chapter/17/special-inspections-and-tests#1707.1

39 Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.