DrJ CERTIFICATION

Technical Evaluation Report™

TER 2207-01

Insul-Stud™ Structural Insulated Stud Wall System

Moment Innovations, LLC

Product:

Insul-Stud™ Structural Insulated Stud

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

SECTION: 06 10 00 - Rough Carpentry

SECTION: 06 11 00 - Wood Framing

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

SECTION: 07 21 00 - Thermal Insulation

SECTION: 07 21 13 - Foam Board Insulation

1 Innovative Product Evaluated[1,2]

1.1 Insul-Stud™ Structural Insulated Stud

2 Applicable Codes and Standards[3,4]

2.1 *Codes*

2.1.1 *IBC—15, 18, 21: International Building Code®*

2.1.2 *IRC—15, 18, 21: International Residential Code®*

2.1.3 *IECC—15, 18, 21: International Energy Conservation Code®*

2.2 *Standards and Referenced Documents*

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

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

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

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

2 24 CFR 3280.2 "Listed or certified" means included in a list published by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation that maintains periodic inspection 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. **Listed**. Equipment, materials, products or services included in a list published by an organization acceptable to the building official and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose Listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose. **Labeled.** Equipment, materials or products to which has been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, approved agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

3 This Listing is a code defined research report, which is also known as a duly authenticated report, provided by an approved agency (see IBC Section 1703.1) and/or an approved source (see IBC Section 1703.4.2). An approved agency is "approved" as an approved agency when it is ANAB accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory). A professional engineer is "approved" as an approved source when that professional engineer is properly licensed to transact engineering commerce. Where sealed by a professional engineer, it is also a duly authenticated report certified by an approved source. (i.e., Registered Design Professional). DrJ is an ANAB accredited product certification body.

4 Unless otherwise noted, all references in this Listing are from the 2021 version of the codes and the standards referenced therein. This material, product, design, service and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.

2.2.4 *ASHRAE Handbook (Fundamentals)*

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

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

2.2.7 *ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials*

2.2.8 *ASTM E330: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*

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

3 Performance Evaluation

3.1 Tests, testing, test reports, research reports, duly authenticated reports and related engineering evaluations are defined as intellectual property and/or trade secrets and protected by Defend Trade Secrets Act 2018 (DTSA).[5]

3.2 Testing and/or inspections conducted for this TER were performed an ISO/IEC 17025 accredited testing laboratory,[6] an ISO/IEC 17020 accredited inspection body,[7] which are internationally recognized accreditations through International Accreditation Forum (IAF), and/or a licensed Registered Design Professional (RDP).

3.3 This TER examines Insul-Stud™ Structural Insulated Stud for the following:

3.3.1 Use for compliance with the thermal resistance provisions of the IECC and Chapter 11 of the IRC.

3.3.2 Compliance of the foam plastic portion of Insul-Stud™ with the provisions of the IRC, IRC Section R316 for flame spread and smoke developed indices.

3.3.3 Use as a direct replacement for 2x4 studs, top plates and sill plates in IRC braced wall applications subject to the limits herein.

3.3.4 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 2302.1 for Allowable Stress Design (ASD).

3.3.5 Structural performance for shear wall assemblies used as lateral force resisting systems in Seismic Design Categories A through F.

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[5] https://www.law.cornell.edu/uscode/text/18/part-I/chapter-90. Whoever, with intent to convert a trade secret, that is related to a product or service used in or intended for use in or intended for use in interstate or foreign commerce, to the economic benefit or anyone other than the owner thereof, and intending or knowing that the offense will injure any owner of that trade secret, knowingly (1) steals, or without authorization appropriates, takes, carries away, or conceals, or by fraud, artifice, or deception obtains such information; (2) without authorization copies, duplicates, sketches, draws, photographs, downloads, uploads, alters, destroys, photocopies, replicates, transmits, delivers, sends, mails, communicates, or conveys such information; (3) receives, buys, or possesses such information, knowing the same to have been stolen or appropriated, obtained, or converted without authorization; (4) attempts to commit any offense described in paragraphs (1) through (3); or (5) conspires with one or more other persons to commit any offense described in paragraphs (1) through (3), and one or more of such persons do any act to effect the object of the conspiracy, shall, except as provided in subsection (b), be fined under this title or imprisoned not more than 10 years, or both. (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. As the National Society of Professional Engineers states, “Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.” Therefore, to protect intellectual property (IP) and TS, and to achieve compliance with public records and trade secret legislation, requires approval through the use of Listings, certified reports, technical evaluation reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.

[6] Internationally recognized accreditations are performed by members of the International Accreditation Forum (IAF). Accreditation Body and Regional Accreditation Group Members of IAF are admitted to the IAF MLA only after a stringent evaluation of their operations by a peer evaluation team, which is charged to ensure that the applicant complies fully with both international standards and IAF requirements. Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope.

[7] Ibid.

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

3.3.6.1 Table 8 of this TER provides seismic design coefficients (SDC) that conform to the requirements in ASCE 7 Section 12.2.1, 12.2.1.1 and Table 12.2-1 for design of wall assemblies in buildings that require seismic design.

3.3.6.1.1 ASTM D7989 is accepted engineering practice used to establish SDCs. Test data generated by ISO/IEC 17025 approved agencies and/or professional engineers, and all associated professional engineering evaluations, which use ASTM D7989 as their basis, are defined as intellectual property and/or trade secrets and are also defined as an independent design review (i.e., Listings, certified reports, duly authenticated reports from approved agencies, and/or research reports prepared by approved agencies and/or approved sources).

3.4 Any building code and/or accepted engineering evaluations (i.e., research reports, duly authenticated reports, etc.) that are conducted for this Listing were performed by DrJ Engineering, LLC (DrJ), an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDPs / approved sources. DrJ is qualified[8] to practice product and code compliance services within its scope of accreditation and engineering expertise, respectively.

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

3.6 Any regulation specific issues not addressed in this section are outside the scope of this TER.

4 Product Description and Materials

4.1 The product evaluated in this TER is shown in Figure 1.

4.1.1 Hold-downs shown in Figure 1 are not a part of the product and are only necessary where required by the design.

Figure 1. Insul-Stud™ Structural Insulated Stud Wall Assembly

[8] 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.

4.2 Insul-Stud™ Structural Insulated Stud consists of two Douglas Fir Larch (DFL) #2 flanges and a structural proprietary polyurethane foam (PF) core as shown in Figure 2.

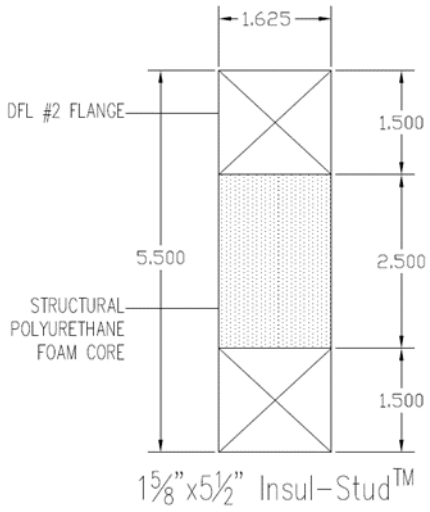

Figure 2. Insul-Stud™ Structural Insulated Stud

4.3 Insul-Stud™ Structural Insulated Stud is available in 8′, 9′ and 10′ lengths for use as wall studs. Wall plate material is available in 12' lengths.

4.4 The Insul-Stud™ Wall Assembly details are as shown in Figure 1 and Table 1.

Table 1. Insul-Stud™ Wall Assembly Details

Product	Description	Fastening
Exterior Sheathing	7/16" OSB	OSB installed vertically with 2⅜" x 0.113" nails spaced 6" on center around the perimeter of each panel and 12" on center in the field.
Framing-2x6 Insul-Stud™	Structural insulated studs are comprised of two 1½" deep by 1⅝" wide DFL #2 flanges. The remaining portion of the web is filled in with 2½" proprietary PFinsulation.	Installed at 24" on center with (2) Nails 3" x 0.131" per Stud at top/bottom plates
Interior Sheathing	None	-

5 Applications

5.1 *Prescriptive Provisions*

5.1.1 Insul-Stud™ wall assemblies are an alternative to solid sawn 2x4 lumber wall assemblies.

5.1.1.1 For use as a replacement for 2x6 sawn lumber, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment. In these cases, referenced design values as specified in Table 2 shall be used in accordance with IBC Section 2308 and IRC Section R602.

5.1.2 The foam plastic insulation forming the web of Insul-Stud™ is in accordance with IBC Section 2603.2, IBC Section 2603.3, IBC Section 2603.4, IRC Section R316.2, IRC Section R316.3, and IRC Section R316.4.

5.1.3 *Cutting, Notching and Boring:*

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

5.1.4 Insul-Stud™ may be used as top and bottom plate framing material in wall assemblies. In all cases, at least one solid sawn lumber top plate must be used. The configurations shown in Figure 3 are permitted.

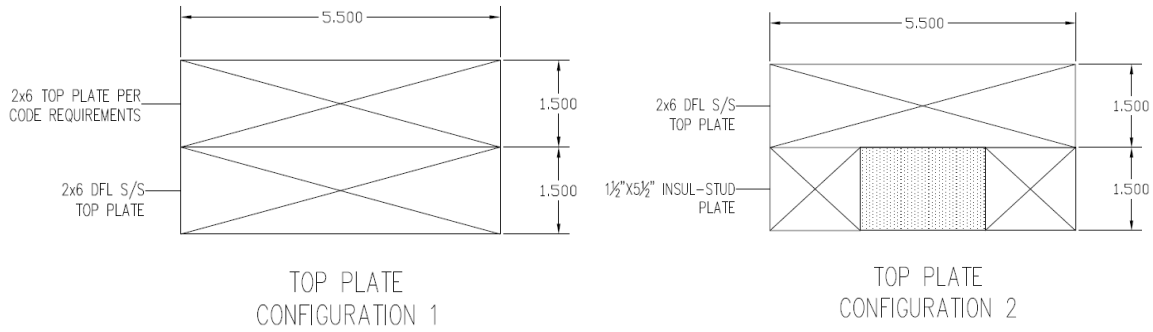

Figure 3. Allowable Top Plate Configurations

5.1.5 When Insul-Stud™ is used as a top plate, a second top plate using solid sawn lumber is also required and the framing above may be placed anywhere along the top plate.

5.1.6 Walls using nominal 2x6 sawn lumber top plates (single or double) shall be in accordance with IRC Section R602.3.2 (This section permits single or double top plates.)

5.1.7 Structural framing attached to Insul-Stud™ walls and Insul-Stud™ used as structural members of a wall assembly shall be fastened as specified in Table 2 of this TER.

5.1.8 Use as jack, trimmer, and cripple studs is permitted.

5.1.9 Structural sheathing shall be installed on one side of the wall and minimum ½" (12.7 mm) gypsum wallboard (GWB), or equivalent, on the other side of the wall fastened in accordance with the applicable building code. Sheathing attached to only one side of the wall is not permitted.

5.1.10 A typical wall assembly is shown in Figure 4.

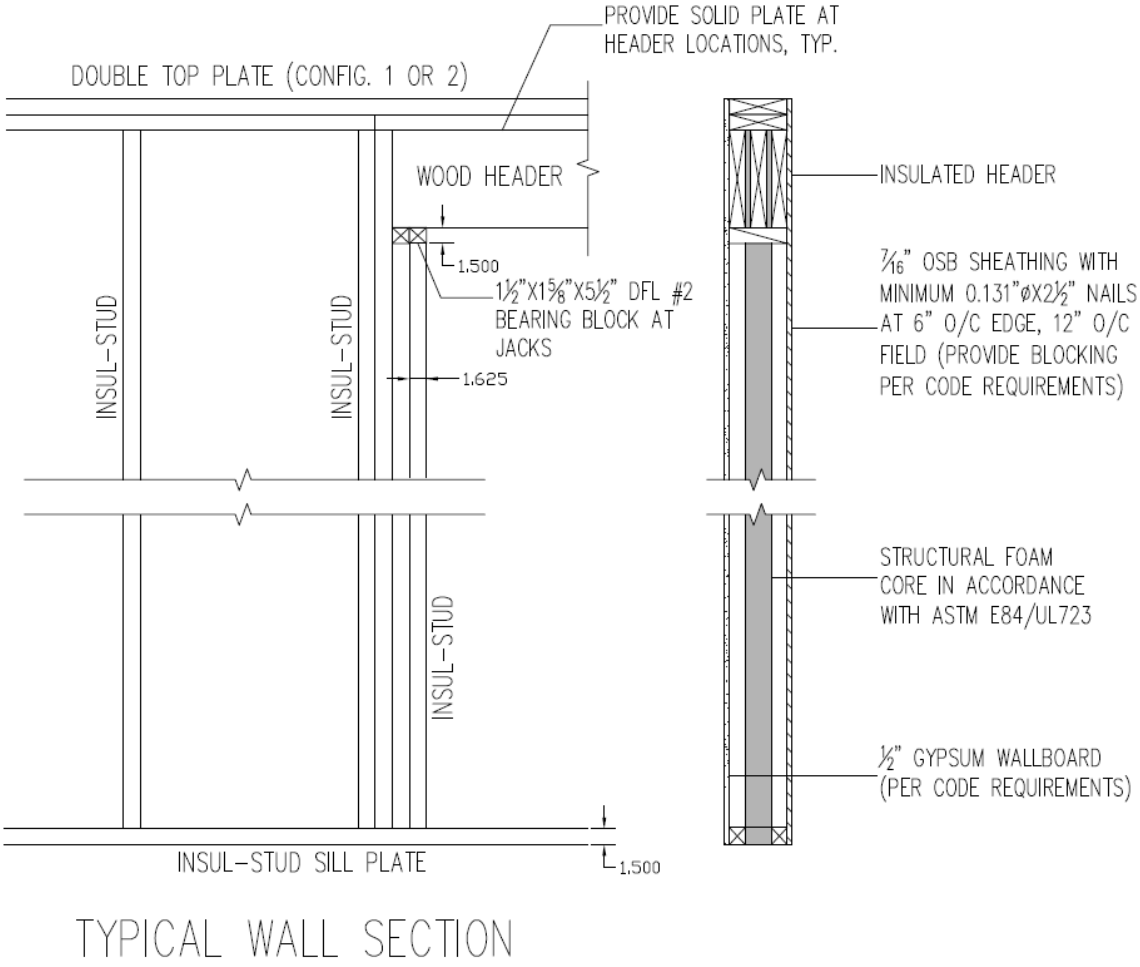

Figure 4. Typical Insul-Stud™ Wall Assembly

5.1.11 For Insul-Stud™ wall assemblies within the scope of the IRC, A maximum roof span of 56' is permitted where roof framing members are spaced no more than 24" on center. The roof framing members may be placed anywhere along the double top plate.

5.1.11.1 For cases where a longer span or a concentrated load that exceed the limits of Section 5.1.11 needs to be supported, engineered design is required.

Table 2. Acceptable Fastening Schedule for Insul-Stud™

Application[1]	Number & Type of Fastener	Fastener Spacing and Location
Blocking between ceiling joists or rafters to top plate	4-8d box (2½" × 0.113") or 3-8d common (2½" × 0.131") or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	Toe nail into sold sawn top plate
Ceiling joists to top plate	4-8d box (2½" × 0.113"); or 3-8d common (2½" × 0.131"); or 3-10d box (3" × 0.128"); or 3-3" × 0.131" nails	Per joist, toe nail
Ceiling joist not attached to parallel rafter, laps over	4-10d box (3" × 0.128"); or 4-3" × 0.131" nails	Per joist, toe nail
Rafter or roof truss to plate	3-10d common nails (3" × 0.148"); or 4-10d box (3" × 0.128"); or 4-3" × 0.131" nails	2 toe nails on one side and 1 toe nail on opposite side of each rafter or truss where 3 nails are used. 2 toe nails on each side of rafter or truss where 4 nails are used.
Stud to stud (not at braced wall panels)	10d box (3" × 0.128")	16" o.c. face nail; exterior flange and interior flange
Stud to stud and abutting studs at intersecting wall corners (at braced wall panels)	3" × 0.131" nails	12" o.c. face nail
Continuous header to stud	4-8d common (2½" × 0.131")	Toe nail - 2 at exterior flange; 2 at interior flange
Solid sawn Top plate to Insul-Stud™ top plate	10d box (3" × 0.128")	12" o.c. face nail-staggered each flange
Double top plate splice	12-10d box (3" × 0.128")	Face nail on each side of end joint (minimum 24" lap splice length each side of end joint) 6 at exterior flange; 6 at interior flange
Bottom plate to joist, rim joist, band joist or blocking (not at braced wall panels)	3" × 0.148" nails	12" o.c. face nail into joist, rim joist, band joist or blocking
Bottom plate to joist, rim joist, band joist or blocking (at braced wall panel)	3" × 0.131" nails	4" o.c. face nail into joist, rim joist, band joist or blocking
Top or bottom plate to stud	2-10d common (3" × 0.148")	End nail 1 in exterior flange; 1 in interior flange
Top plates, laps at corners and intersections	2-10d common (3" × 0.148")	Face nail 1 in exterior flange; 1 in interior flange
Joist to sill, top plate or girder	4-8d box (2½" × 0.113")	Toe nail - 2 in interior flange; 2 in exterior flange

Table 2. Acceptable Fastening Schedule for Insul-Stud™

Application[1]	Number & Type of Fastener	Fastener Spacing and Location
Rim joist, band joist or blocking to sill or top plate (roof applications also)	8d box (2½" × 0.113")	4" o.c. toe nail at exterior flange
	8d common (2½" × 0.131"); or 10d box (3" × 0.128"); or 3" × 0.131" nails	6" o.c. toe nail at exterior flange

SI: 1 in = 25.4 mm

1. For all connections, care must be taken to avoid splitting.
2. Solid sawn top plate shall be used in single top plate applications and for the top plate in double plate applications.

5.2 *Engineered Design*

5.2.1 The design provisions for wood construction noted in IBC Section 2302.1[9] and IRC Section R301.1.3 apply to Insul-Stud™ wall Assemblies for ASD, unless otherwise noted in this TER.

5.2.2 *Insul-Stud™ Composite Assembly Properties*

5.2.2.1 When constructed at a minimum, as defined in Table 2, wall assemblies or portions thereof may be designed on a per Insul-Stud™ basis using the design values shown in Table 3.

Table 3. 2x6 Insul-Stud™ Composite Wall Assembly Allowable Design Values

Product	Fb (psi)	Ft (psi)	Fv (psi)	Fc (psi)	Fc⊥ (psi)	EI (lb-in)^2	EI_{Min} (lb-in)^2	MOE (psi)	I (in)^4	S (in)^3
2x6 Insul-Stud™ Assembly	900	575	180 (flange) 60 (foam)	1350	625	15,000,000 (panel stiffness)	9,900,000 (single member)	670,000	22.53	8.19

1. A single Insul-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 Insul-Stud™ spaced a maximum of 24 inches on center and are reported on a per stud basis.
3. Values include size factor adjustments as appropriate.
4. Reference design values for Insul-Stud™ shall be multiplied by the adjustment factors specified in NDS Section 4.3

[9] 2015 IBC Section 2301.2

5.2.3 The allowable compression loads, deflection ratios and shear reactions of Insul-Stud™ for various wind speeds, studs spacings, and wall heights are as shown in Table 4 through Table 7.

Table 4. Insul-Stud™ - Axial Capacity per Wind Speed (Zone 4, Exposure "B", h=35')[1,2,3,4]

Stud Spacing (in.)	Wall Height (ft.)	Allowable Compression Load (lb), Deflection Ratio & (Shear Reaction, lb)					
		Ultimate Design Windspeed, V_{ULT} (mph)					
		90	95	100	105	110	115
12	8	3750 L/2640 (37)	3750 L/2379 (41)	3750 L/2145 (45)	3750 L/1938 (50)	3750 L/1767 (55)	3750 L/1624 (60)
	9	3750 L/1829 (41)	3750 L/1648 (46)	3750 L/1486 (51)	3750 L/1342 (57)	3750 L/1224 (62)	3750 L/1125 (67)
	10	3750 L/1319 (46)	3750 L/1188 (51)	3750 L/1071 (57)	3750 L/968 (63)	3750 L/882 (69)	3750 L/811 (75)
16	8	3750 L/1985 (49)	3750 L/1789 (54)	3750 L/1613 (60)	3750 L/1457 (67)	3750 L/1328 (73)	3750 L/1221 (80)
	9	3750 L/1375 (55)	3750 L/1239 (61)	3750 L/1117 (68)	3750 L/1009 (75)	3750 L/920 (83)	3750 L/846 (90)
	10	3750 L/991 (62)	3750 L/893 (68)	3750 L/806 (76)	3750 L/728 (84)	3750 L/663 (92)	3750 L/610 (100)
24	8	3750 L/1320 (73)	3750 L/1190 (81)	3750 L/1073 (90)	3750 L/969 (100)	3750 L/883 (110)	3750 L/812 (119)
	9	3750 L/914 (83)	3750 L/824 (92)	3750 L/743 (102)	3750 L/671 (113)	3750 L/612 (124)	3750 L/562 (135)
	10	3750 L/659 (92)	3750 L/594 (103)	3750 L/536 (114)	3750 L/484 (126)	3750 L/441 (138)	3750 L/405 (150)

1. Wind speed assumes Exposure Category B, Wall Zone 4, Enclosed Building, Mean Roof Height 35'
2. Reference material properties table for design value assumptions.
3. Shear reactions are the reactions at the ends of the Insul-Stud™ for use in designing connections to other framing members.
4. Maximum compression capacities are limited by compression perpendicular to grain for Douglas Fir lumber. Where SPF lumber is used for top or bottom plates, compression capacities shall be limited to 2,550 pounds.

Table 5. Insul-Stud™ - Axial Capacity per Wind Speed (Zone 5, Exposure "B", h=35')[1,2,3,4]

Stud Spacing (in.)	Wall Height (ft.)	Allowable Compression Load (lb), Deflection Ratio & (Shear Reaction, lb)					
		Ultimate Design Windspeed, V_{ULT} (mph)					
		90	95	100	105	110	115
12	8	3750 L/2204 (44)	3750 L/1970 (49)	3750 L/1780 (54)	3750 L/1613 (60)	3750 L/1474 (66)	3750 L/1350 (72)
	9	3750 L/1527 (50)	3750 L/1364 (56)	3750 L/1233 (62)	3750 L/1117 (68)	3750 L/1021 (74)	3750 L/935 (81)
	10	3750 L/1101 (55)	3750 L/984 (62)	3750 L/889 (69)	3750 L/805 (76)	3750 L/736 (83)	3750 L/674 (90)
16	8	3750 L/1657 (59)	3750 L/1481 (66)	3750 L/1338 (73)	3750 L/1212 (80)	3750 L/1108 (88)	3750 L/1015 (96)
	9	3750 L/1148 (66)	3750 L/1026 (74)	3750 L/927 (82)	3750 L/840 (91)	3750 L/768 (99)	3750 L/703 (108)
	10	3750 L/828 (74)	3750 L/740 (83)	3750 L/668 (91)	3750 L/606 (101)	3750 L/554 (110)	3750 L/507 (121)
24	8	3750 L/1102 (88)	3750 L/985 (98)	3750 L/890 (109)	3750 L/806 (120)	3750 L/737 (131)	3750 L/675 (144)
	9	3750 L/763 (99)	3750 L/682 (111)	3750 L/616 (123)	3750 L/559 (136)	3750 L/511 (149)	3750 L/468 (162)
	10	3750 L/550 (111)	3750 L/492 (124)	3750 L/444 (137)	3750 L/403 (151)	3750 L/368 (166)	3697 L/337 (181)

1. Wind speed assumes Exposure Category B, Wall Zone 5, Enclosed Building, Mean Roof Height 35'
2. Reference material properties table for design value assumptions
3. Shear reactions are the reactions at the ends of the Insul-Stud™ for use in designing connections to other framing members.
4. Maximum compression capacities are limited by compression perpendicular to grain for Douglas Fir lumber. Where SPF lumber is used for top or bottom plates, compression capacities shall be limited to 2,550 pounds.

Table 6. Insul-Stud™ - Axial Capacity per Wind Speed (Zone 4, Exposure "C", h=35')[1,2,3,4]

Stud Spacing (in.)	Wall Height (ft.)	Allowable Compression Load (lb), Deflection Ratio & (Shear Reaction, lb)					
		Ultimate Design Windspeed, V_{ULT} (mph)					
		90	95	100	105	110	115
12	8	3750 L/1912 (51)	3750 L/1723 (56)	3750 L/1554 (62)	3750 L/1403 (69)	3750 L/1279 (76)	3750 L/1176 (82)
	9	3750 L/1324 (57)	3750 L/1193 (64)	3750 L/1076 (70)	3750 L/972 (78)	3750 L/886 (86)	3750 L/814 (93)
	10	3750 L/955 (64)	3750 L/860 (71)	3750 L/776 (79)	3750 L/701 (87)	3750 L/639 (95)	3750 L/587 (104)
16	8	3750 L/1438 (68)	3750 L/1295 (75)	3750 L/1168 (83)	3750 L/1055 (92)	3750 L/962 (101)	3750 L/884 (110)
	9	3750 L/996 (76)	3750 L/897 (85)	3750 L/809 (94)	3750 L/731 (104)	3750 L/666 (114)	3750 L/612 (124)
	10	3750 L/718 (85)	3750 L/647 (95)	3750 L/583 (105)	3750 L/527 (116)	3750 L/480 (127)	3750 L/441 (138)
24	8	3750 L/956 (101)	3750 L/861 (112)	3750 L/777 (125)	3750 L/702 (138)	3750 L/640 (151)	3750 L/588 (165)
	9	3750 L/662 (115)	3750 L/597 (127)	3750 L/538 (141)	3750 L/486 (156)	3750 L/443 (171)	3750 L/407 (186)
	10	3750 L/477 (128)	3750 L/430 (142)	3750 L/388 (157)	3750 L/350 (174)	3568 L/319 (191)	3350 L/294 (208)

1. Wind speed assumes Exposure Category C, Wall Zone 4, Enclosed Building, Mean Roof Height 35'
2. Reference material properties table for design value assumptions
3. Shear reactions are the reactions at the ends of the Insul-Stud™ for use in designing connections to other framing members.
4. Maximum compression capacities are limited by compression perpendicular to grain for Douglas Fir lumber. Where SPF lumber is used for top or bottom plates, compression capacities shall be limited to 2,550 pounds.

Table 7. Insul-Stud™ - Axial Capacity per Wind Speed (Zone 5, Exposure "C", h=35')[1,2,3,4]

Stud Spacing (in.)	Wall Height (ft.)	Allowable Compression Load (lb), Deflection Ratio & (Shear Reaction, lb)					
		Ultimate Design Windspeed, V_{ULT} (mph)					
		90	95	100	105	110	115
12	8	3750 L/1596 (61)	3750 L/1426 (68)	3750 L/1289 (75)	3750 L/1168 (83)	3750 L/1067 (91)	3750 L/978 (99)
	9	3750 L/1106 (69)	3750 L/988 (77)	3750 L/893 (85)	3750 L/809 (94)	3750 L/739 (103)	3750 L/677 (112)
	10	3750 L/797 (76)	3750 L/712 (86)	3750 L/644 (95)	3750 L/583 (105)	3750 L/533 (114)	3750 L/488 (125)
16	8	3750 L/1200 (81)	3750 L/1072 (91)	3750 L/969 (100)	3750 L/878 (111)	3750 L/803 (121)	3750 L/735 (132)
	9	3750 L/831 (91)	3750 L/743 (102)	3750 L/671 (113)	3750 L/608 (125)	3750 L/556 (137)	3750 L/509 (149)
	10	3750 L/599 (102)	3750 L/536 (114)	3750 L/484 (126)	3750 L/438 (139)	3750 L/401 (153)	3750 L/367 (167)
24	8	3750 L/798 (121)	3750 L/713 (136)	3750 L/644 (150)	3750 L/584 (166)	3750 L/534 (182)	3750 L/489 (198)
	9	3750 L/553 (137)	3750 L/494 (154)	3750 L/446 (170)	3750 L/404 (188)	3750 L/370 (205)	3750 L/339 (224)
	10	3750 L/399 (153)	3750 L/356 (171)	3586 L/322 (189)	3332 L/292 (209)	3077 L/267 (229)	2805 L/244 (250)

1. Wind speed assumes Exposure Category C, Wall Zone 5, Enclosed Building, Mean Roof Height 35'
2. Reference material properties table for design value assumptions
3. Shear reactions are the reactions at the ends of the Insul-Stud™ for use in designing connections to other framing members.
4. Maximum compression capacities are limited by compression perpendicular to grain for Douglas Fir lumber. Where SPF lumber is used for top or bottom plates, compression capacities shall be limited to 2,550 pounds.

5.2.4 *Design for Compression Loads*

5.2.4.1 The maximum allowable compression load for Insul-Stud™ is specified in Table 4 through Table 7 for Insul-Stud™ assemblies utilizing Insul-Stud™ for wall studs and bottom plates, and Insul-Stud™ and/or DFL solid sawn top plates.

5.2.4.2 The maximum allowable compression load is controlled by perpendicular-to-grain compression of Insul-Stud™ and/or DFL top and bottom plates.

5.2.4.3 The allowable axial compression for Insul-Stud™ can be calculated using the provisions of NDS Section 3.6 and 3.7.

5.2.4.4 For computing the column stability factor, the critical bucking design value, F_{cE}, shall be computed using the formula in Equation 1.

Equation 1. Critical Bucking Design Value

$$F_{cE} = \frac{\pi^2 EI_{min}}{A(l_e)^2}$$

Where: EI_{min} = bending stiffness for beam and column stability (lb-in^2)

A = minimum net section area of Insul-Stud™ (in^2) = (1.5" x 1.625") + (1.5" x 1.625") = 4.875 in^2

l_e = Effective column length (in) = K_e x h

5.2.5 *Design for Bending:*

5.2.5.1 The maximum bending moment and shear forces shall not exceed the reference design values for the Insul-Stud™ specified in Table 3.

5.2.6 *Design for Combined Bending and Axial Compression Loads:*

5.2.6.1 The Insul-Stud™ resists bending using tension and compression stresses in the wood members.

5.2.6.2 The axial compressive stress due to combined bending and axial load can be computed using Equation 2.

Equation 2. Axial Compressive Stress

$$f_a = \frac{P}{A} + \frac{M}{A_m \cdot d_{eff}}$$

Where: P = axial load applied to Insul-Stud™ (lb)

A = minimum net section area of Insul-Stud™ (in^2) = (1.625" x 1.5") + (1.625" x 1.5") = 4.875 in^2

M = bending moment applied to Insul-Stud™ (lb-in)

A_m = minimum net section area of single Insul-Stud™ member (in^2) = (1.625" x 1.5") = 2.44 in^2

d_{eff} = distance from center to center of Insul-Stud™ member (in) = 4.00 in

5.2.6.3 The axial stresses in Insul-Stud™ members shall be checked in accordance with NDS Section 3.6 and 3.7.

5.2.6.4 The Insul-Stud™ shall also be checked in bending only to insure the allowable bending moment in Table 3 is not exceeded.

5.2.6.5 For wall assemblies up to 10 feet in height and for wind speeds up to 115 mph, the allowable axial compression load is as shown in Table 4 through Table 7.

5.2.6.6 For cases where a higher reaction needs to be supported, use of built-up studs fastened in accordance with Table 2 is permitted with a compression limit per-ply as specified in Table 4 through Table 7.

5.2.6.6.1 For example, for Insul-Stud™ with a DF top plate on an 8' wall, the maximum compression load is 3,750 lbs. per ply. Therefore, for a 2-ply built-up stud, the maximum reaction is 6,500 lbs.

5.2.6.6.2 In this case, the built-up stud shall be located directly under the applied load.

5.3 *Lateral Load Diaphragm Resistance for Wall Applications*

5.3.1 Insul-Stud™ used in wall assemblies designed as shear walls are permitted to be designed in accordance with the methodology used in SDPWS for wood structural panels. Fasteners for the attachment of sheathing materials to Insul-Stud™ shall not be closer than 3" on center.

5.3.1.1 The response modification coefficient, R; system overstrength factor, Ω_0; and deflection amplification factor, C_d, indicated in Table 8 shall be used to determine the base shear, element design forces, and design story drift in accordance with ASCE 7 Chapter 12 and Section 14.5.

Table 8. Insul-Stud™ Composite Assembly Allowable unit Shear Capacity for Seismic Loading

Seismic Force Resisting System	Response Modification Factor, R[1]	Over-strength Factor, Ω_0[2]	Deflection Amplification Coefficient, C_d[3]	Structural System Limitations and Building Height Limit (ft)				
				Seismic Design Category				
				B	C	D	E	F
Insul-Stud™ framed walls[4] sheathed with wood structural panels for shear resistance	6.5	3	4	NL	NL	65	65	65

1. Response modification coefficient, R, for use with ASCE7.
2. The tabulated value of the overstrength factor, Ω0 is permitted to be reduced by subtracting one-half (0.5) for structures with flexible diaphragms
3. Deflection amplification factor Cd, for use with ASCE 7 Section 12.8.6, 12.8.7 and 12.9.2
4. NL = Not Limited. Heights are measured from the base of the structure as defined in ASCE 7 Section 11.2

5.3.2 *Hold Downs:*

5.3.2.1 Hold-downs shall not be attached directly to Insul-Stud™ members. Solid sawn nominal 2"x6" blocking shall be used where hold-downs are required and shall be designed to transfer loads from the Insul-Stud™ through the blocking and into the hold down device.

5.4 *Thermal Resistance*

5.4.1 An example calculation for the effective R-Value and U-factor for the Insul-Stud™ wall assembly are as shown in Table 9.

Table 9. 1.625" x 5.5" Insul-Stud™ Wall Assembly U Factor Analysis

Wall Assembly Layer or Component	Component R-Value		
	Cavity	Insulated Framing	Framing
Exterior Air Film	0.17	0.17	0.17
Wood Siding	0.81	0.81	0.81
7/16" OSB Sheathing	0.55	0.55	0.55
Cavity Insulation (fiberglass Batt)	21.0	-	-
Insul-Stud™ Cavity Insulation (2.5")	-	15.75	-
Insul-Stud™ Flanges	-	3.75	6.875
½" Gypsum Wall Board	0.45	0.45	0.45
Interior Air Film	0.68	0.68	0.68
Total R-Value	**23.7**	**22.2**	**9.5**
U-Factor	**0.042**	**0.045**	**0.105**
Percent of Wall Assembly	**88**	**9**	**3**
Average U-Factor	**0.044**		
Average Effective R-Value	**22.5**		

1. Calculated on opaque wall sections only without fenestrations.
2. Assumes 8' 1⅛" tall x 8' 0" wall section with studs 24" o.c.
3. Assumes top and bottom plates are Insul-Stud™ and top plate is solid sawn 2x6.
4. If all plates are solid sawn 2x lumber, U-factor is 0.046.
5. If a single solid sawn top plate is used, U-factor is 0.044.

5.4.2 The effective R-Value and U-factors for various assemblies are shown in Table 10.

Table 10. Effective R-Value and U-factors for various Insul-Stud™ Wall Assemblies

Wall Framing	Cavity Insulation	Exterior Insulation	Sheathing	U-Factor	R-Value
1.625"x5.5" Insul-Stud™ @ 24" OC	R-19 Batt	-	7/16" OSB	0.048	21.0
1.625"x5.5" Insul-Stud™ @ 24" OC	R-21 Batt	-	7/16" OSB	0.0441	22.6
1.625"x5.5" Insul-Stud™ @ 24" OC	R-21 Batt	R3 Insulated Zip	7/16" OSB	0.039	25.7
1.625"x5.5" Insul-Stud™ @ 24" OC	R-21 Batt	R6 Polyiso	7/16" OSB	0.035	28.8
1.625"x5.5" Insul-Stud™ @ 24" OC	2"Closed Cell + R15 Batt	-	7/16" OSB	0.037	27.9
1.625"x5.5" Insul-Stud™ @ 24" OC	2"Closed Cell + R15 Batt	R3 Insulated Zip	7/16" OSB	0.032	31.2
1.625"x5.5" Insul-Stud™ @ 24" OC	2"Closed Cell + R15 Batt	R6 Polyiso	7/16" OSB	0.029	34.4

1. If a single top plate is used, the U-Factor is 0.043 and if all plates are solid (top and bottom) the U-Factor is 0.045.

5.5 *Fire Performance*

5.5.1 The foam plastic portion of the Insul-Stud™ has the flame spread and smoke developed index shown on Table 11.

Table 11. Insul-Stud™ Foam Plastic Flame Spread and Smoke Developed Indexes

Product Description	Flame Spread	Smoke Developed Index
Insul-Stud™	≤ 25	≤ 450
1. Foam plastic portion of Insul-Stud™ tested in accordance with ASTM E84/ UL723		

5.6 Wall assemblies utilizing Insul-Stud™ shall be provided with a thermal barrier on the interior side of the wall in accordance with the IRC Section R316.4 consisting of minimum ½" gypsum wallboard or equivalent.

5.7 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.

6 Installation

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

6.2 In the event of a conflict between the manufacturer installation instructions and this TER, the more restrictive shall govern.

6.3 *Installation Procedure*

6.3.1 Insul-Stud™ is designed to be used as a direct replacement of nominal 2x4 (38 mm x 89 mm) solid sawn lumber, as wall studs and top and bottom plates.

6.3.1.1 For use as a 2x6, design shall be permitted in accordance with accepted engineering procedures, experience and technical judgment. In these cases, referenced design values as specified in Table 3. Insul-Stud™ Reference Design Values shall be used in accordance with IBC Section 2308 and IRC Section R602.

6.3.2 Install Insul-Stud™ in the same manner as solid sawn lumber, except as noted herein.

6.3.2.1 For IBC Section 2308 and the IRC, install in accordance with the provisions therein, except as noted in this TER. See Table 2 for framing connection information.

6.3.2.2 For engineered design, walls shall be designed in accordance with the IBC and the referenced standards therein using the material properties and design limitations as noted in Section 5.

6.3.2.3 Design of connections not listed herein using Insul-Stud™ shall be in accordance with NDS.

7 Substantiating Data

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

7.1.1 Compressive load testing of Insul-Stud™ in accordance with ASTM D4761

7.1.2 Bending tests in accordance with ASTM D198 and ASTM D4761

7.1.3 Lateral load resistance in accordance with ASTM E2126

7.1.4 Transverse load test in accordance with ASTM E330

7.1.5 Flame Spread and Smoke Developed indices in accordance with ASTM E84

7.1.6 Effective R-value and U-Factors in accordance with ASHRAE Handbook (Fundamentals)

7.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies (i.e., ANAB accredited agencies), approved sources (i.e., RDPs), and/or professional engineering regulations. Accuracy of external test data and resulting analysis is relied upon.

7.3 Where pertinent, testing and/or engineering analysis is based upon provisions that have been codified into law through state or local adoption of codes and standards. The developers of these codes and standards are responsible for the reliability of published content. DrJ's engineering practice may use a code-adopted provision as the control sample. A control sample versus a test sample establishes a product as being equivalent to the code-adopted provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

7.4 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, Listings, certified reports, duly authenticated reports from approved agencies, and research reports prepared by approved agencies and/or approved sources provided by the suppliers of products, materials, designs, assemblies and/or methods of construction. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this TER, may be dependent upon published design properties by others.

7.5 Testing and engineering analysis: 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.[10]

7.6 Where additional condition of use and/or code compliance information is required, please search for Insul-Stud™ Structural Insulated Stud on the DrJ Certification website.

8 Findings

8.1 As delineated in Section 3, Insul-Stud™ Structural Insulated Stud has performance characteristics that were tested and/or meet pertinent standards and is suitable for use pursuant to its specified purpose.

8.2 When used and installed in accordance with this TER and the manufacturer installation instructions, Insul-Stud™ Structural Insulated Stud shall be approved for the following applications:

8.2.1 The structural performance as described in Table 3 through Table 8.

8.2.2 The effective R-value/U-Factor shown in Table 9 and Table 10.

8.2.3 The fire performance of the foam plastic shown in Table 11.

8.2.4 Use as replacement for 2x4 solid sawn lumber in wall assemblies.

8.3 Unless exempt by state statute, when the Insul-Stud™ Structural Insulated 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.

8.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from Moment Innovations, LLC.

8.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[11] are similar) in pertinent part states:

> **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. 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.

[10] See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

[11] 2018 IFC Section 104.9

8.6 **Approved**:[12] Building codes require that the building official shall accept duly authenticated reports[13] or research reports[14] from approved agencies and/or approved sources (i.e., licensed RDP) with respect to the quality and manner of use of new products, materials, designs, services, assemblies, or methods of construction.

8.6.1 Acceptability of an approved agency, by a building official, is performed by verifying that the agency is accredited by a recognized accreditation body of the International Accreditation Forum (IAF).

8.6.2 Acceptability of a licensed RDP, by a building official, is performed by verifying that the RDP and/or their business entity is listed by the licensing board of the relevant jurisdiction.

8.6.3 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, as denial without written reason deprives a protected right to free and fair competition in the marketplace.

8.7 DrJ is an engineering company, employs RDPs and is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131.

8.8 Through ANAB accreditation and the IAF Multilateral Agreements, this TER can be used to obtain product approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – "*certified once, accepted everywhere*." IAF specifically says, "*Once an accreditation body is a signatory of the IAF MLA, it is required to recognise certificates and validation and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope*."[15]

9 Conditions of Use

9.1 Material properties shall not fall outside the boundaries defined in Section 3.

9.2 As defined in Section 3, 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.

9.3 As listed herein, Insul-Stud™ Structural Insulated Stud shall not be used:

9.3.1 In single top plate applications. When used as the lower member of double top plate application, the top member shall consist of DFL solid sawn lumber. Alternately, a single top plate of DFL solid sawn lumber is permitted in accordance with IRC Section R602.3.2.

9.4 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:

9.4.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice, and, when prepared by an approved source, shall be approved when requirements of adopted legislation are met.

9.4.2 This TER and the installation instructions shall be submitted at the time of permit application.

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

9.4.4 At a minimum, this product shall be installed per Section 6 of this TER.

9.4.5 The review of this TER, by the AHJ, shall be in compliance with IBC Section 104 and IBC Section 105.4.

9.4.6 This product has an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4 and IRC Section R109.2.

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[12] 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 where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

[13] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1

[14] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2

[15] https://iaf.nu/en/about-iaf-mla/#:~:text=required%20to%20recognise

9.4.7 The application of this product in the context of this TER 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.

9.5 The approval of this TER by the AHJ shall comply with IBC Section 1707.1, where legislation states in pertinent part, "*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 104.11*", all of IBC Section 104, and IBC Section 105.4.

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

9.7 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.

10 Identification

10.1 The product listed in Section 1.1 is identified by a label on the board or packaging material bearing the manufacturer name, product name, TER number, and other information to confirm code compliance.

10.2 Additional technical information can be found at www.insulstud.com.

11 Review Schedule

11.1 This TER is subject to periodic review and revision. For the most recent version, visit drjcertification.org.

11.2 For information on the status of this TER, contact DrJ Certification.

12 Approved for Use Pursuant to US and International Legislation Defined in Appendix A

12.1 Insul-Stud™ Structural Insulated Stud is included in this TER published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services, and whose TER Listing states either that the material, product, or service meets identified standards or has been tested and found suitable for a specified purpose. This TER meets the legislative intent and definition of being acceptable to the AHJ.

Appendix A

1 Legislation that Authorizes AHJ Approval

1.1 **Fair Competition**: State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies and/or methods of construction that:

1.1.1 Advance Innovation,

1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints, and

1.1.3 Benefit consumers through lower prices, better quality, and greater choice.

1.2 **Adopted Legislation**: The following local, state, and federal regulations affirmatively authorize Insul-Stud™ Structural Insulated Stud to be approved by AHJs, delegates of building departments, and/or delegates of an agency of the federal government:

1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies and/or methods of construction. The goal is to "protect economic freedom and opportunity by promoting free and fair competition in the marketplace."

1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation, and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.

1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2018 (DTSA).

1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of listings, certified reports, Technical Evaluation Reports, duly authenticated reports and/or research reports prepared by approved agencies and/or approved sources.

1.2.4 For new materials[16] that are not specifically provided for in any building code, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.

1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.[17]

1.2.6 The commerce of approved sources (i.e., registered PEs) is regulated by professional engineering legislation. Professional engineering commerce shall always be approved by AHJs, except where there is evidence, provided in writing, that specific legislation has been violated by an individual registered PE.

1.2.7 The AHJ 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 IBC Section 104.11.[18]

[16] https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2

[17] IBC 2021, Section 1706.1 Conformance to Standards

[18] IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General

1.3 **Approved**[19] **by Los Angeles**: The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards, which apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.[20] The Superintendent of Building roster of approved testing agencies is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a CBI Listing are LAMC approved. In addition, the Superintendent of Building 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 the California Building Code (CBC) Section 1707.1.[21]

1.4 **Approved by Chicago**: The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).

1.5 **Approved by New York City**: The NYC Building Code 2022 (NYCBC) states in pertinent part that an approved agency shall be deemed[22] an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation, and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement[23] (i.e., ANAB, International Accreditation Forum (IAF), etc.).

1.6 **Approved by Florida**: Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation, by 1) A certification mark or listing of an approved certification agency, 2) A test report from an approved testing laboratory, 3) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity; 4) A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a professional engineer or architect, licensed in Florida. For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods; 1) A certification mark, listing, or label from a commission-approved certification agency indicating that the product complies with the code; 2) A test report from a commission-approved testing laboratory indicating that the product tested complies with the code; 3) A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code; 4) A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code; 5) A statewide product approval issued by the Florida Building Commission. The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642), and as a Florida Registered Engineer (i.e., ANE13741).

[19] See Section 8 for the distilled building code definition of **Approved**

[20] Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

[21] https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1

[22] New York City, The Rules of the City of New York, § 101-07 Approved Agencies

[23] New York City, The Rules of the City of New York, § 101-07 Approved Agencies

1.7 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA])**: A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.

1.8 **Approved by New Jersey**: Pursuant to Building Code 2018 of New Jersey in IBC Section 1707.1 General,[24] it states: "In the absence of approved rules or other approved standards, 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 the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)".[25] Furthermore N.J.A.C 5:23-3.7 states: Municipal approvals of alternative materials, equipment, or methods of construction. **(a) Approvals**: Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability and safety of those conforming with the requirements of the regulations. 1. A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. 2. Reports of engineering findings issued by nationally recognized evaluation service programs, such as, but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC), and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of (a) above. The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item 2 given that the listed entities are no longer in existence and/or do not provide "reports of engineering findings".

1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards**: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[26] and Part 3280,[27] the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform with the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow: 1) "All construction methods shall be in conformance with accepted engineering practices"; 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."; and 3) "The design stresses of all materials shall conform to accepted engineering practice."

1.10 **Approval by US, Local, and State Jurisdictions in General**: In all other local and state jurisdictions, the adopted building code legislation states in pertinent part that:

1.10.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.[28]

1.10.2 For innovative alternative products, materials, designs, services and/or methods of construction, in the absence of approved rules or other approved standards…the building official shall accept duly authenticated reports (i.e., listing and/or research report) from approved agencies with respect to the quality and manner of use of new materials or assemblies.[29] A building official approved agency is deemed to be approved via certification from an accreditation body that is listed by the International Accreditation Forum[30] or equivalent.

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[24] https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

[25] https://www.nj.gov/dca/divisions/codes/codreg/ucc.html

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

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

[28] IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.

[29] IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.

[30] Please see the ANAB directory for building official approved agencies.

1.10.3 The design strengths and permissible stresses of any structural material…shall conform to the specifications and methods of design of accepted engineering practice performed by an approved source.[31] An approved source is defined as a PE subject to professional engineering laws, where a research and/or a technical evaluation report certified by a PE, shall be approved.

1.11 **Approval by International Jurisdictions**: The USMCA and GATT agreements provide for approval of innovative materials, products, designs, services, assemblies and/or methods of construction through the Technical Barriers to Trade agreements and the International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA), where these agreements:

1.11.1 Permit participation of conformity assessment bodies located in the territories of other Members (defined as GATT Countries) under conditions no less favourable than those accorded to bodies located within their territory or the territory of any other country,

1.11.2 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.

1.11.3 State that conformity assessment procedures are not prepared, adopted, or applied with a view to or with the effect of creating unnecessary obstacles to international trade. This means that conformity assessment procedures shall not be more strict or be applied more strictly than is necessary to give the importing Member adequate confidence that products conform to the applicable technical regulations or standards.

1.11.4 **Approved**: The purpose of the IAF MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA, and subsequently acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, products, designs, services, assemblies and/or methods of construction. Accreditations granted by IAF MLA signatories are recognised worldwide based on their equivalent accreditation programs, therefore reducing costs and adding value to businesses and consumers.

[31] IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.