Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

Report No: 2405-119

Issue Date: November 18, 2024

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Subject to Renewal: January 1, 2027

X-Bracket System® and Batt Bracket® by InSoFast®

Trade Secret Report Holder:

InSoFast®, LLC

Phone: 888-501-7899 Website: insofast.com Email: info@insofast.com

CSI Designations:

DIVISION: 07 00 00 - THERMAL AND MOISTURE PROTECTION

Section: 07 70 00 - Roof and Wall Specialties and Accessories

Section: 07 77 00 - Wall Specialties

1 Innovative Product Evaluated[1]

1.1 X-Brackets Continuous Insulation System

1.2 Batt-Bracket Continuous Insulation System

2 Product Description and Materials

2.1 The innovative products evaluated in this report are shown in **Figure 1**.



Figure 1. Installed X-Brackets and Batt Brackets

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2.2 X-Brackets Continuous Insulation System and Batt-Bracket Continuous Insulation System are composed of a matrix of individual X-Brackets or Batt-Brackets that are designed to hold furring strips or girts parallel to any surface such as walls, ceilings, roofs, and floors, for use on interior or exterior of wood, steel, or concrete surfaces in a horizontal, sloped, or vertical position.

2.2.1 Nails or construction screws can be used to secure X-Brackets or Batt-Brackets to wood substrates.

2.2.2 Self-drilling screws can be used to secure X-Brackets or Batt-Brackets to cold-formed steel substrates.

2.2.3 Concrete anchors can be used to secure X-Brackets or Batt-Brackets to concrete substrates.

2.2.3.1 Approved mechanical anchors or fasteners may be used to secure X-Brackets or Batt-Brackets to concrete or masonry substrates in accordance with **Section 6.3.3** and the applicable fastener evaluation report.

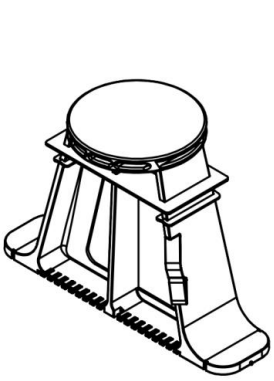
2.2.4 Adhesives can be used to secure X-Brackets (2.5", 3.75" , and 5.5" X-Bracket only) to steel or concrete surfaces.

2.2.4.1 The base of X-Brackets are ribbed for additional surface area.

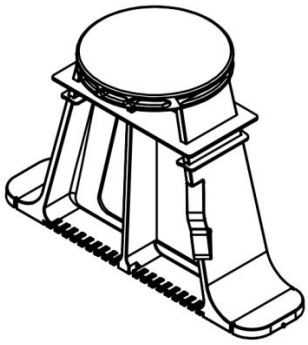
2.2.5 The space created by the X-Brackets System can be filled with closed-cell spray foam or loose-fill insulation (e.g., mineral wool, fiberglass insulation, cellulose, etc.).

2.2.6 The wings of the Batt-Bracket System support batt insulation.

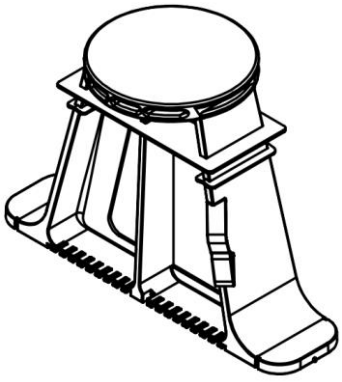
2.3 See **Figure 2** for available variations of the X-Brackets and **Figure 3** for available variations of the Batt-Bracket.



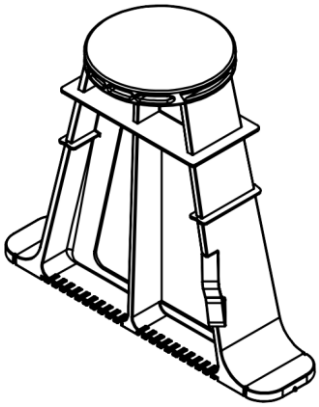
2.5″ X-Brackets



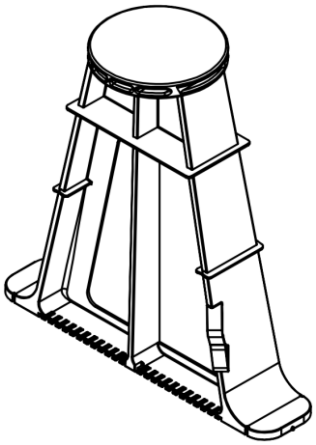
3.75″ X-Brackets



5.5″ X-Brackets



7.5″ X-Brackets



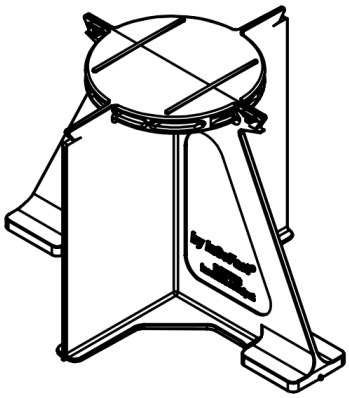
9.5″ X-Brackets

Figure 2. InSoFast X-Brackets

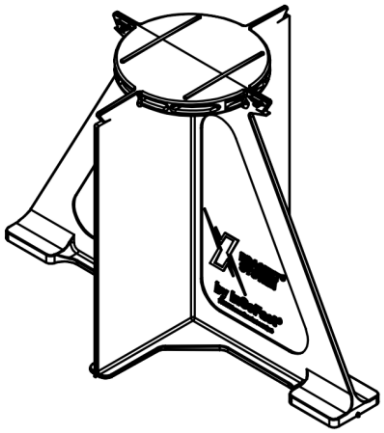
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3.5″ Batt-Bracket



5.5″ Batt-Bracket



7.25″ Batt-Bracket

Figure 3. InSoFast Batt-Brackets

2.4 Product dimensions are listed in **Table 1**.

Table 1. Product Dimensions

Product		Overall Height (in)	Base / Support Flange Width (in)	Base Length (in)	Face Diameter (in)
X-Brackets	2.5"	2.50	2.00	7.25	3.50
	3.75"	3.75	2.00	7.25	3.50
	5.5"	5.50	2.00	8.18	3.50
	7.5"	7.50	2.00	8.88	3.50
	9.5"	9.50	2.00	9.58	3.50
Batt-Bracket	3.5"	3.50	2.00	6.50	3.50
	5.5"	5.50	2.00	8.00	3.50
	7.25"	7.25	2.00	10.50	3.50
SI: 1 in = 25.4 mm					

2.5 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]

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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®*

4.3 *Standards*

4.3.1 *ACI 318: Building Code Requirements for Structural Concrete*

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

4.3.3 *ASTM D638: Standard Test Method for Tensile Properties of Plastics*

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4.3.4 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood and Wood-Based Materials*

4.3.5 *ASTM D5961: Standard Test Method for Bearing Response of Polymer Matrix Composite Laminates*

4.3.6 *ASTM D7332: Standard Test Method for Measuring the Fastener Pull-through Resistance of a Fiber-Reinforced Polymer Matrix Composite*

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*

6.1.1 X-Brackets and Batt Brackets may be installed over substrates including wood framing, cold-formed steel, masonry, or concrete.

6.1.2 X-Brackets and Batt Brackets may be used in buildings of Types I, II, III, IV, and V construction where the complete wall assembly complies with the applicable requirements of the IBC, including the requirements for material combustibility, fire resistance, vertical and lateral flame propagation, and fireblocking.

6.1.3 X-Brackets and Batt Brackets provide the following when used to attach exterior cladding to the building envelope:

6.1.3.1 Transverse load resistance

6.1.3.2 Gravity load resistance for the weight of cladding materials

6.2 *Product Axial Performance*

6.2.1 X-Brackets and Batt Brackets were evaluated for axial performance.

6.2.2 Allowable compressive and tensile strength are provided in **Table 2**.

Table 2. Allowable Axial Loads

Product	Compressive Strength (lb)	Tensile Strength[1] (lb)
X-Brackets	2,010	755
Batt-Bracket	1,590	860

SI: 1 lb = 4.45 N

1. Tensile strength may limit allowable loads due to uplift or wind loading for mechanical and adhesive attachment to wood or steel framing or solid surfaces such as concrete or steel.

6.3 *Structural Performance*

6.3.1 X-Brackets was evaluated for uplift performance (i.e., negative loads applied normal to the product) when installed with an approved adhesive or mechanically fastened with nails or screws.

6.3.2 *Approved Adhesives*

6.3.2.1 Loctite® PL Premium® 3X

6.3.2.2 LePage® PL Premium® 3X

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6.3.3 *Bracket Base Connection Path*

6.3.3.1 Batt-Bracket was evaluated for uplift performance (i.e., negative loads applied normal to the product) when mechanically fastened with nails or screws.

6.3.3.2 Allowable uplift and lateral capacities for various configurations are provided in Table 3.

Table 3. Allowable Loads for Various Substrates and Connection Types[1,4]

Product	Substrate	Connection Type	Quantity[2]	Allowable Uplift Load (lb)	Allowable Lateral Load (lb)
3.75" X-Bracket or 2.5" X-Bracket	Wood (SG = 0.42)	0.131" x 3" Ring Shank Nail	4	240	325
		#8 x 3" or Larger Construction Screw	2	330	245
		1/4" x 2 1/2" GRK RSS Screw	2	620	245
	CFS Framing, 20-gauge (f_y = 33 ksi)	#12 Self-Drilling Screw	2	250	110
	CFS Framing, 18-gauge (f_y = 33 ksi)		2	330	145
	Steel	Adhesive[3]	N/A	385	120
	Concrete/CMU		N/A	480	170
	Concrete/CMU[5,6]	1/4" Tapcon	2	210	200
		Hilti X-U or X-P	2	140	135
5.5" X-Brackets Only	Steel	Adhesive[3]	N/A	385	90
	Concrete/CMU		N/A	480	130
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Wood (SG = 0.42)	0.131" x 3" Ring Shank Nails	4	240	210
		#8 x 3" or Larger Construction Screw	2	330	135
		1/4" x 2 1/2" GRK RSS Screw	2	620	235
	CFS Framing, 20-gauge (f_y = 33 ksi)	#14 Self-Drilling Screw	2	290	55
	CFS Framing, 18-gauge (f_y = 33 ksi)		2	380	70
	Concrete/CMU[5,6]	1/4" Tapcon	2	210	105
		Hilti X-U or X-P	2	140	70

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Table 3. Allowable Loads for Various Substrates and Connection Types[1,4]

Product	Substrate	Connection Type	Quantity[2]	Allowable Uplift Load (lb)	Allowable Lateral Load (lb)
Batt-Bracket (All)	Wood (SG = 0.42)	0.131" x 3" Ring Shank Nail	4	295	240
		#8 x 2 1/2" or Larger Construction Screw	2	330	180
		1/4" x 2 1/2" GRK RSS Screw	2	530	240
	CFS Framing, 20-gauge (f_y = 33 ksi)	#14 Self-Drilling Screw	2	290	80
	CFS Framing, 18-gauge (f_y = 33 ksi)	#14 Self-Drilling Screw	2	380	105
	Concrete/CMU[5,6]	1/4" Tapcon	2	210	150
		Hilti X-U or X-P	2	140	100

SI: 1 lb = 4.45 N

1. Tabulated values based on the connection of the brackets to the substrate only.
2. For configurations requiring two fasteners, install one fastener at each flange along the centerline of the base. For configurations requiring four fasteners, install two fasteners at each flange with a minimum edge distance of 1/2".
3. Adhesive connection applicability shall be as shown in this table. Apply a continuous 3/8" bead size at the perimeter of the base of the bracket where adhesive attachment is permitted.
4. For fasteners used in the connection to cold-formed steel members, the length of the fastener shall be sufficient to penetrate through the thickness of the steel by 3 threads.
5. Concrete and CMU mechanical fasteners are limited to:

   a) 1/4" Tapcon hex-washer-head screw anchor with 0.190" shank diameter, 0.250" thread outside diameter, effective head/washer bearing diameter not less than 0.321", and minimum nominal embedment of 1.0" into minimum 2,000 psi uncracked concrete or medium/normal-weight CMU in accordance with the applicable manufacturer evaluation report.

   b) Hilti X-U and Hilti X-P power-actuated fasteners with 0.157" shank and 0.321" head, minimum 1.0" embedment into minimum 2,500 psi normal-weight uncracked concrete or normal-weight CMU in accordance with the applicable manufacturer evaluation report.
6. Fastener length, spacing, edge distance, concrete thickness, environmental exposure, redundancy, and installation shall comply with the applicable evaluation report and manufacturer instructions.

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6.3.4 *Bracket Double Top-Face Connection Path*

6.3.4.1 Allowable withdrawal strength for fasteners when installed into the top face of X-Brackets or Batt Brackets are provided in **Table 4**.

6.3.4.1.1 The withdrawal values in **Table 4** are per fastener. The quantity of fasteners used to attach furring strips, girts, or other supported members to the bracket double top face shall provide a total allowable withdrawal resistance equal to or greater than the applicable allowable uplift load of the selected bracket-to-substrate connection in Table 3.

6.3.4.2 The overall system uplift and lateral resistance shall be limited to the lesser of the applicable bracket-to-substrate connection resistance in Table 3 and the applicable double top-face connection resistance in **Table 4**.

6.3.4.3 Where the tabulated top-face lateral resistance in **Table 4** is used without separate engineering of the supported member, the furring member shall be:

6.3.4.3.1 Nominal 2x4 or larger solid-sawn lumber bearing directly against the bracket's double top face and fastened with a minimum of two #8 construction screws.

6.3.4.3.2 20-gauge CFS furring, with a minimum ultimate tensile strength of 45 ksi, bearing directly against the bracket's double top face and fastened with a minimum of two #12 self-drilling screws.

6.3.4.4 The required screw quantity for uplift shall be determined from the withdrawal values in **Table 4** and may exceed two.

6.3.4.5 Other furring members, including engineered wood, steel girts, hat channels, and other cold-formed steel or composite members, are permitted where the supported member and its fastener head-side connection are designed to resist the applicable Table 3 uplift and lateral loads.

6.3.4.5.1 Checks shall include fastener bearing, pull-through or pull-over, tear-out, local distortion, member bending, and other applicable limit states. The supported member shall bear directly against the bracket double top face; gaps or spacers that create unsupported fastener shank length or eccentric shear loading require separate engineering evaluation.

Table 4. Allowable Fastener Properties Installed into the Round Double Top Face of Brackets[1,2,3]

Product	Fastener	Allowable Withdrawal Load per Fastener (lb)	Allowable Lateral Load[4,5] (lb)
X-Brackets or Batt-Brackets	0.131" x 3" Ring Shank Nail	170	-
	#8 Construction Screw	195	325
	#10 Construction Screw	205	325
	#12 Self-Drilling Screw	190	325

SI: 1 lb = 4.45 N

1. Fastener installed into the double top face of X-Brackets shall be of sufficient length to penetrate at least 1" into the double top face of the X-Brackets or Batt Brackets.
2. Fasteners shall be installed with a minimum ¼" clearance from the edge of top face of brackets. See **Figure 4.**
3. The number of fasteners used to attach the furring strip, girt, hat channel, or other supported member to the double top face of the bracket shall be such that the sum of the allowable fastener withdrawal resistances is not less than the applicable allowable uplift resistance of the bracket-to-substrate connection in **Table 3.**
4. Tabulated lateral load is the total allowable load for a minimum 2-fastener top-face connection.
5. Apply a 0.8 factor to the allowable lateral load for brackets 5.5 inches or taller.

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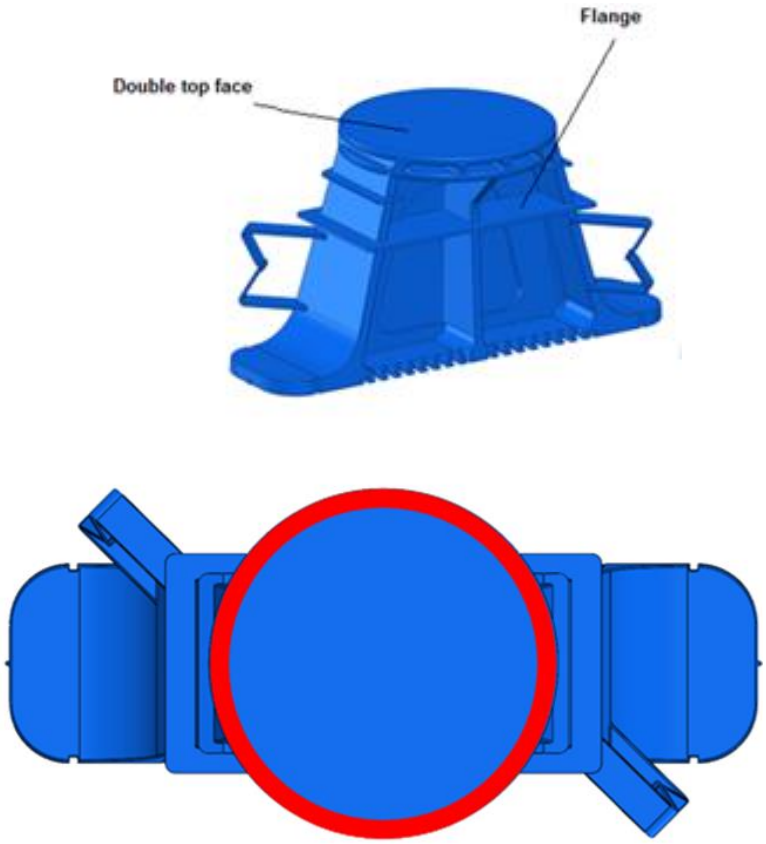


Figure 4. Minimum Edge Distances (1/4") for Fasteners Installed into the Double Top Face

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6.4 *Wind Performance*

6.4.1 Maximum allowable wind pressure and basic wind speed for the connection methods listed in Table 3 are provided in **Table 5** through **Table 7**.

6.4.1.1 *Wood Substrate*

Table 5. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
3.75" X-Bracket or 2.5" X-Bracket	Wood (SG = 0.42)	(4) 0.131" Ring Shank Nail	16	16	220	220	220	220	220	220	218	216	210
				24	220	219	210	191	187	180	177	174	166
				32	192	187	176	164	160	151	152	148	140
				48	153	147	133	131	126	114	121	116	105
				72	120	113	94	103	97	-	96	-	-
			24	16	220	219	210	191	187	180	177	174	166
				24	179	174	163	153	149	139	142	138	129
				32	153	147	133	131	126	114	121	116	105
				48	120	113	94	103	97	-	96	-	-
				72	93	-	-	-	-	-	-	-	-
3.75" X-Bracket or 2.5" X-Bracket	Wood (SG = 0.42)	(2) Min. #8 Construction Screw	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	216	204	205	200	189
				32	220	214	196	189	183	168	175	170	156
				48	175	166	143	150	142	123	139	132	114
				72	136	124	91	117	106	-	108	98	-
				96	112	97	-	96	-	-	-	-	-
			24	16	220	220	220	220	216	204	205	200	189
				24	207	200	181	178	171	155	164	158	143
				32	175	166	143	150	142	123	139	132	114
				48	136	124	91	117	106	-	108	98	-
				72	104	-	-	-	-	-	-	-	-

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Table 5. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
3.75" X-Bracket or 2.5" X-Bracket	Wood (SG = 0.42)	(2) 1/4" GRK RSS Screws	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	220	220	220	220	220
				32	220	220	220	220	220	220	220	220	213
				48	220	220	196	205	195	168	190	180	155
				72	188	171	126	161	146	108	149	136	100
				96	154	133	-	132	114	-	122	105	-
			24	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	220	212	220	216	196
				32	220	220	196	205	195	168	190	180	155
				48	188	171	126	161	146	108	149	136	100
				72	141	118	-	121	101	-	112	94	-
				96	111	-	-	95	-	-	-	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Wood (SG = 0.42)	(4) 0.131" Ring Shank Nails	16	16	220	220	220	220	220	219	216	213	203
				24	219	213	198	188	182	170	174	169	157
				32	187	180	162	160	154	139	149	143	129
				48	147	138	114	126	118	97	117	109	90
				72	113	101	-	97	-	-	-	-	-
			24	16	219	213	198	188	182	170	174	169	157
				24	174	167	147	149	143	126	138	132	117
				32	147	138	114	126	118	97	117	109	90
				48	113	101	-	97	-	-	-	-	-

Table 5. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Wood (SG = 0.42)	(2) Min. #8 Construction Screw	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	209	214	204	179	198	189	166
				32	211	197	160	180	168	137	167	156	127
				48	162	143	-	139	123	-	128	114	-
				72	118	91	-	101	-	-	94	-	-
				96	90	-	-	-	-	-	-	-	-
			24	16	220	220	209	214	204	179	198	189	166
				24	196	181	141	168	155	120	156	143	112
				32	162	143	-	139	123	-	128	114	-
				48	118	91	-	101	-	-	94	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Wood (SG = 0.42)	(2) 1/4" GRK RSS Screws	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	220	220	220	220	220
				32	220	220	220	220	220	220	220	220	212
				48	220	220	192	205	193	165	189	179	153
				72	186	169	121	160	145	103	148	134	96
				96	152	130	-	130	112	-	121	103	-
			24	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	220	209	220	215	194
				32	220	220	192	205	193	165	189	179	153
				48	186	169	121	160	145	103	148	134	96
				72	140	115	-	120	99	-	111	92	-
				96	109	-	-	94	-	-	-	-	-

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Table 5. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
Batt-Bracket (All)	Wood (SG = 0.42)	(4) 0.131" Ring Shank Nails	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	210	204	192	194	189	178
				32	209	202	185	179	173	158	165	160	147
				48	165	156	134	141	134	115	131	124	106
				72	129	117	-	110	100	-	102	93	-
				96	106	91	-	91	-	-	-	-	-
			24	16	220	220	220	210	204	192	194	189	178
				24	195	188	170	167	161	146	155	149	135
				32	165	156	134	141	134	115	131	124	106
				48	129	117	-	110	100	-	102	93	-
				72	97	-	-	-	-	-	-	-	-
Batt-Bracket (All)	Wood (SG = 0.42)	(2) #8 Construction Screw	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	218	211	194	202	195	179
				32	216	206	181	185	177	155	172	164	144
				48	170	156	122	145	134	104	134	124	96
				72	129	111	-	110	95	-	102	-	-
				96	103	-	-	-	-	-	-	-	-
			24	16	220	220	220	218	211	194	202	195	179
				24	201	190	163	172	163	140	160	151	129
				32	170	156	122	145	134	104	134	124	96
				48	129	111	-	110	95	-	102	-	-
				72	92	-	-	-	-	-	-	-	-

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Table 5. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
Batt-Bracket (All)	Wood (SG = 0.42)	(2) 1/4" GRK RSS Screws	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	220	220	220	220	220
				32	220	220	220	220	220	212	220	215	196
				48	220	209	179	189	179	154	175	166	142
				72	172	156	113	147	134	97	136	124	-
				96	142	122	-	122	105	-	113	97	-
			24	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	216	195	208	200	181
				32	220	209	179	189	179	154	175	166	142
				48	172	156	113	147	134	97	136	124	-
				72	129	108	-	111	92	-	103	-	-
				96	101	-	-	-	-	-	-	-	-

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psf = 0.0479 kPa, 1 mph = 1.61 km/hr

1. Based on a building height of 60-feet, GC_p= -1.4 for Zone 5 and an Effective Wind Area of 10ft^2, Topographic Factor: K_{zt}=1.0, Ground Elevation Factor: Ke=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 for an enclosed building, K_d = 0.85 for Component and Cladding
2. Basic Wind Speed determined in accordance with IBC Section 1609.3 and ASCE 7-22. Wind speed is capped to 220 mph (highest wind speed specified in ASCE 7 Chapter 26). Wind pressures are determined based on the component and cladding loads for a building with a mean roof height of 60 feet: $V_{asd} = V_{ult}\sqrt{0.6}$.
3. Tabulated values based on the connection of the brackets to the substrate only. The double top-face connection shall comply with **Section 6.3.4** and **Table 4** so that it does not reduce the applicable tabulated resistance.
4. See Table 3 for additional details regarding connection type.
5. The 7 psf, 11 psf, and 20 psf columns represent total supported dead load acting parallel to the wall, including the weight of furring strips, girts, cladding, backer board, accessories, and other supported components. Interpolation between tabulated values is not permitted.

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6.4.1.2 *CFS/Structural Steel Substrate*

Table 6. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
3.75" X-Bracket or 2.5" X-Bracket	CFS Framing 20-gauge (f_y = 33 ksi)	(2) #12 Self-Drilling Screw	16	16	220	220	220	220	220	202	215	206	187
				24	214	201	168	183	172	144	169	159	133
				32	178	162	120	152	139	103	141	129	95
				48	135	113	-	115	97	-	107	-	-
				72	94	-	-	-	-	-	-	-	-
			24	16	214	201	168	183	172	144	169	159	133
				24	166	149	100	142	127	-	131	118	-
				32	135	113	-	115	97	-	107	-	-
				48	94	-	-	-	-	-	-	-	-
3.75" X-Bracket or 2.5" X-Bracket	CFS Framing 18-gauge (f_y = 33 ksi)	(2) #12 Self-Drilling Screw	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	214	215	206	183	199	191	170
				32	212	199	166	182	171	143	168	158	132
				48	164	147	98	141	126	-	130	117	-
				72	121	97	-	104	-	-	96	-	-
				96	94	-	-	-	-	-	-	-	-
			24	16	220	220	214	215	206	183	199	191	170
				24	198	184	147	170	158	126	157	146	117
				32	164	147	98	141	126	-	130	117	-
				48	121	97	-	104	-	-	96	-	-

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Table 6. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
3.75" X-Bracket or 2.5" X-Bracket	Steel	Adhesive	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	216	220	216	185	211	200	172
				32	220	206	160	192	177	137	177	164	127
				48	170	147	-	146	126	-	135	116	-
				72	122	-	-	105	-	-	97	-	-
			24	16	220	220	216	220	216	185	211	200	172
				24	207	189	137	178	162	117	165	150	109
				32	170	147	-	146	126	-	135	116	-
				48	122	-	-	105	-	-	97	-	-
5.5" X-Bracket	Steel	Adhesive	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	185	220	204	159	205	189	147
				32	214	189	115	183	162	99	170	150	91
				48	157	121	-	134	104	-	125	96	-
				72	103	-	-	-	-	-	-	-	-
			24	16	220	220	185	220	204	159	205	189	147
				24	197	169	-	168	145	-	156	134	-
				32	157	121	-	134	104	-	125	96	-
				48	103	-	-	-	-	-	-	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	CFS Framing 20-gauge (f_y = 33 ksi)	(2) #14 Self-Drilling Screw	16	16	220	220	184	220	212	157	215	197	146
				24	205	172	-	176	148	-	163	137	-
				32	162	118	-	139	101	-	129	93	-
				48	101	-	-	-	-	-	-	-	-
			24	16	205	172	-	176	148	-	163	137	-
				24	145	92	-	124	-	-	115	-	-
				32	101	-	-	-	-	-	-	-	-

Table 6. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	CFS Framing 18-gauge (f_y = 33 ksi)	(2) #14 Self-Drilling Screw	16	16	220	220	220	220	220	213	220	220	197
				24	220	220	141	212	189	121	196	175	112
				32	201	166	-	172	142	-	159	132	-
				48	139	-	-	119	-	-	110	-	-
			24	16	220	220	141	212	189	121	196	175	112
				24	183	144	-	156	123	-	145	114	-
				32	139	-	-	119	-	-	110	-	-
Batt-Bracket (All)	CFS Framing 20-gauge (f_y = 33 ksi)	(2) #14 Self-Drilling Screw	16	16	220	220	220	220	220	197	220	214	183
				24	220	201	146	189	172	125	175	159	116
				32	182	157	-	156	134	-	144	124	-
				48	130	92	-	111	-	-	103	-	-
			24	16	220	201	146	189	172	125	175	159	116
				24	167	139	-	143	119	-	132	110	-
				32	130	92	-	111	-	-	103	-	-
Batt-Bracket (All)	CFS Framing 18-gauge (f_y = 33 ksi)	(2) #14 Self-Drilling Screw	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	203	220	210	174	208	195	161
				32	218	198	142	187	170	122	173	157	113
				48	164	135	-	140	116	-	130	107	-
				72	114	-	-	98	-	-	91	-	-
			24	16	220	220	203	220	210	174	208	195	161
				24	202	180	115	173	154	99	160	143	91
				32	164	135	-	140	116	-	130	107	-
				48	114	-	-	98	-	-	91	-	-

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psf = 0.0479 kPa, 1 mph = 1.61 km/hr

1. Based on a building height of 60-feet, GC_p= -1.4 for Zone 5 and an Effective Wind Area of 10ft^2, Topographic Factor: K_{zt}=1.0, Ground Elevation Factor: Ke=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 for an enclosed building, K_d = 0.85 for Component and Cladding
2. Basic Wind Speed determined in accordance with IBC Section 1609.3 and ASCE 7-22. Wind speed is capped to 220 mph (highest wind speed specified in ASCE 7 Chapter 26). Wind pressures are determined based on the component and cladding loads for a building with a mean roof height of 60 feet: $V_{asd} = V_{ult}\sqrt{0.6}$.
3. Tabulated values based on the connection of the brackets to the substrate only. The double top-face connection shall comply with **Section 6.3.4** and **Table 4** so that it does not reduce the applicable tabulated resistance.
4. See Table 3 for additional details regarding connection type.
5. The 7 psf, 11 psf, and 20 psf columns represent total supported dead load acting parallel to the wall, including the weight of furring strips, girts, cladding, backer board, accessories, and other supported components. Interpolation between tabulated values is not permitted.

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6.4.1.3 *Concrete/CMU Substrate*

Table 7. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
3.75" X-Bracket or 2.5" X-Bracket	Concrete / CMU	1/4" Tapcon	16	16	220	220	220	218	214	204	202	198	189
				24	205	199	184	175	170	158	162	158	146
				32	174	167	149	149	143	128	138	132	118
				48	136	127	103	117	109	-	108	101	-
				72	105	92	-	-	-	-	-	-	-
			24	16	205	199	184	175	170	158	162	158	146
				24	163	155	136	140	133	117	130	123	108
				32	136	127	103	117	109	-	108	101	-
				48	105	92	-	-	-	-	-	-	-
3.75" X-Bracket or 2.5" X-Bracket	Concrete / CMU	Hilti X-U, Hilti X-P	16	16	205	199	184	175	170	158	162	158	146
				24	163	156	137	140	133	117	130	124	109
				32	136	127	104	117	109	-	108	101	-
				48	105	93	-	-	-	-	-	-	-
			24	16	163	156	137	140	133	117	130	124	109
				24	127	117	91	109	101	-	101	93	-
				32	105	93	-	-	-	-	-	-	-

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Table 7. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
3.75" X-Bracket or 2.5" X-Bracket	Concrete / CMU	Adhesive	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	220	220	220	220	214
				32	220	220	214	220	211	184	205	196	170
				48	203	186	140	174	159	120	161	147	111
				72	153	130	-	131	111	-	122	103	-
				96	121	90	-	104	-	-	96	-	-
			24	16	220	220	220	220	220	220	220	220	214
				24	220	220	193	207	195	165	192	181	153
				32	203	186	140	174	159	120	161	147	111
				48	153	130	-	131	111	-	122	103	-
				72	109	-	-	93	-	-	-	-	-
5.5" X-Bracket	Concrete / CMU	Adhesive	16	16	220	220	220	220	220	220	220	220	220
				24	220	220	220	220	220	213	220	220	198
				32	220	220	189	216	201	162	200	186	150
				48	194	170	97	166	146	-	154	135	-
				72	141	106	-	121	91	-	112	-	-
				96	106	-	-	91	-	-	-	-	-
			24	16	220	220	220	220	220	213	220	220	198
				24	220	215	164	201	185	141	186	171	130
				32	194	170	97	166	146	-	154	135	-
				48	141	106	-	121	91	-	112	-	-
				72	91	-	-	-	-	-	-	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Concrete / CMU	1/4" Tapcon	16	16	220	220	214	211	203	183	196	188	169
				24	195	182	151	167	156	129	155	145	120
				32	162	147	106	139	126	90	129	117	-
				48	121	100	-	104	-	-	96	-	-
			24	16	195	182	151	167	156	129	155	145	120
				24	151	134	-	129	115	-	120	106	-
				32	121	100	-	104	-	-	96	-	-

Table 7. Maximum Allowable Wind Pressure and Basic Wind Speed for Various Connection Types [1,2,3,4,5]

Product	Substrate	Connection Type[4]	Spacing of Brackets in a Row (in o.c.)	Spacing of Brackets in a Column (in o.c.)	Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					7 psf	11 psf	20 psf	7 psf	11 psf	20 psf	7 psf	11 psf	20 psf
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Concrete / CMU	Hilti X-U, Hilti X-P	16	16	195	182	151	167	156	129	155	145	120
				24	151	134	-	129	115	-	120	106	-
				32	121	100	-	104	-	-	96	-	-
			24	16	151	134	-	129	115	-	120	106	-
				24	111	-	-	95	-	-	-	-	-
Batt-Bracket (All)	Concrete / CMU	1/4" Tapcon	16	16	220	220	220	216	210	197	200	194	182
				24	201	193	173	172	165	148	160	153	137
				32	170	160	135	145	137	115	135	127	107
				48	131	118	-	112	101	-	104	93	-
				72	98	-	-	-	-	-	-	-	-
			24	16	201	193	173	172	165	148	160	153	137
				24	159	148	120	136	127	103	126	117	95
				32	131	118	-	112	101	-	104	93	-
				48	98	-	-	-	-	-	-	-	-
Batt-Bracket (All)	Concrete / CMU	Hilti X-U, Hilti X-P	16	16	201	193	173	172	165	148	160	153	137
				24	159	148	120	136	127	103	126	117	95
				32	131	118	-	112	101	-	104	93	-
				48	98	-	-	-	-	-	-	-	-
			24	16	159	148	120	136	127	103	126	117	95
				24	121	107	-	104	92	-	96	-	-
				32	98	-	-	-	-	-	-	-	-

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psf = 0.0479 kPa, 1 mph = 1.61 km/hr

1. Based on a building height of 60-feet, GC_p= -1.4 for Zone 5 and an Effective Wind Area of 10ft^2, Topographic Factor: K_{zt}=1.0, Ground Elevation Factor: Ke=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 for an enclosed building, K_d = 0.85 for Component and Cladding
2. Basic Wind Speed determined in accordance with IBC Section 1609.3 and ASCE 7-22. Wind speed is capped to 220 mph (highest wind speed specified in ASCE 7 Chapter 26). Wind pressures are determined based on the component and cladding loads for a building with a mean roof height of 60 feet: $V_{asd} = V_{ult}\sqrt{0.6}$.
3. Tabulated values based on the connection of the brackets to the substrate only. The double top-face connection shall comply with Section 6.3.4 and **Table 4** so that it does not reduce the applicable tabulated resistance.
4. See Table 3 for additional details regarding connection type.
5. The 7 psf, 11 psf, and 20 psf columns represent total supported dead load acting parallel to the wall, including the weight of furring strips, girts, cladding, backer board, accessories, and other supported components. Interpolation between tabulated values is not permitted.

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6.5 *Cladding Attachment*

6.5.1 The allowable cladding weights in **Table 8** through **Table 10** are based on the combined effects of wind suction acting normal to the wall assembly and gravity load from the cladding acting parallel to the wall assembly. The combined demand is evaluated using a linear unity interaction equation.

6.5.1.1 *Wood Substrate*

Table 8. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
3.75" X-Bracket or 2.5" X-Bracket	Wood (SG = 0.42)	(4) 0.131" Ring Shank Nail	16	16	25	25	25	25	25	25	25	25	2
				24	25	25	7	25	25	-	25	13	-
				32	25	21	-	25	-	-	25	-	-
				48	25	-	-	13	-	-	5	-	-
				72	4	-	-	-	-	-	-	-	-
			24	16	25	25	7	25	25	-	25	13	-
				24	25	11	-	25	-	-	25	-	-
				32	25	-	-	13	-	-	5	-	-
				48	4	-	-	-	-	-	-	-	-
3.75" X-Bracket or 2.5" X-Bracket	Wood (SG = 0.42)	(2) Min. #8 Construction Screw	16	16	25	25	25	25	25	25	25	25	25
				24	25	25	25	25	25	5	25	25	-
				32	25	25	4	25	16	-	25	8	-
				48	25	6	-	18	-	-	14	-	-
				72	9	-	-	3	-	-	-	-	-
				96	2	-	-	-	-	-	-	-	-
			24	16	25	25	25	25	25	5	25	25	-
				24	25	22	-	25	8	-	25	-	-
				32	25	6	-	18	-	-	14	-	-
				48	9	-	-	3	-	-	-	-	-

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Table 8. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
3.75" X-Bracket or 2.5" X-Bracket	Wood (SG = 0.42)	(2) 1/4" GRK RSS Screws	16	16	25	25	25	25	25	25	25	25	25
				24	25	25	25	25	25	25	25	25	25
				32	25	25	25	25	25	21	25	25	14
				48	25	23	10	25	16	-	25	12	-
				72	18	8	-	14	1	-	12	-	-
				96	10	-	-	7	-	-	5	-	-
			24	16	25	25	25	25	25	25	25	25	25
				24	25	25	25	25	25	14	25	25	6
				32	25	23	10	25	16	-	25	12	-
				48	18	8	-	14	1	-	12	-	-
				72	8	-	-	4	-	-	2	-	-
				96	3	-	-	-	-	-	-	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Wood (SG = 0.42)	(4) 0.131" Ring Shank Nails	16	16	25	25	25	25	25	16	25	25	-
				24	25	25	3	25	17	-	25	7	-
				32	25	13	-	25	-	-	22	-	-
				48	15	-	-	7	-	-	2	-	-
				72	2	-	-	-	-	-	-	-	-
			24	16	25	25	3	25	17	-	25	7	-
				24	25	6	-	20	-	-	15	-	-
				32	15	-	-	7	-	-	2	-	-
				48	2	-	-	-	-	-	-	-	-

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Table 8. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Wood (SG = 0.42)	(2) Min. #8 Construction Screw	16	16	25	25	25	25	25	25	25	25	19
				24	25	25	14	25	20	1	25	15	-
				32	25	15	1	21	7	-	19	3	-
				48	12	2	-	9	-	-	6	-	-
				72	4	-	-	-	-	-	-	-	-
			24	16	25	25	14	25	20	1	25	15	-
				24	21	11	-	17	3	-	15	-	-
				32	12	2	-	9	-	-	6	-	-
				48	4	-	-	-	-	-	-	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Wood (SG = 0.42)	(2) 1/4" GRK RSS Screws	16	16	25	25	25	25	25	25	25	25	25
				24	25	25	25	25	25	25	25	25	25
				32	25	25	25	25	25	20	25	25	13
				48	25	22	10	25	16	-	25	11	-
				72	17	8	-	14	-	-	12	-	-
				96	10	-	-	6	-	-	4	-	-
			24	16	25	25	25	25	25	25	25	25	25
				24	25	25	24	25	25	13	25	25	6
				32	25	22	10	25	16	-	25	11	-
				48	17	8	-	14	-	-	12	-	-
				72	7	-	-	4	-	-	2	-	-
				96	2	-	-	-	-	-	-	-	-

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Table 8. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
Batt-Bracket (All)	Wood (SG = 0.42)	(4) 0.131" Ring Shank Nails	16	16	25	25	25	25	25	25	25	25	25
				24	25	25	20	25	25	-	25	23	-
				32	25	24	-	25	10	-	25	-	-
				48	22	2	-	15	-	-	10	-	-
				72	7	-	-	-	-	-	-	-	-
			24	16	25	25	20	25	25	-	25	23	-
				24	25	17	-	25	2	-	25	-	-
				32	22	2	-	15	-	-	10	-	-
				48	7	-	-	-	-	-	-	-	-
Batt-Bracket (All)	Wood (SG = 0.42)	(2) #8 Construction Screw	16	16	25	25	25	25	25	25	25	25	25
				24	25	25	19	25	25	3	25	22	-
				32	25	21	2	25	11	-	25	5	-
				48	17	4	-	12	-	-	9	-	-
				72	6	-	-	1	-	-	-	-	-
			24	16	25	25	19	25	25	3	25	22	-
				24	25	15	-	24	5	-	21	-	-
				32	17	4	-	12	-	-	9	-	-
				48	6	-	-	1	-	-	-	-	-
Batt-Bracket (All)	Wood (SG = 0.42)	(2) ¼" GRK RSS Screws	16	16	25	25	25	25	25	25	25	25	25
				24	25	25	25	25	25	25	25	25	25
				32	25	25	25	25	25	13	25	25	5
				48	25	20	5	25	12	-	24	6	-
				72	16	5	-	12	-	-	9	-	-
				96	8	-	-	4	-	-	2	-	-

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Table 8. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
Batt-Bracket (All)	Wood (SG = 0.42)	(2) 1/4" GRK RSS Screws	24	16	25	25	25	25	25	25	25	25	25
				24	25	25	20	25	25	6	25	21	-
				32	25	20	5	25	12	-	24	6	-
				48	16	5	-	12	-	-	9	-	-
				72	6	-	-	2	-	-	-	-	-

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psf = 0.0479 kPa, 1 mph = 1.61 km/hr

1. The tabulated allowable cladding are based on a preset basic wind speed of 120 mph, 170 mph, and 220 mph shown in the table. Wind pressures were determined for the listed exposure condition and used as the wind component of the combined interaction check.
2. Based on a building height of 60-feet, GC_p= -1.4 for Zone 5 and an Effective Wind Area of 10ft^2, Topographic Factor: K_{zt}=1.0, Ground Elevation Factor: Ke=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 for an enclosed building, K_d = 0.85 for Component and Cladding.
3. Tabulated values based on the connection at the base of the X-Bracket and Batt-Brackets only. The double top-face connection shall comply with **Section 6.3.4** and **Table 4** so that it does not reduce the applicable tabulated resistance. Cladding connections to the brackets shall be sized by others.
4. Blank cells indicate that the configuration is not permitted for the listed exposure condition because the wind demand alone exceeds the allowable normal-to-wall resistance or because no remaining capacity is available for cladding weight.
5. The tabulated allowable cladding weight assumed a dead load (i.e. weight of furring strips, girts, hat channels, backer board, accessories, or other supported components) of 3 psf. If the total dead load is less than 3 psf, the difference can be added to the tabulated values in this table.
6. The table is limited to the bracket connection demand check. The values do not establish structural capacity for the cladding, furring strips, girts, hat channels, sheathing, framing, fastener withdrawal from the supporting structure, wall assembly, roof assembly, or any other component not expressly evaluated in this report.
7. Interpolation between tabulated values is not permitted.

6.5.1.2 *CFS/Structural Substrate*

Table 9. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
3.75" X-Bracket or 2.5" X-Bracket	CFS Framing 20-gauge (f_y = 33 ksi)	(2) #12 Self-Drilling Screw	16	16	25	25	22	25	25	9	25	24	1
				24	25	17	2	23	9	-	21	4	-
				32	17	6	-	13	-	-	11	-	-
				48	7	-	-	3	-	-	-	-	-
			24	16	25	17	2	23	9	-	21	4	-
				24	14	3	-	10	-	-	7	-	-
				32	7	-	-	3	-	-	-	-	-

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Table 9. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
3.75" X-Bracket or 2.5" X-Bracket	CFS Framing 18-gauge (f_y = 33 ksi)	(2) #12 Self-Drilling Screw	16	16	25	25	25	25	25	25	25	25	21
				24	25	25	15	25	22	2	25	17	-
				32	25	16	1	23	8	-	21	3	-
				48	13	2	-	9	-	-	7	-	-
				72	4	-	-	-	-	-	-	-	-
			24	16	25	25	15	25	22	2	25	17	-
				24	22	12	-	19	4	-	16	-	-
				32	13	2	-	9	-	-	7	-	-
				48	4	-	-	-	-	-	-	-	-
3.75" X-Bracket or 2.5" X-Bracket	Steel	Adhesive	16	16	25	25	25	25	25	25	25	25	24
				24	25	25	16	25	21	7	25	18	1
				32	23	15	5	20	10	-	19	6	-
				48	12	4	-	9	-	-	7	-	-
				72	4	-	-	2	-	-	-	-	-
			24	16	25	25	16	25	21	7	25	18	1
				24	19	12	1	17	6	-	15	3	-
				32	12	4	-	9	-	-	7	-	-
				48	4	-	-	2	-	-	-	-	-
5.5" X-Bracket	Steel	Adhesive	16	16	25	25	25	25	25	21	25	25	17
				24	25	19	11	23	15	4	22	12	-
				32	17	11	3	14	7	-	13	4	-
				48	8	2	-	6	-	-	5	-	-
				72	2	-	-	-	-	-	-	-	-
			24	16	25	19	11	23	15	4	22	12	-
				24	14	8	-	12	4	-	10	1	-
				32	8	2	-	6	-	-	5	-	-
				48	2	-	-	-	-	-	-	-	-

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Table 9. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	CFS Framing 20-gauge (f_y = 33 ksi)	(2) #14 Self-Drilling Screw	16	16	23	19	12	22	15	7	21	13	3
				24	13	8	2	11	5	-	10	3	-
				32	8	3	-	6	-	-	5	-	-
				48	3	-	-	-	-	-	-	-	-
			24	16	13	8	2	11	5	-	10	3	-
				24	6	1	-	4	-	-	3	-	-
				32	3	-	-	-	-	-	-	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	CFS Framing 18-gauge (f_y = 33 ksi)	(2) #14 Self-Drilling Screw	16	16	25	25	21	25	24	16	25	22	12
				24	19	14	8	17	11	2	16	9	-
				32	12	8	1	11	4	-	9	2	-
				48	6	1	-	4	-	-	3	-	-
				72	1	-	-	-	-	-	-	-	-
			24	16	19	14	8	17	11	2	16	9	-
				24	10	5	-	8	2	-	7	-	-
				32	6	1	-	4	-	-	3	-	-
				48	1	-	-	-	-	-	-	-	-
Batt-Bracket (All)	CFS Framing 20-gauge (f_y = 33 ksi)	(2) #14 Self-Drilling Screw	16	16	25	25	19	25	23	11	25	20	6
				24	20	13	4	18	8	-	16	5	-
				32	13	6	-	10	-	-	9	-	-
				48	5	-	-	3	-	-	1	-	-
			24	16	20	13	4	18	8	-	16	5	-
				24	10	3	-	8	-	-	6	-	-
				32	5	-	-	3	-	-	1	-	-

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Table 9. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
Batt-Bracket (All)	CFS Framing 18-gauge (f_y = 33 ksi)	(2) #14 Self-Drilling Screw	16	16	25	25	25	25	25	25	25	25	20
				24	25	23	14	25	18	5	25	15	-
				32	20	13	4	17	8	-	16	5	-
				48	10	3	-	7	-	-	6	-	-
				72	3	-	-	-	-	-	-	-	-
			24	16	25	23	14	25	18	5	25	15	-
				24	16	10	-	14	5	-	12	2	-
				32	10	3	-	7	-	-	6	-	-
				48	3	-	-	-	-	-	-	-	-

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psf = 0.0479 kPa, 1 mph = 1.61 km/hr

1. The tabulated allowable cladding weights are based on a preset basic wind speed of 120 mph, 170 mph, and 220 mph shown in the table. Wind pressures were determined for the listed exposure condition and used as the wind component of the combined interaction check.
2. Based on a building height of 60-feet, GC_p= -1.4 for Zone 5 and an Effective Wind Area of 10ft^2, Topographic Factor: K_{zt}=1.0, Ground Elevation Factor: Ke=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 for an enclosed building, K_d = 0.85 for Component and Cladding.
3. Tabulated values based on the connection at the base of the X-Bracket and Batt-Brackets only. The double top-face connection shall comply with **Section 6.3.4** and **Table 4** so that it does not reduce the applicable tabulated resistance. Cladding connections to the brackets shall be sized by others.
4. Blank cells indicate that the configuration is not permitted for the listed exposure condition because the wind demand alone exceeds the allowable normal-to-wall resistance or because no remaining capacity is available for cladding weight.
5. The tabulated allowable cladding weight assumed a dead load (i.e. weight of furring strips, girts, hat channels, backer board, accessories, or other supported components) of 3 psf. If the total dead load is less than 3 psf, the difference can be added to the tabulated values in this table.
6. The table is limited to the bracket connection demand check. The values do not establish structural capacity for the cladding, furring strips, girts, hat channels, sheathing, framing, fastener withdrawal from the supporting structure, wall assembly, roof assembly, or any other component not expressly evaluated in this report.
7. Interpolation between tabulated values is not permitted.

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6.5.1.3 *Concrete/CMU Substrate*

Table 10. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
3.75" X-Bracket or 2.5" X-Bracket	Concrete / CMU	1/4" Tapcon	16	16	25	25	25	25	25	2	25	25	-
				24	25	25	-	25	8	-	25	-	-
				32	25	6	-	21	-	-	16	-	-
				48	11	-	-	3	-	-	-	-	-
			24	16	25	25	-	25	8	-	25	-	-
				24	24	-	-	15	-	-	10	-	-
				32	11	-	-	3	-	-	-	-	-
3.75" X-Bracket or 2.5" X-Bracket	Concrete / CMU	Hilti X-U, Hilti X-P	16	16	25	25	-	25	8	-	25	-	-
				24	24	-	-	15	-	-	10	-	-
				32	11	-	-	3	-	-	-	-	-
			24	16	24	-	-	15	-	-	10	-	-
				24	7	-	-	-	-	-	-	-	-
3.75" X-Bracket or 2.5" X-Bracket	Concrete	Adhesive	16	16	25	25	25	25	25	25	25	25	25
				24	25	25	25	25	25	21	25	25	14
				32	25	25	15	25	21	5	25	17	-
				48	20	11	-	17	5	-	15	1	-
				72	10	-	-	6	-	-	4	-	-
				96	4	-	-	1	-	-	-	-	-
			24	16	25	25	25	25	25	21	25	25	14
				24	25	22	10	25	16	-	25	12	-
				32	20	11	-	17	5	-	15	1	-
				48	10	-	-	6	-	-	4	-	-
				72	2	-	-	-	-	-	-	-	-

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Table 10. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
5.5" X-Bracket	Concrete	Adhesive	16	16	25	25	25	25	25	25	25	25	25
				24	25	25	23	25	25	15	25	24	10
				32	25	20	11	24	15	3	23	12	-
				48	15	8	-	12	3	-	11	-	-
				72	7	-	-	4	-	-	3	-	-
				96	3	-	-	-	-	-	-	-	-
			24	16	25	25	23	25	25	15	25	24	10
				24	23	16	7	20	11	-	19	8	-
				32	15	8	-	12	3	-	11	-	-
				48	7	-	-	4	-	-	3	-	-
				72	1	-	-	-	-	-	-	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Concrete / CMU	1/4" Tapcon	16	16	25	25	15	25	22	-	25	17	-
				24	24	12	-	20	3	-	17	-	-
				32	14	2	-	10	-	-	7	-	-
				48	4	-	-	-	-	-	-	-	-
			24	16	24	12	-	20	3	-	17	-	-
				24	11	-	-	6	-	-	4	-	-
				32	4	-	-	-	-	-	-	-	-
9.5" X-Bracket or 7.5" X-Bracket or 5.5" X-Bracket	Concrete / CMU	Hilti X-U, Hilti X-P	16	16	24	12	-	20	3	-	17	-	-
				24	11	-	-	6	-	-	4	-	-
				32	4	-	-	-	-	-	-	-	-
			24	16	11	-	-	6	-	-	4	-	-
				24	2	-	-	-	-	-	-	-	-

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Table 10. Allowable Cladding Weight for Various Substrates and Connection Methods[1,2,3,4,5,6,7]

Product	Substrate	Connection Type[4]	Bracket Horizontal Spacing, sp_h (in o.c.)	Bracket Vertical Spacing, sp_v (in o.c.)	Allowable Cladding Weight (psf) for Specified Maximum Basic Wind Speed (mph)								
					Exposure B			Exposure C			Exposure D		
					120	170	220	120	170	220	120	170	220
Batt-Bracket (All)	Concrete / CMU	1/4" Tapcon	16	16	25	25	22	25	25	-	25	25	-
				24	25	18	-	25	5	-	25	-	-
				32	22	4	-	15	-	-	11	-	-
				48	8	-	-	1	-	-	-	-	-
			24	16	25	18	-	25	5	-	25	-	-
				24	17	-	-	11	-	-	7	-	-
				32	8	-	-	1	-	-	-	-	-
Batt-Bracket (All)	Concrete / CMU	Hilti X-U, Hilti X-P	16	16	25	18	-	25	5	-	25	-	-
				24	17	-	-	11	-	-	7	-	-
				32	8	-	-	1	-	-	-	-	-
			24	16	17	-	-	11	-	-	7	-	-
				24	4	-	-	-	-	-	-	-	-

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psf = 0.0479 kPa, 1 mph = 1.61 km/hr

1. The tabulated allowable cladding are based on a preset basic wind speed of 120 mph, 170 mph, and 220 mph shown in the table. Wind pressures were determined for the listed exposure condition and used as the wind component of the combined interaction check.
2. Based on a building height of 60-feet, GC_p= -1.4 for Zone 5 and an Effective Wind Area of 10ft^2, Topographic Factor: K_{zt}=1.0, Ground Elevation Factor: Ke=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 for an enclosed building, K_d = 0.85 for Component and Cladding.
3. Tabulated values based on the connection at the base of the X-Bracket and Batt-Brackets only. The double top-face connection shall comply with **Section 6.3.4** and **Table 4** so that it does not reduce the applicable tabulated resistance. Cladding connections to the brackets shall be sized by others.
4. Blank cells indicate that the configuration is not permitted for the listed exposure condition because the wind demand alone exceeds the allowable normal-to-wall resistance or because no remaining capacity is available for cladding weight.
5. The tabulated allowable cladding weight assumed a dead load (i.e. weight of furring strips, girts, hat channels, backer board, accessories, or other supported components) of 3 psf. If the total dead load is less than 3 psf, the difference can be added to the tabulated values in this table.
6. The table is limited to the bracket connection demand check. The values do not establish structural capacity for the cladding, furring strips, girts, hat channels, sheathing, framing, fastener withdrawal from the supporting structure, wall assembly, roof assembly, or any other component not expressly evaluated in this report.
7. Interpolation between tabulated values is not permitted.

6.6 Tabulated connection values assume that the supported furring strip, girt, or other member bears at the bracket and transfers load without a significant cantilever-induced moment or prying action at the bracket.

6.6.1 Cantilevered overhangs beyond the outermost bracket that introduce eccentric uplift, prying, or bending moment are outside the prescriptive scope of the tabulated connection values unless specifically engineered.

6.6.2 Such conditions shall be designed by an RDP or provided with supplemental support or strapping capable of transferring the resulting forces to the supporting structure.

6.7 Alternative techniques shall be permitted in accordance with accepted engineering practice and experience. These provisions for the use of alternative materials, designs, and methods of construction are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed herein. This includes, but is not limited to, the following areas of engineering: mechanics of materials, structures, building science, and fire science.

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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 X-Brackets and Batt-Brackets comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 Structural under transverse load conditions for wind loading in accordance with general engineering principles.

8.1.2 Connection performance in accordance with general engineering principles.

8.2 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[29] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise,[30] respectively.

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

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 *General*

9.3.1 Inspect the substrate for the readiness to install the brackets.

9.3.2 When installing onto steel structures via approved adhesives, the surface shall be wiped clean of any grease or debris with an acetone solution prior to adhering the brackets.

9.3.2.1 Adhesive shall be applied per the manufacturer instructions with modifications with this report as appropriate.

9.3.3 When installing onto concrete and CMU substrates via approved adhesives, the surface shall be wiped clean of any debris prior to adhering the brackets.

9.3.4 Powder-actuated fasteners (e.g., Hilti X-U, X-P) shall be installed with the fastener manufacturer recommended tool, cartridge strength, and fastener guide. Install them in accordance with the manufacturer published instructions, including minimum base-material thickness, edge distance, and spacing.

9.3.5 Concrete screw anchors (e.g., Tapcon) shall be installed in accordance with the anchor manufacturer published instructions, including pilot-hole diameter, hole depth, minimum embedment, edge distance, and spacing.

9.3.5.1 Drill pilot holes with the manufacturer-specified carbide bit and clean them of dust before installing the anchor. Anchors may be driven with a drill/driver or impact driver. Stop driving when the bracket is seated tight against the substrate. Do not over-torque, strip, or snap anchors.

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9.3.6 When installing X-Brackets or Batt-Brackets with screws, use a drill/driver with an adjustable clutch or depth-sensing nosepiece.

9.3.6.1 Do not use impact drivers or impact wrenches. Drive screws until the bracket is seated flush and tight against the substrate, without stripping the wood or deforming the bracket.

9.3.7 Ring-shank nails (0.131" diameter) may be driven by hammer or by pneumatic nailer.

9.3.7.1 When using a pneumatic nailer, adjust the drive depth so the nail head seats flush against the bracket without crushing or deforming the bracket flange. Do not overdrive nails.

9.3.8 *Securement of Insulation*

9.3.8.1 Application of spray foam shall be in accordance with manufacturer instructions.

9.3.8.2 Securement of loose-fill insulation shall be in accordance with manufacturer instructions.

9.3.9 *Cladding Fastening*

9.3.9.1 Secure furring strips onto the double top face of the X-Brackets or Batt-Brackets per project plans.

9.3.9.2 Secure cladding onto furring strips per manufacturer instructions.

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 Axial testing in general accordance with ASTM D198

10.1.2 Uplift testing in general accordance with ASTM D1761

10.1.3 Withdrawal testing of listed fasteners in general accordance with ASTM D1761

10.1.4 Head pull-through testing of listed fasteners in general accordance with ASTM D1761

10.1.5 Lateral shear testing on the connection at the base and at the double top face in general accordance with ASTM D1761

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.[31]

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

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11 Findings

11.1 As outlined in **Section 6**, X-Brackets and Batt-Brackets have 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, X-Brackets and Batt-Brackets shall be approved for the following applications:

11.2.1 Cladding supports for use with exterior insulated walls.

11.2.1.1 X-Brackets and Batt-Brackets function as a shim between exterior cladding supports (furring strips) and the structural backer (sheathed light-framed wood walls, cold-formed steel walls, concrete walls, etc.).

11.2.1.2 X-Brackets and Batt-Brackets reduce thermal bridging, which assist in energy performance of the wall system.

11.3 Unless exempt by state statute, when X-Brackets and Batt-Brackets are 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 InSoFast, LLC.

11.5 IBC Section 104.2.3[32] (IRC Section R104.2.2[33] and IFC Section 104.2.3[34] 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:**[35] Building regulations require that the building official shall accept duly authenticated reports.[36]

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.[37]

12 Conditions of Use

12.1 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.

12.2 Structural substrate shall be designed to support the required loads in accordance with the application sections in IBC Chapter 16 and IRC Section R301.

12.3 Where the prescriptive double top face lateral resistance in **Table 4** is used, the furring member shall comply with Section 6.3.4. Other furring or girt materials and configurations shall be designed for the applicable uplift and lateral loads.

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12.4 Cantilevered furring, girts, or other supported members that extend beyond the outermost bracket and introduce eccentric uplift, prying, or bending moment are outside the prescriptive scope of the tabulated connection values unless specifically engineered or provided with supplemental support or strapping.

12.5 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:

12.5.1 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.

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

12.5.3 These innovative products have an internal quality control program and a third-party quality assurance program.

12.5.4 At a minimum, these innovative products shall be installed per **Section 9**.

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

12.5.6 This innovative products 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.

12.5.7 The application of these innovative products 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.

12.6 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.

12.7 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).

12.8 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 X-Brackets Continuous Insulation System and Batt-Bracket Continuous Insulation System, as listed in **Section 1.1** and **Section 1.2**, are identified by a label on the product 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 insofast.com.

14 Review Schedule

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

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

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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

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[29] 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.

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

[31] 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

[32] 2021 IBC Section 104.11

[33] 2021 IRC Section R104.11

[34] 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

[35] 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.

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

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

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