DrJ™ CERTIFICATION

ANAB ANSI National Accreditation Board ACCREDITED ISO/IEC 17065 PRODUCT CERTIFICATION BODY

IAF MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT

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Technical Evaluation Report

TER 2101-01

Trufast® SIP Fasteners for Use in Vented and Non-Vented Nailable Insulation Panels in Roofing Applications

Altenloh, Brinck & Co. US, Inc.

Products:

SIPTP
SIPLD
SIPHD

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Subject to Renewal:

April 1, 2022

COMPANY
INFORMATION:

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DIVISION: 04 00 00 - MASONRY

SECTION: 05 05 23 - Metal Fastenings

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

SECTION: 06 05 23 - Wood, Plastic, and Composite Fastenings

1 PRODUCT EVALUATED[1]

1.1 SIPTP
SIPLD
SIPHD

2 APPLICABLE CODES AND STANDARDS[2,3]

2.1 *Codes*

2.1.1 *IBC—12, 15, 18: International Building Code®*

2.1.2 *IRC—12, 15, 18: International Residential Code®*

2.2 *Standards and Referenced Documents*

2.2.1 *AISI S100: North American Specification for the Design of Cold-formed Steel Structural Members*

2.2.2 *AISI S904: Standard Test Methods for Determining the Tensile and Shear Strength of Screws*

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

2.2.4 *ASTM A370: Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

2.2.5 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*

2.2.6 *ASTM D6294: Standard Test Method for Corrosion Resistance of Ferrous Metal Fastener Assemblies Used in Roofing and Waterproofing*

2.2.7 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*

2.2.8 *DOC PS 1: Structural Plywood*

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

[2] Unless otherwise noted, all references in this TER are from the 2018 version of the codes and the standards referenced therein. This material, design, or method of construction also complies with the 2000-2015 versions of the referenced codes and the standards referenced therein.

[3] All terms defined in the applicable building codes are italicized.

2.2.9 *DOC PS 2: Performance Standard for Wood-based Structural-use Panels*

2.2.10 *FM 4470: Approval Standard for Single-Ply Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction*

3 Performance Evaluation

3.1 Trufast® SIPTP, SIPLD, and SIPHD (Trufast® SIP) fasteners were evaluated for use in attaching vented and non-vented nailable insulation panels to approved substrates. The fasteners were evaluated to resist uplift due to wind loads and shear loads due to dead and live loads.

3.2 The scope of this TER includes attachment of vented and non-vented nailable insulation panels to wood and steel roof decks.

3.2.1 For installation on wood roof decks, the scope of this TER is limited to vented nailable insulation panels with a maximum 2" vent space plus a maximum of 8.5" of foam insulation (total thickness 10.5") or a non-vented nailable insulation panel with a total thickness of 10.5".

3.2.2 For installation on steel roof decks, the scope of this TER is limited to vented nailable insulation panels with a maximum 2" vent space plus a maximum of 12" of foam insulation (total thickness 14"), or a non-vented nailable insulation panel with a total thickness of 14".

3.3 The scope of this TER includes connections of nailable insulation panels as described in Section 4.2 and 4.3 to roof decks as described in Section 4.4.

3.4 For evaluation of SIPTP, SIPLD, and SIPHD fastener properties see TER 1909-04.

3.5 Use of fasteners in locations exposed to saltwater and saltwater spray are outside the scope of this TER.

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

3.7 Any engineering evaluation conducted for this TER was performed within DrJ's ANAB "accredited ICS code scope" and/or the defined professional engineering scope of work on the dates provided herein.

4 Product Description and Materials

4.1 *Fasteners*

4.1.1 SIPTP (thread point) fasteners are size No. 14 fasteners with a pancake head and a T-30 drive. The point is a threaded drill point. The SIPTP fastener is shown in Figure 1.

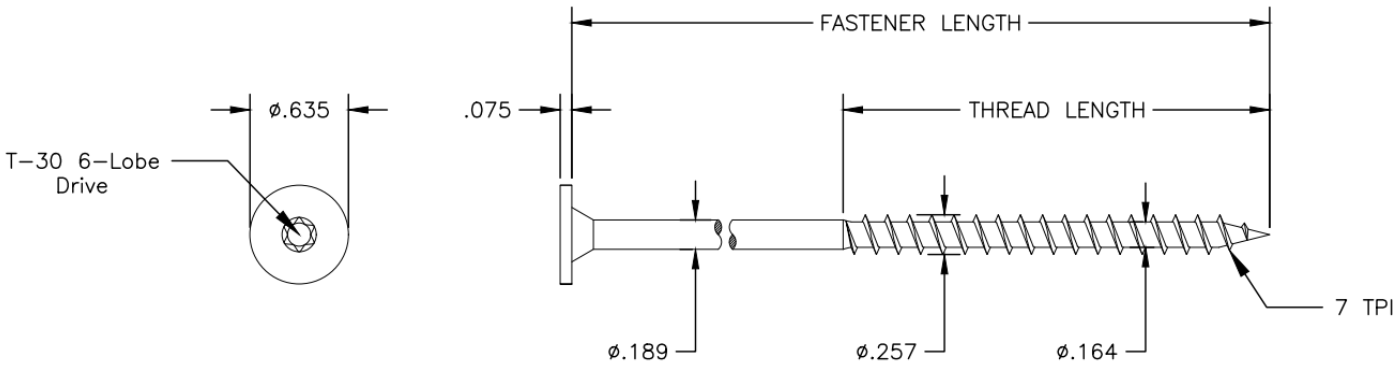

FIGURE 1. SIPTP FASTENER

4.1.2 SIPLD (light-duty) fasteners are size No. 14 fasteners with a pancake head and a T-30 drive. The point is a two-flute formed drill tip. The SIPLD fastener is shown in Figure 2.

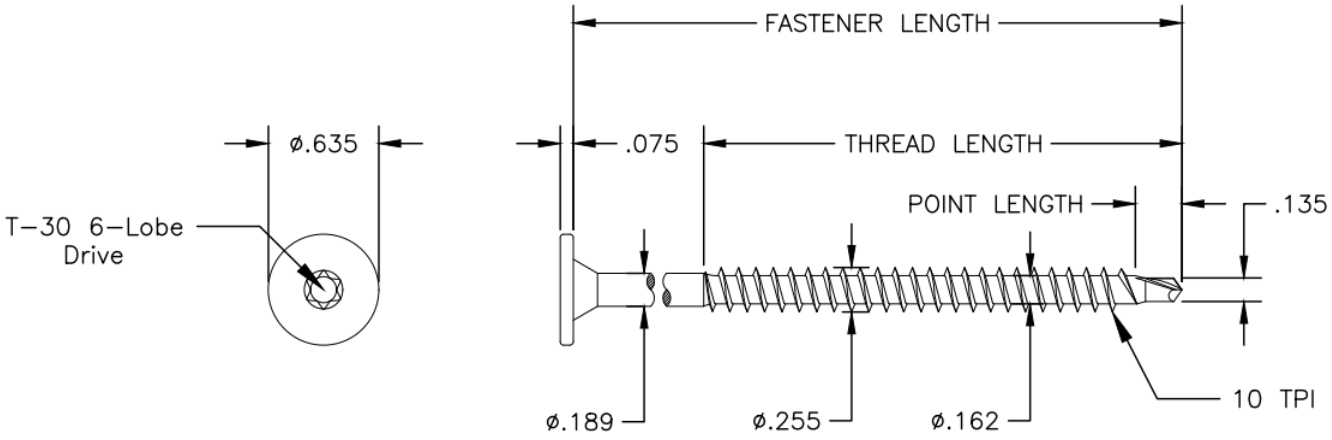

FIGURE 2. SIPLD FASTENER

4.1.3 SIPHD (heavy-duty) fasteners are size No. 14 fasteners with a pancake head and a T-30 drive. The point is a two-flute formed drill tip. The SIPHD fastener is shown in Figure 3.

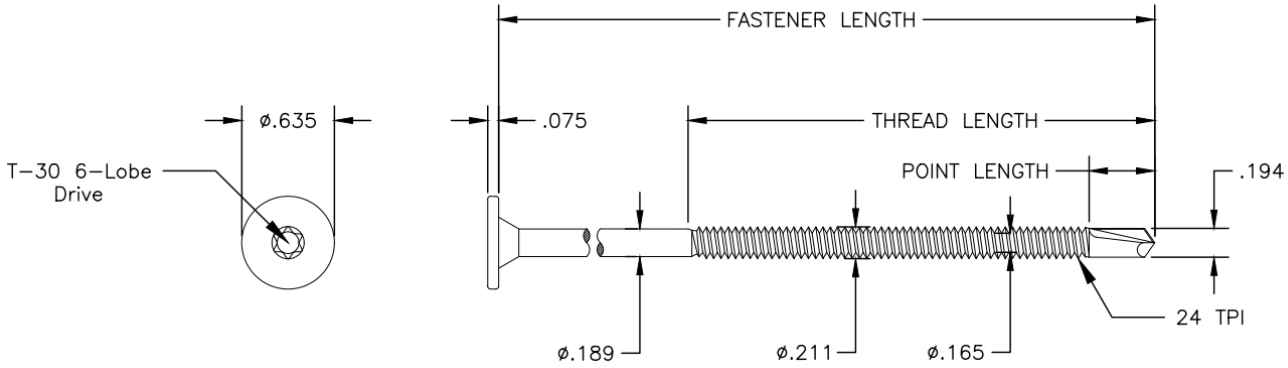

FIGURE 3. SIPHD FASTENER

4.1.4 SIP fasteners are coated with Trufast® Tru-Kote™ coating.

4.1.4.1 SIP fasteners coated with Trufast® Tru-Kote™ were tested and passed *ASTM D6294* with less than 15% red rust after 15 cycles, in accordance with *FM 4470*.

4.1.5 The fasteners evaluated in this TER are set forth in Table 1, Table 2, and Table 3.

TABLE 1. SIPTP FASTENER SPECIFICATIONS

Fastener Name	Fastener Part Number	Head (in)		Nominal Length[1] (in)	Thread Length[1] (in)	Shank Diameter[2] (in)	Thread Diameter (in)		Nominal Bending Yield[3], f_{yb} (psi)	Allowable Fastener Strength (lb)		
		Diameter	Drive Type				Minor	Major		Tensile	Shear at Shank Diameter	Shear at Minor Diameter
SIPTP	SIPTP-2000	0.635	T-30	2.00	1.75	0.189	0.164	0.257	185,000	1,185	975	860
	SIPTP-2500			2.50								
	SIPTP-3000			3.00	2.00							
	SIPTP-3500			3.50								
	SIPTP-4000			4.00	2.75							
	SIPTP-4500			4.50								
	SIPTP-5000			5.00								
	SIPTP-5500			5.50								
	SIPTP-6000			6.00								
	SIPTP-6500			6.50								
	SIPTP-7000			7.00								
	SIPTP-7500			7.50								
	SIPTP-8000			8.00								
	SIPTP-8500			8.50								
	SIPTP-9000			9.00								
	SIPTP-10000			10.00								
	SIPTP-11000			11.00								
	SIPTP-12000			12.00								
	SIPTP-13000			13.00								
	SIPTP-14000			14.00								
	SIPTP-15000			15.00								
	SIPTP-16000			16.00								
	SIPTP-18000			18.00								

SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N, 1 psi = 0.00689 MPa

1. Fastener length is measured from the underside of the head to the tip. Thread length includes tapered tip (see Figure 1).
2. Shank diameter based on manufactured thickness. Finished dimensions are larger, due to the proprietary coatings added.
3. Nominal bending yield, F_{yb}, is measured along the threaded portion of the fastener. For the nominal bending yield of the fastener along the shank, take a 10% reduction.

TABLE 2. SIPLD FASTENER SPECIFICATIONS

Fastener Name	Fastener Part Number	Head (in)		Nominal Length[1] (in)	Thread Length[1] (in)	Point Length (in)	Shank Diameter[2] (in)	Thread Diameter (in)		Nominal Bending Yield[3], f_{yb} (psi)	Allowable Fastener Strength (lb)		
		Diameter	Drive Type					Minor	Major		Tensile	Shear at Shank Diameter	Shear at Minor Diameter
SIPLD	SIPLD-2250	0.635	T-30	2.25	1.00	0.125	0.189	0.162	0.255	185,000	1,130	945	830
	SIPLD-3000			3.00	2.75	0.275							
	SIPLD-3250			3.25	1.50	0.125							
	SIPLD-3500			3.50	2.75	0.275							
	SIPLD-4000			4.00									
	SIPLD-4250			4.25	2.00	0.125							
	SIPLD-4500			4.50	2.75	0.275							
	SIPLD-5000			5.00									
	SIPLD-5250			5.25	2.50	0.125							
	SIPLD-5500			5.50	2.75	0.275							
	SIPLD-6000			6.00									
	SIPLD-6500			6.50									
	SIPLD-7000			7.00									
	SIPLD-7500			7.50									
	SIPLD-8000			8.00									
	SIPLD-8500			8.50									
	SIPLD-9000			9.00									
	SIPLD-9500			9.50									
	SIPLD-10000			10.00									
	SIPLD-11000			11.00									
	SIPLD-12000			12.00									
	SIPLD-13000			13.00									
	SIPLD-14000			14.00									
	SIPLD-15000			15.00									
	SIPLD-16000			16.00									
	SIPLD-18000			18.00									

SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N, 1 psi = 0.00689 MPa

1. Fastener length is measured from the underside of the head to the tip. Thread length includes tapered tip (see Figure 2).
2. Shank diameter based on manufactured thickness. Finished dimensions are larger, due to the proprietary coatings added.
3. Nominal bending yield, F_{yb}, is measured along the threaded portion of the fastener. For the nominal bending yield of the fastener along the shank, take a 10% reduction.

TABLE 3. SIPHD FASTENER SPECIFICATIONS

Fastener Name	Fastener Part Number	Head (in)		Nominal Length[1] (in)	Thread Length[1] (in)	Point Length (in)	Shank Diameter[2] (in)	Thread Diameter (in)		Nominal Bending Yield[3], f_{yb} (psi)	Allowable Fastener Strength (lb)		
		Diameter	Drive Type					Minor	Major		Tensile	Shear at Shank Diameter	Shear at Minor Diameter
SIPHD	SIPHD-2250	0.635	T-30	2.25	1.00	0.125	0.189	0.165	0.211	185,000	1,285	1,015	875
	SIPHD-3250			3.25	1.50								
	SIPHD-4250			4.25	2.00								
	SIPHD-4500			4.50	3.19	0.450							
	SIPHD-5250			5.25	2.50	0.125							
	SIPHD-6000			6.00	3.88	0.450							
	SIPHD-8000			8.00									
	SIPHD-9000			9.00									
	SIPHD-9750			9.75									
	SIPHD-11750			11.75									
	SIPHD-13750			13.75									

SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N, 1 psi = 0.00689 MPa

1. Fastener length is measured from the underside of the head to the tip. Thread length includes tapered tip (see Figure 3).
2. Shank diameter based on manufactured thickness. Finished dimensions are larger, due to the proprietary coatings added.
3. Nominal bending yield, F_{yb}, is measured along the threaded portion of the fastener. For the nominal bending yield of the fastener along the shank, take a 10% reduction.

4.2 *Vented and Non-Vented Nailable Insulation Panels*

4.2.1 Vented nailable insulation panels are a composite of single layer of OSB or plywood material, vent spacer, and a rigid insulation board. Vented nailable insulation panels have an air space, formed by blocking, between the wood facer and foam insulation.

4.2.2 Non-Vented nailable insulation panels are a composite of a single layer of OSB or plywood material and a rigid insulation board.

4.2.3 *Rigid Insulation Board:*

4.2.3.1 Expanded polystyrene (EPS) shall be *ASTM C578* Type 1, at a minimum.

4.2.3.2 Polyisocyanurate (polyiso) insulation shall be *ASTM C1289,* Type II Class 1 Grade 2 minimum or Type II Class 2 Grade 2 minimum.

4.2.3.3 EPS and polyiso products with greater density and compressive strength than the types listed above are also allowed.

4.2.4 *Vent Spacers:*

4.2.4.1 Vent spacers shall be constructed of either EPS or wood blocking per manufacturer's specifications.

4.2.5 *Nailable Surface:*

4.2.5.1 Facing material shall be a minimum:

4.2.5.1.1 7/16" thick OSB with a specific gravity of at least 0.50 and comply with *DOC PS 2.*

4.2.5.1.2 19/32" thick plywood with a specific gravity of at least 0.50 and comply with *DOC PS 1.*

4.3 *Field Fabricated Nailable Insulation Panels*

4.3.1 Nailable insulation panels may also consist of OSB or plywood, over layer(s) of foam insulation, with or without a vent space.

4.3.2 Where fire retardant treated (FRT) plywood is used as a nail base, the appropriate reduction factors shall be taken, per the FRT manufacturer.

4.4 *Substrate Materials*

4.4.1 *Wood Roof Deck:*

4.4.1.1 Wood roof decks must meet the requirements of the nailable insulation panel manufacturer, or one of the following, whichever is most restrictive:

4.4.1.1.1 Solid sawn wood (plank or tongue and groove) shall be a minimum 1" thick and have a specific gravity of at least 0.42.

4.4.1.1.2 Plywood shall be a minimum 1/2" thick with a specific gravity of at least 0.39 and comply with *DOC PS 1*.

4.4.1.1.3 OSB shall be a minimum 7/16" thick with a specific gravity of at least 0.50 and comply with *DOC PS 2*.

4.4.2 *Steel Roof Deck:*

4.4.2.1 Steel must comply with one of the material standards provided in Section A3.1 of *AISI S100*.

4.4.2.1.1 The steel deck shall be 18 to 22 gauge and have a minimum tensile strength of 45 ksi (e.g., *ASTM A653* Gr. 33, *ASTM A1063* Gr. 33, etc.).

5 APPLICATIONS

5.1 Trufast® SIP fasteners are self-tapping fasteners used for attaching vented and non-vented nailable insulation panels to approved roof decks.

5.2 Unless otherwise noted, adjustment of the design stresses for load duration shall be in accordance with the applicable code.

5.3 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

5.4 *Connections in Wood Roof Deck*

5.4.1 SIPTP and SIPLD fasteners are approved for attaching vented nailable insulation panels in roof assemblies with a maximum 2" vent space plus a maximum of 8.5" of foam insulation (total of 10.5" space between nailable insulation panels face and roof deck) to wood decking, or a non-vented nailable insulation panel with a total of 10.5" space between the nailable insulation panel face and roof deck.

5.4.2 Design of SIPTP and SIPLD fasteners is governed by the applicable code and the provisions for dowel-type fasteners in *NDS*.

5.4.3 The required number of fasteners per nailable insulation panels is selected by choosing the largest value for the applicable wind speed and snow/seismic load from Section 5.4.7 or Section 5.4.8 and Section 5.4.9, respectively.

5.4.4 Nailable insulation panels shall be attached through the foam insulation to the roof deck or wood framing (if approved by the nailable insulation panel manufacturer) spaced a maximum of 24" on-center, per the nailable insulation panel manufacturer's specifications and installation instructions.

5.4.5 Fastener thread shall penetrate a minimum 1" into sawn lumber decks (plank or tongue and groove) and achieve full thickness penetration and extend 3/4" beyond the underside of the board where driven into OSB and Plywood decks.

5.4.6 Where FRT plywood nailable insulation panels are used, the tabulated allowable minimum number of fasteners shall be divided by the FRT manufacturer's strength reduction factor for screw connections.

5.4.6.1 For example, where 1/2" FRT plywood is used and the FRT manufacture specifies a strength design factor of 0.90 for wood screws:

5.4.6.1.1 Table 4 requires 20 fasteners to resist a 120 mph wind load on Roof Zone 3 of a 3:12 roof pitch sheathed with standard 1/2" plywood. If 1/2" FRT plywood is used in place of 1/2" standard plywood, the required number of fasteners is 20÷0.90=22.2. Therefore, 23 fasteners are required.

5.4.7 *ASCE 7-10 Wind Loading:*

5.4.7.1 The required number of fasteners per 4'x8' nailable insulation panel to resist wind loads on gable, hip, and monoslope roofs per *ASCE 7-10* are provided in Table 4.

TABLE 4. CONNECTION TO WOOD ROOF DECK: FASTENER REQUIREMENTS TO RESIST ASCE 7-10 WIND LOADS

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[5,6,7,8,9]												
Wind Speed (mph)	**100**		**120**		**140**		**160**		**180**		**200**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
7/16" OSB[1]												
Roof Zone 1	15	15	16	15	20	16	24	20	28	24	36	28
Roof Zone 2	15	15	20	15	24	16	32	24	40	28	48	32
Roof Zone 3	20	15	28	15	40	16	52	24	64	28	80	32
½" Plywood[2]												
Roof Zone 1	15	15	15	15	16	15	16	16	24	16	28	20
Roof Zone 2	15	15	16	15	20	15	24	16	28	20	36	24
Roof Zone 3	16	15	20	15	28	15	36	16	48	20	56	24
19/32" Plywood[3] or SPF[4]												
Roof Zone 1	15	15	15	15	15	15	15	15	16	15	20	16
Roof Zone 2	15	15	15	15	16	15	20	15	24	16	28	20
Roof Zone 3	15	15	16	15	20	15	28	15	36	16	44	20

SI: 1 mph = 1.61 km/h

1. Minimum 7/16" OSB with a specific gravity of at least 0.50 that complies with *DOC PS 2*
2. Minimum ½" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
3. Minimum 19/32" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
4. Minimum 1" thick SPF (specific gravity 0.42)
5. Table based on ASCE 7-10 wind components and cladding part 1 low-rise rise (h ≤ 60 ft).
6. Tabulated values apply to hip, gable, and monoslope roofs only for wind exposure B or C.
7. Tabulated values assume K_z = 1.13, K_{zt} = 1.0, and K_d = 0.85. Tabulated values may be adjusted to account for site-specific conditions.
8. See ASCE 7-10 Chapter 30 for roof zone locations.
9. Tabulated values are based on a load duration factor C_D = 1.6. No further increases are permitted.

5.4.8 *ASCE 7-16 Wind Loading:*

5.4.8.1 The required number of fasteners per 4'x8' nailable insulation panel to resist wind loads on gable, hip, and monoslope roofs per *ASCE 7-16* are provided in Table 5, Table 6 , and Table 7, respectively.

TABLE 5. CONNECTION TO WOOD ROOF DECK: FASTENER REQUIREMENTS TO RESIST ASCE 7-16 WIND LOADS - GABLE ROOFS

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[5,6,7,8,9]												
Wind Speed (mph)	**100**		**120**		**140**		**160**		**180**		**200**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
7/16" OSB[1]												
Roof Zone 1	16	15	20	20	28	24	36	32	44	40	56	48
Roof Zone 2	20	16	32	20	40	28	52	36	68	44	80	56
Roof Zone 3	24	20	36	24	48	36	64	44	80	56	96	68
½" Plywood[2]												
Roof Zone 1	15	15	16	16	20	20	28	24	32	28	40	36
Roof Zone 2	16	15	24	16	32	20	40	28	48	32	60	40
Roof Zone 3	20	15	28	20	36	24	48	32	56	40	72	48
19/32" Plywood[3] or SPF[4]												
Roof Zone 1	15	15	15	15	16	16	20	20	24	24	28	28
Roof Zone 2	15	15	16	15	24	16	28	20	36	24	44	28
Roof Zone 3	16	15	20	16	28	20	36	24	44	32	52	36

SI: 1 mph = 1.61 km/h

1. Minimum 7/16" OSB with a specific gravity of at least 0.50 that complies with *DOC PS 2*
2. Minimum ½" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
3. Minimum 19/32" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
4. Minimum 1" thick SPF (specific gravity 0.42)
5. Table based on ASCE 7-16 wind components and cladding part 1 low-rise rise (h ≤ 60 ft).
6. Tabulated values apply to gable roofs only for wind exposure B or C.
7. Tabulated values assume K_z = 1.13, K_{zt} = 1.0, K_d = 0.85, and K_e = 1.0. Tabulated values may be adjusted to account for site-specific conditions.
8. See ASCE 7-16 Chapter 30 for roof zone locations.
9. Tabulated values are based on a load duration factor C_D = 1.6. No further increases are permitted.

TABLE 6. CONNECTION TO WOOD ROOF DECK: FASTENER REQUIREMENTS TO RESIST ASCE 7-16 WIND LOADS – MONOSLOPE ROOFS

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[5,6,7,8,9]												
Wind Speed (mph)	**100**		**120**		**140**		**160**		**180**		**200**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
7/16" OSB[1]												
Roof Zone 1	15	15	16	20	20	24	24	32	28	40	36	48
Roof Zone 2	15	16	16	20	24	28	28	36	36	44	44	56
Roof Zone 3	20	20	28	24	40	36	52	44	64	56	80	68
½" Plywood[2]												
Roof Zone 1	15	15	15	16	16	20	16	24	24	28	28	36
Roof Zone 2	15	15	15	16	16	20	20	28	28	32	32	40
Roof Zone 3	16	15	20	20	28	24	36	32	48	40	56	48
19/32" Plywood[3] or SPF[4]												
Roof Zone 1	15	15	15	15	15	16	15	20	16	24	20	28
Roof Zone 2	15	15	15	15	15	16	16	20	20	24	24	28
Roof Zone 3	15	15	16	16	20	20	28	24	36	32	44	36

SI: 1 mph = 1.61 km/h

1. Minimum 7/16" OSB with a specific gravity of at least 0.50 that complies with *DOC PS 2*
2. Minimum ½" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
3. Minimum 19/32" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
4. Minimum 1" thick SPF (specific gravity 0.42)
5. Table based on *ASCE 7-16* wind components and cladding part 1 low-rise rise ($h \leq 60$ ft).
6. Tabulated values apply to monoslope roofs only for wind exposure B or C.
7. Tabulated values assume $K_z = 1.13$, $K_{zt} = 1.0$, $K_d = 0.85$, and $K_e = 1.0$. Tabulated values may be adjusted to account for site-specific conditions.
8. See *ASCE 7-16* Chapter 30 for roof zone locations.
9. Tabulated values are based on a load duration factor $C_D = 1.6$. No further increases are permitted.

TABLE 7. CONNECTION TO WOOD ROOF DECK: FASTENER REQUIREMENTS TO RESIST ASCE 7-16 WIND LOADS - HIP ROOFS

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[5,6,7,8,9]												
Wind Speed (mph)	**100**		**120**		**140**		**160**		**180**		**200**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
7/16" OSB[1]												
Roof Zone 1	15	15	20	16	24	20	32	28	40	36	48	40
Roof Zone 2	20	16	28	24	36	32	44	44	56	52	72	64
Roof Zone 3	20	20	28	24	36	36	44	44	56	56	72	68
½" Plywood[2]												
Roof Zone 1	15	15	16	15	20	16	24	20	28	24	36	32
Roof Zone 2	16	15	20	20	28	24	32	32	44	40	52	48
Roof Zone 3	16	15	20	20	28	24	32	32	44	40	52	48
19/32" Plywood[3] or SPF[4]												
Roof Zone 1	15	15	15	15	16	15	20	16	24	20	28	24
Roof Zone 2	15	15	16	16	20	20	24	24	32	28	40	36
Roof Zone 3	15	15	16	16	20	20	24	24	32	32	40	36

SI: 1 mph = 1.61 km/h

1. Minimum 7/16" OSB with a specific gravity of at least 0.50 that complies with *DOC PS 2*
2. Minimum ½" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
3. Minimum 19/32" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
4. Minimum 1" thick SPF (specific gravity 0.42)
5. Table based on *ASCE 7-16* wind components and cladding part 1 low-rise rise ($h \leq 60$ ft).
6. Tabulated values apply to hip roofs only for wind exposure B or C.
7. Tabulated values assume $K_z = 1.13$, $K_{zt} = 1.0$, $K_d = 0.85$, and $K_e = 1.0$. Tabulated values may be adjusted to account for site-specific conditions.
8. See *ASCE 7-16* Chapter 30 for roof zone locations.
9. Tabulated values are based on a load duration factor $C_D = 1.6$. No further increases are permitted.

5.4.9 *Snow and Seismic Loading:*

5.4.9.1 The required number of fasteners per 4'x8' nailable insulation panel to resist snow and seismic loads are provided in Table 8 and Table 9.

5.4.9.2 The tables in this section may be used with *ASCE 7-10* or *ASCE 7-16*.

TABLE 8. CONNECTION TO WOOD DECK: FASTENER REQUIREMENTS TO RESIST SNOW LOADS UP TO 60 PSF

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[4,5,6]								
Snow Load (psf)	**30**		**40**		**50**		**60**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
$^{7}/_{16}$" OSB[1]								
Roof Zone – All	15	16	15	20	20	24	20	28
S_{DS} Max	1.154	1.121	0.811	1.375	1.161	1.591	0.873	1.779
½" Plywood[2] or SPF[3]								
Roof Zone – All	15	15	15	15	15	16	15	16
S_{DS} Max	2.819	3.015	2.314	2.411	1.898	2.178	1.550	1.711

SI: 1 psf = 0.0479 kN/m^2

1. Minimum $^{7}/_{16}$" OSB with a specific gravity of at least 0.50 that complies with *DOC PS 2*
2. Minimum ½" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
3. Minimum 1" thick SPF (specific gravity 0.42)
4. Tabulated snow load is a design snow load.
5. 10 psf dead load is assumed to act concurrently with snow load.
6. S_{DS} max per *ASCE 7* Section 13.5.3 for W_p assuming 10 psf dead load plus 0.2 snow load (sloped roof).
7. Tabulated values are based on a load duration factor C_D = 1.15 for the snow load case and 1.6 for the seismic load case. No further increases are permitted.

TABLE 9. CONNECTION TO WOOD DECK: FASTENER REQUIREMENTS TO RESIST SNOW LOADS UP TO 100 PSF

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[4,5,6]								
Snow Load (psf)	**70**		**80**		**90**		**100**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
$^{7}/_{16}$" OSB[1]								
Roof Zone – All	24	28	24	32	28	36	32	40
S_{DS} Max	1.058	1.367	0.817	1.546	0.982	1.704	1.126	1.846
½" Plywood[2] or SPF[3]								
Roof Zone – All	15	20	15	20	16	20	16	24
S_{DS} Max	1.255	2.295	1.001	1.877	0.940	1.505	0.737	2.008

SI: 1 psf = 0.0479 kN/m^2

1. Minimum $^{7}/_{16}$" OSB with a specific gravity of at least 0.50 that complies with *DOC PS 2*
2. Minimum ½" plywood with a specific gravity of at least 0.39 that complies with *DOC PS 1*
3. Minimum 1" thick SPF (specific gravity 0.42)
4. Tabulated snow load is a design snow load.
5. 10 psf dead load is assumed to act concurrently with snow load.
6. S_{DS} max per *ASCE 7* Section 13.5.3 for W_p assuming 10 psf dead load plus 0.2 snow load (sloped roof).
7. Tabulated values are based on a load duration factor C_D = 1.15 for the snow load case and 1.6 for the seismic load case. No further increases are permitted.

5.5 *Connections in Steel Roof Deck*

5.5.1 SIPLD and SIPHD fasteners are approved for attaching nailable insulation panels with a maximum 2" vent space plus a maximum of 12" of foam insulation to steel decking (total of 14" space between nailable insulation panel face and roof deck) or a non-vented nailable insulation panel with a total of 14" space between the nailable insulation panel face and roof deck.

5.5.2 The required number of fasteners per nailable insulation panel is selected by choosing the largest value for the applicable wind speed and snow load from Section 5.5.4 or Section 5.5.5 and Section 5.5.6, respectively.

5.5.3 Fastener length shall provide a minimum of 3/4" penetration through steel deck.

5.5.4 *ASCE 7-10 Wind Loading:*

5.5.4.1 The required number of fasteners per 4'x8' nailable insulation panel to resist wind loads on gable, hip, and monoslope roofs per ASCE 7-10 are provided in Table 10.

TABLE 10. CONNECTION TO STEEL DECK: FASTENER REQUIREMENTS TO RESIST ASCE 7-10 WIND LOADS

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[1,2,3,4,5]												
Wind Speed (mph)	**100**		**120**		**140**		**160**		**180**		**200**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
Roof Zone 1	15	15	15	15	15	15	20	15	25	20	30	20
Roof Zone 2	15	15	15	15	20	15	25	20	30	20	40	25
Roof Zone 3	15	15	25	15	30	15	40	20	50	20	60	25

SI: 1 mph = 1.61 km/h

1. Steel decking shall be 18 to 22 gauge and have a minimum ultimate tensile strength of 45 ksi.
2. Table based on *ASCE 7-10* wind components and cladding part 1 low-rise rise (h ≤ 60 ft).
3. Tabulated values apply to hip, gable, and monoslope roofs only for wind exposure B or C.
4. Tabulated values assume K_z = 1.13, K_{zt} = 1.0, and K_d = 0.85. Tabulated values may be adjusted to account for site-specific conditions.
5. See *ASCE 7-10* Chapter 30 for roof zone locations.

5.5.5 *ASCE 7-16 Wind Loading:*

5.5.5.1 The required number of fasteners per 4'x8' nailable insulation panel to resist wind loads on gable, monoslope, and hip roofs per ASCE 7-16 are provided in Table 11, Table 12, and Table 13, respectively.

TABLE 11. CONNECTION TO STEEL DECK: FASTENER REQUIREMENTS TO RESIST ASCE 7-16 WIND LOADS – GABLE ROOFS

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[1,2,3,4,5]												
Wind Speed (mph)	**100**		**120**		**140**		**160**		**180**		**200**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
Roof Zone 1	15	15	15	15	20	20	30	25	35	30	40	40
Roof Zone 2	15	15	25	15	30	20	40	30	50	35	60	40
Roof Zone 3	20	15	30	20	40	25	50	35	60	45	75	50

SI: 1 mph = 1.61 km/h

1. Steel decking shall be 18 to 22 gauge and have a minimum ultimate tensile strength of 45 ksi.
2. Table based on *ASCE 7-16* wind components and cladding part 1 low-rise rise (h ≤ 60 ft).
3. Tabulated values apply to gable roofs only for wind exposure B or C.
4. Tabulated values assume K_z = 1.13, K_{zt} = 1.0, K_d = 0.85, and K_e = 1.0. Tabulated values may be adjusted to account for site-specific conditions.
5. See *ASCE 7-16* Chapter 30 for roof zone locations.

TABLE 12. CONNECTION TO STEEL DECK: FASTENER REQUIREMENTS TO RESIST ASCE 7-16 WIND LOADS – MONOSLOPE ROOFS

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[1,2,3,4,5]												
Wind Speed (mph)	**100**		**120**		**140**		**160**		**180**		**200**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
Roof Zone 1	15	15	15	15	15	20	20	25	25	30	30	40
Roof Zone 2	15	15	15	15	20	20	25	30	30	35	35	40
Roof Zone 3	15	15	25	20	30	25	40	35	50	45	60	50

SI: 1 mph = 1.61 km/h

1. Steel decking shall be 18 to 22 gauge and have a minimum ultimate tensile strength of 45 ksi.
2. Table based on *ASCE 7-16* wind components and cladding part 1 low-rise rise (h ≤ 60 ft).
3. Tabulated values apply to monoslope roofs only for wind exposure B or C.
4. Tabulated values assume K_z = 1.13, K_{zt} = 1.0, K_d = 0.85, and K_e = 1.0. Tabulated values may be adjusted to account for site-specific conditions.
5. See *ASCE 7-16* Chapter 30 for roof zone locations.

TABLE 13. CONNECTION TO STEEL DECK: FASTENER REQUIREMENTS TO RESIST ASCE 7-16 WIND LOADS – HIP ROOFS

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[1,2,3,4,5]												
Wind Speed (mph)	**100**		**120**		**140**		**160**		**180**		**200**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
Roof Zone 1	15	15	15	15	20	15	25	20	30	25	40	30
Roof Zone 2	15	15	20	20	30	25	35	35	45	40	55	50
Roof Zone 3	15	15	20	20	30	25	35	35	45	45	55	50

SI: 1 mph = 1.61 km/h

1. Steel decking shall be 18 to 22 gauge and have a minimum ultimate tensile strength of 45 ksi.
2. Table based on *ASCE 7-16* wind components and cladding part 1 low-rise rise (h ≤ 60 ft).
3. Tabulated values apply to hip roofs only for wind exposure B or C.
4. Tabulated values assume K_z = 1.13, K_{zt} = 1.0, K_d = 0.85, and K_e = 1.0. Tabulated values may be adjusted to account for site-specific conditions.
5. See *ASCE 7-16* Chapter 30 for roof zone locations.

5.5.6 *Snow and Seismic Loading:*

5.5.6.1 The required number of fasteners per 4'x8' nailable insulation panel to resist snow loads are provided in Table 14 and Table 15.

5.5.6.2 The tables in this section may be used with *ASCE 7-10* or *ASCE 7-16*.

TABLE 14. CONNECTION TO STEEL DECK: FASTENER REQUIREMENTS TO RESIST SNOW LOADS UP TO 60 PSF

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[1,2,3,4]								
Snow Load (psf)	**30**		**40**		**50**		**60**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
Roof Zone – All	15	20	20	25	25	25	25	30
S_{DS} Max	0.510	0.815	0.729	1.022	0.910	0.604	0.642	0.797

SI: 1 psf = 0.0479 kN/m²

1. Steel decking shall be 18 to 22 gauge and have a minimum ultimate tensile strength of 45 ksi.
2. Tabulated snow load is a design snow load.
3. 10 psf dead load is assumed to act concurrently with snow load.
4. S_{DS} max per *ASCE 7* Section 13.5.3 for W_p assuming 10 psf dead load plus 0.2 snow load (sloped roof).

TABLE 15. CONNECTION TO STEEL DECK: FASTENER REQUIREMENTS TO RESIST SNOW LOADS UP TO 100 PSF

Minimum Number of Fasteners per 4'x8' Nailable Insulation Panel[1,2,3,4]								
Snow Load (psf)	**70**		**80**		**90**		**100**	
Roof Pitch	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**	**3:12 to 6:12**	**7:12 to 12:12**
Roof Zone – All	30	35	30	35	35	40	35	45
S_{DS} Max	0.802	0.966	0.579	0.626	0.722	0.786	0.532	0.928

SI: 1 psf = 0.0479 kN/m²

1. Steel decking shall be 18 to 22 gauge and have a minimum ultimate tensile strength of 45 ksi.
2. Tabulated snow load is a design snow load.
3. 10 psf dead load is assumed to act concurrently with snow load.
4. S_{DS} max per *ASCE 7* Section 13.5.3 for W_p assuming 10 psf dead load plus 0.2 snow load (sloped roof).

6 INSTALLATION

6.1 Installation shall comply with the manufacturer's installation instructions and this TER. In the event of a conflict between the manufacturer's installation instructions and this TER, the more restrictive shall govern.

6.2 Fasteners shall be installed with the appropriate rotating powered driver, per the manufacturer's instructions.

6.3 Fasteners shall not be struck with a hammer during installation.

6.4 Trufast® SIP fasteners shall be evenly spaced in equal rows along the nailable insulation panel, spaced 24" on center maximum. Depending on the deck framing spacing, additional fasteners from the minimum required per the tables in this TER may be required to achieve equal rows across the entire panel. In all cases, the installation shall comply with the nailable insulation manufacturer's specifications and installation recommendations.

6.5 Fasteners shall not be installed closer than 5/8" from any perimeter edge (edge distance) of the nailable surface of the vented or non-vented nailable insulation panel, subject to the panel manufacturer's instructions, whichever is more restrictive.

6.6 *Installation into Wood Substrates*

6.6.1 Fastener thread shall penetrate a minimum of 1″ (including the tip) into solid sawn lumber decking with a specific gravity of at least 0.42 (plank or tongue and groove).

6.6.2 Fastener thread shall fully penetrate the thickness of OSB or plywood decking and extend beyond the underside by a minimum of 3/4".

6.6.3 Lead holes are not required.

6.6.4 The underside of the fastener head shall be installed flush to the surface of the nailable insulation panel. Fasteners shall not be overdriven or underdriven.

6.6.5 Minimum requirements for attaching to wood joists/rafters shall be in accordance with Table 16; this application must be approved by the nailable insulation panel manufacturer. The requirements in Table 16 do not apply to continuous wood decking.

TABLE 16. SIPTP AND SIPLD MINIMUM SPACING, EDGE DISTANCE, AND END DISTANCE REQUIREMENTS IN WOOD JOISTS AND RAFTERS

Label[3]	Connection Geometry[1,2]	SIPTP and SIPLD (in)
A	Edge Distance – Load in any direction	5/8
B	End Distance – Load parallel to grain, towards end	3 7/8
	End Distance – Load parallel to grain, away from end	2 5/8
	End Distance – Load perpendicular to grain	2 5/8
C	Spacing between Fasteners in a Row – Parallel to grain	3 7/8
D	Spacing between Fasteners in a Row – Perpendicular to grain	2 5/8
E	Spacing between Rows of Fasteners – In-line	1 1/4
F	Spacing between Rows of Fasteners – Staggered	5/8

SI: 1 in. = 25.4 mm

1. Edge distances, end distances, and spacing of fasteners shall be sufficient to prevent splitting of the wood or as shown in this table, whichever is the more restrictive.
2. Values for "Spacing between Rows of Fasteners-Staggered" apply where the fasteners in adjacent rows are offset by one half of the "Spacing between Fasteners in a Row"
3. See Figure 4 for spacing requirement labels.

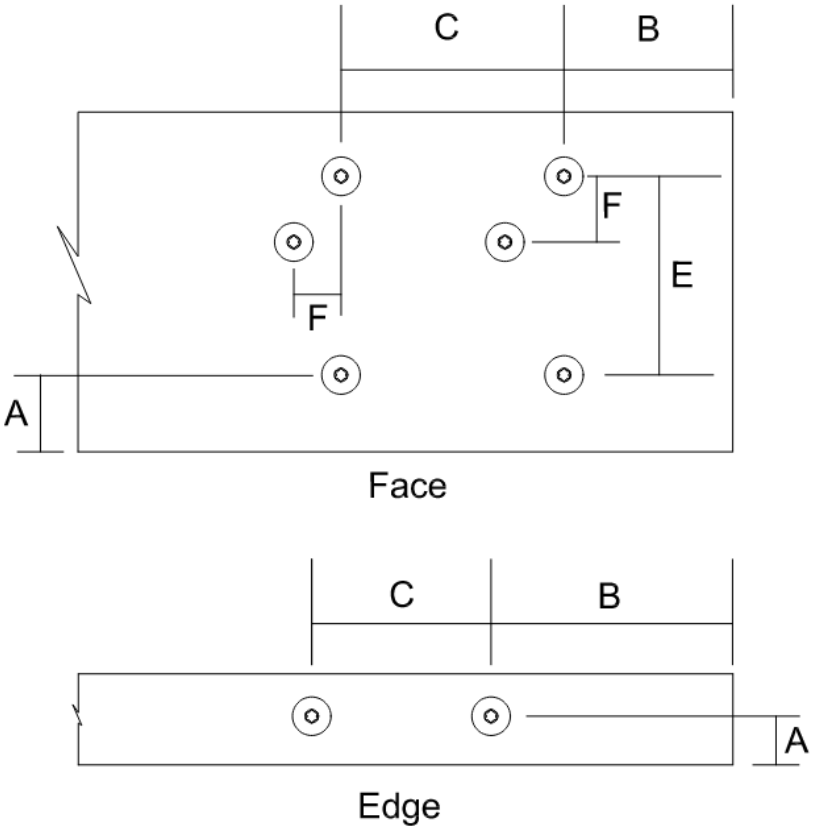

FIGURE 4. EXAMPLE OF FASTENER SPACING IN WOOD

6.7 *Installation into Steel Substrates*

6.7.1 Install using a maximum 2,000-rpm screw gun.

6.7.2 Minimum requirements for fastener spacing, edge distance, and end distance shall be in accordance with Table 17.

6.7.3 The fastener shall penetrate a minimum of 3/4" through the steel deck.

TABLE 17. SIPLD AND SIPHD MINIMUM SPACING, EDGE DISTANCE, AND END DISTANCE REQUIREMENTS IN STEEL

Connection Geometry	SIPLD and SIPHD (in)
Spacing Between Fastener	5/8
Edge Distance	3/8
End Distance	5/8
SI: 1 in. = 25.4 mm	

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 Fastener bending yield testing in accordance with *ASTM F1575*

7.1.2 Steel tensile strength in accordance with *ASTM A370*

7.1.3 Lateral shear strength in accordance with *ASTM D1761*

7.2 Information contained herein is the result of testing and/or data analysis by sources which conform to *IBC* Section 1703 and/or professional engineering regulations. DrJ relies upon accurate data to perform its ISO/IEC 17065 evaluations.

7.3 Where appropriate, DrJ's analysis is based on provisions that have been codified into law through state or local adoption of codes and standards. The providers of the codes and standards are legally responsible for their content. DrJ analysis may use code-adopted provisions as a control sample. A control sample versus a test sample establishes a product as being equivalent to that prescribed in this code in quality, *strength*, effectiveness, *fire resistance*, durability, and safety. Where the accuracy of the provisions provided herein is reliant upon the published properties of materials, DrJ relies upon the grade mark, grade stamp, mill certificate, and/or test data provided by material suppliers to be minimum properties. DrJ analysis relies upon these properties to be accurate.

8 FINDINGS

8.1 When used and installed in accordance with this TER and the manufacturer's installation instructions, the product listed in Section 1.1 is approved for the following:

8.1.1 For use in attaching vented or non-vented nailable insulation panels to approved decks to resist uplift due to wind loads and shear loads due to dead, snow, and seismic loads.

8.2 This product has been evaluated in the context of the codes listed in Section 2 and is compliant with all known state and local building codes. Where there are known variations in state or local codes applicable to this TER, they are listed here.

8.2.1 No known variations

8.3 Building codes require data from valid *research reports* be obtained from *approved sources* (i.e., licensed *registered design professionals* [RDPs]).

8.3.1 Building official approval of a licensed RDP is performed by verifying the RDP and/or their business entity is listed by the licensing board of the relevant *jurisdiction*.

8.4 Agencies who are accredited through ISO/IEC 17065 have met the code requirements for approval by the *building official*. DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131 and employs RDPs.

8.5 Through ANAB accreditation and the IAF MLA, DrJ certification 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."

8.6 *IBC* Section 104.11 (*IRC* Section R104.11 and *IFC* Section 104.9 are similar) 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*.

9 CONDITIONS OF USE

9.1 Trufast® SIP fasteners shall be installed in dry lumber with a moisture content less than or equal to 19 percent.

9.2 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this TER.

9.3 Where required by the *building official*, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed, this TER and the installation instructions shall be submitted at the time of *permit* application.

9.4 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.

9.5 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 (e.g., *owner* or RDP).

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

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

9.8 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.

9.9 This TER shall be reviewed for code compliance by the AHJ in concert with *IBC* Section 104.

9.10 The implementation of this TER for this product is dependent on the design, quality control, third-party quality assurance, proper implementation of installation instructions, inspections required by *IBC* Section 110.3, and any other code or regulatory requirements that may apply.

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's name, product name, TER number, and other information to confirm code compliance.

10.2 Additional technical information can be found at www.trufast.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 current status of this TER, contact DrJ Certification.