Engineering Evaluation Report: **ATL041713-23**

Guide to Attaching Sheathing, Furring and/or Cladding through Atlas Continuous Foam Insulation to Wood Framing, Steel Framing, Concrete and CMU Substrates with TRUFAST SIP TP, SIP LD and Tru-Grip Fasteners

PRODUCT: TRUFAST SIP TP, SIP LD and Tru-Grip Fasteners
DIVISION: Metal (05)
SECTION: Fastenings (05 05 23)

Report Holder:
Atlas Roofing Corporation
2000 Riveredge Parkway NW
Atlanta, GA 30328

1. SUBJECT

TRUFAST SIP TP, SIP LD and Tru-Grip Fasteners **installed through the following products*:***

Atlas CI Wall Insulation Division
www.atlasroofing.com
EnergyShield
EnergyShield CGF (formerly Rboard)
EnergyShield Pro
EnergyShield Pro2
EnergyShield CGF PRO (formerly Rboard Pro)
EnergyShield Ply Pro

Atlas EPS Division
www.atlaseps.com
ThermalStar LCI
ThermalStar LCI-SS
ThermalStar Chrome
ThermalStar Nailbase

2. SCOPE

NTA, Inc. has evaluated the above product(s) for compliance with the applicable sections of the following codes:

- 2006, 2009, 2012 International Building Code (IBC)
- 2006, 2009, 2012 International Residential Code (IRC)

NTA, Inc. has evaluated the following properties of the above product(s):

- Connection lateral shear strength and wind pressure resistance analysis in accordance with AF&PA NDS – 05 and AISI S100-2007
- Fastener head pull-through strength
- Fastener withdrawal and pull-out strength

3. USES

3.1. General. *TRUFAST SIP TP, SIP LD and Tru-Grip Fasteners* may be used to secure sheathing, furring and/or cladding through continuous foam to structural wall elements (masonry, concrete, cold-formed steel, and/or wood framing) subject to the limitations and conditions of this report.

4. DESCRIPTION

4.1. The *TRUFAST SIP TP* fastener is a #14 thread-point screw that may be used to fasten to wood framing. The fastener dimensions are shown in Table 1. The fastener is available in lengths ranging from 2-inches to 18-inches and is manufactured with Tru-Kote coating. Install fastener using a maximum 2500 rpm screw gun until head is properly seated.

4.2. The *TRUFAST SIP LD* fastener is a #14 drill-point screw that may be used to fasten to wood framing, cold formed steel framing, CMU substrates. The fastener dimensions are shown in Table 1. The fastener is available in lengths ranging from 3-inches to 18-inches and is manufactured with Tru-Kote coating. Install fastener using a maximum 2500 rpm screw gun until head is properly seated. In CMU substrates, pre-drill a 3/16-inch diameter hole a minimum ½-inch deeper than fastener embedment.

4.3. The *TRUFAST Tru-Grip* fastener is a fluted concrete nail that may be used to fasten to concrete substrates. The fastener dimensions are shown in Table 1. The fastener is available in lengths ranging from 1.5-inches to 12-inches and is manufactured with Tru-Kote coating. Pre-drill a 3/16-inch diameter hole a minimum ½-inch deeper than fastener embedment. Install with a hammer until head is properly seated.

5. DESIGN

5.1. Overall Structural System. The scope of this report is limited to the evaluation of TRUFAST fasteners identified herein to resist shear and wind loading conditions when used to secure sheathing, furring and/or cladding through maximum 6-inch thick continuous insulation to wood, steel, concrete and CMU structural wall elements. The adequacy of the components secured by the connections described herein, including supporting wall and structure, are beyond the scope of this report.

5.2. Design Approval. Where required by the authority having jurisdiction, project specific details addressing the use of the TRUFAST fasteners identified herein shall be prepared by a registered design professional. The individual preparing such documents shall possess the necessary qualifications as required by the applicable code and the professional registration laws of the state where the construction is undertaken.

5.3. Design Loads. Design loads to be resisted by the connections shall be as required under the applicable building code. Loads on the TRUFAST fasteners shall not exceed the allowable loads noted in this report.

5.4. Allowable Loads. The applied dead and negative wind loads shall not exceed the loads provided in Table 2 through Table 5 for the specific connections described. For each of the connections types, attachment to concrete, CMU, cold-formed steel, and wood, shear and negative wind loading conditions are tabulated separately. The required fastener spacing shall be taken as the more restrictive spacing considering both shear and negative wind resistance.

For loading conditions not specifically addressed herein calculations demonstrating that the applied loads are less than the allowable loads described in this report shall be submitted to the code official for approval.

5.5. Seismic Design. Table 2 through Table 5 are applicable only to structures in Seismic Category A and B and where the Occupancy Category is I, II or III. Use of the connectors described herein in buildings having seismic design criteria exceeding these limits requires design by a licensed design professional.

6. INSTALLATION

6.1. General. Installation of the TRUFAST fasteners described herein shall be in accordance with this report, the manufacture's installation instructions, and the approved construction documents. In the event of a conflict between the manufacturer's published installation instructions and this report, this report shall govern. This report and the manufacturer's installation instructions shall be available at all times on the jobsite during installation.

6.2. Weather Protection. The connection assemblies described herein shall be protected from weather and contained within a weather-resistant exterior wall envelope complying with IBC Section 1403 or IRC Section R703. The design and specification of the weather-resistive covering, water-resistive barrier, flashing and drainage are not addressed herein and must be provided by the building designer.

7. CONDITIONS OF USE

TRUFAST fasteners, *as* described in this report, comply with the codes listed in Section 2.0, subject to the following conditions:

7.1. Installation complies with this report, the manufacturer's installation instructions and the approved construction documents.

8. EVIDENCE SUBMITTED

NTA, Inc. has examined the following evidence to evaluate this product:

8.1. Strength calculations in accordance with the *National Design Specification for Wood Construction*, 2005 Edition.

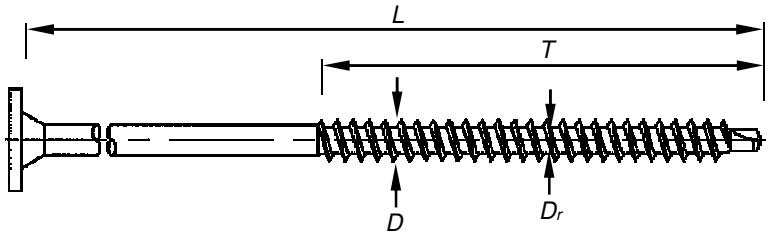
8.2. Strength calculations in accordance with the *AISI S100-2007, North American Specification for the Design of Cold-Formed Steel Structural Members*, 2007 Edition.

8.3. Testing on representative fastener shear, fastener head pull-through, fastener withdrawal, and fastener pull-out connection assemblies.

Evaluation evidence and data are on file with NTA, Inc. NTA, Inc. is accredited by the International Accreditation Service (IAS) as follows:

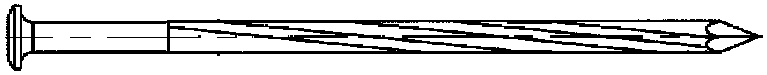
ISO17020 Inspection Agency
ISO17025 Testing Laboratory
ISO Guide 65 Product Certification Agency

The scope of accreditation related to testing, inspection or product certification pertain only to the test methods and/or standard referenced therein. Design parameters and the application of building code requirements, such as special inspection, have not been reviewed by IAS and are not covered in the accreditation. Product evaluations are performed under the direct supervision of Professional Engineers licensed in all jurisdictions within the United States as required by the building code and state engineering board rules.



TRUFAST SIP LD

TRUFAST SIP TP



TRUFAST Tru-Grip Fluted Concrete Nail

Figure 1: Fastener Geometry

Table 1: Fastener Dimensions and Properties

Fastener	Major Diameter, *D* (in.)	Root Diameter, D_r (in.)	Thread Length, *T* (in.)	Bending Yield Strength, F_{yb} (psi)
SIP LD	0.255	0.162	2.75	189,000
SIP TP	0.255	0.162	1.75 (min.)	185,000
Tru-Grip	0.212	0.190	n/a	176,000

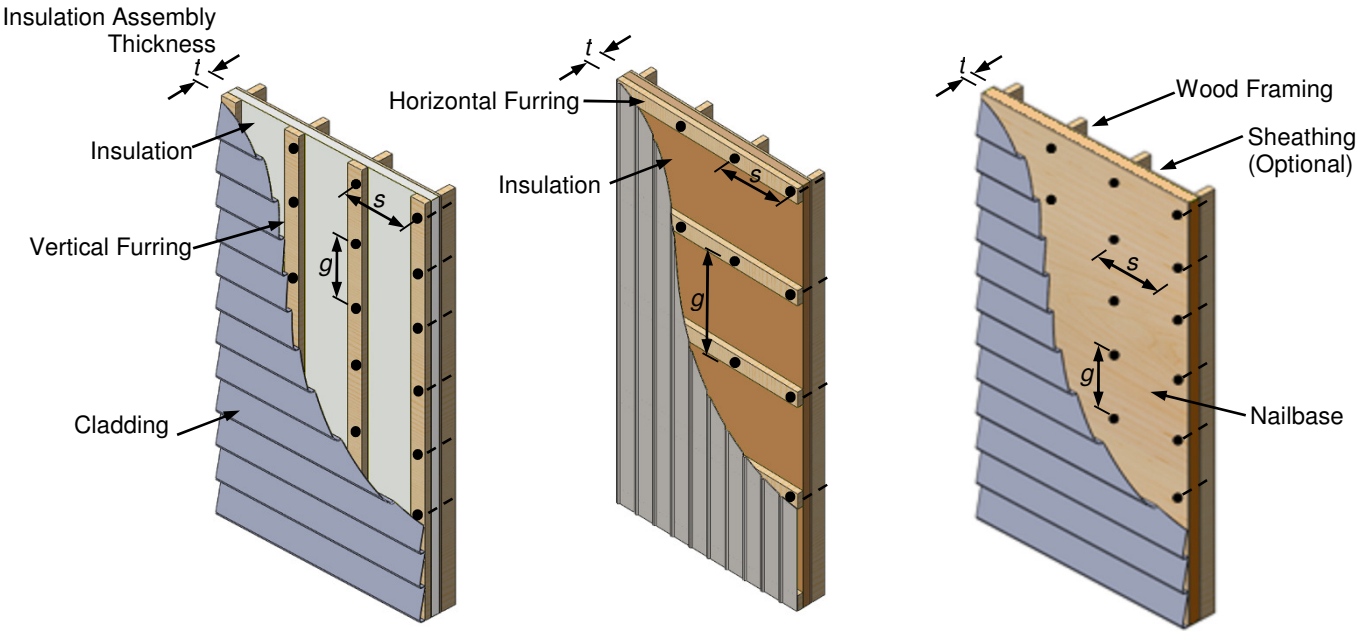


Figure 2: SIP TP or SIP LD into Wood Studs

Table 2a: Recommended Fastener Spacing for SIP TP and SIP LD Fasteners When Used to Support the Shear Load of Various Insulation Thickness and Assembly Weights into Wood Framing[1,2]

Horizontal Fastener Spacing, *s* (in. oc)	Insulation Assembly Thickness,[3] *t* (in.)	Shear Strength,[4] *V* (lbf/fastener)	Vertical Fastener Spacing, *g* (in. oc) — Maximum Insulation Assembly Weight to be Supported[7,8,9] (psf)						
			5	7.5	10	15	20	25	30
16”	1	49.9	24"	24"	24"	24"	16"	16"	12"
	1.5	37.3	24"	24"	24"	16"	16"	12"	8"
	2	29.6	24"	24"	24"	16"	12"	8"	8"
	3	20.8	24"	24"	16"	12"	8"	6"	6"
	4	16.0	24"	16"	12"	8"	6"	4"	4"
	5	13.0	16"	12"	8"	6"	4"	4"	
	6	11.0	16"	12"	8"	6"	4"		
24”	1	49.9	24"	24"	24"	16"	12"	8"	8"
	1.5	37.3	24"	24"	16"	12"	8"	8"	6"
	2	29.6	24"	16"	16"	8"	8"	6"	4"
	3	20.8	24"	16"	12"	8"	6"	4"	4"
	4	16.0	16"	12"	8"	6"	4"		
	5	13.0	12"	8"	6"	4"			
	6	11.0	12"	8"	6"	4"			

See Table 2 notes on next page.

Table 2b: Allowable Wind Pressure and Maximum Wind Speed For SIP TP or SIP LD Fastener into Wood Framing Based on Fastener Spacing and Wind Exposure[1,2,3]

Horizontal Fastener Spacing, *s* (in. oc)	Vertical Fastener Spacing, g (in. oc)	Allowable Wind Pressure[5], *p* (psf)	Maximum Wind Speed (mph) Based on Wind Exposure[6,8,9]					
			ASCE 7 – 05 IRC, 2006/2009 IBC			ASCE 7 – 10 2012 IBC		
			B	C	D	B	C	D
16	24	53.8	140	120	110	180	155	140
	16	80.6	175	145	135	220	190	175
	12	108	200	170	155	255	220	200
	8	161	245	210	195	315	270	250
	6	215	285	240	225	365	310	285
	4	323	350	295	275	450	380	355
24	24	35.8	115	95	90	145	125	115
	16	53.8	140	120	110	180	155	140
	12	71.7	165	140	130	210	175	165
	8	108	200	170	155	255	220	200
	6	143	230	195	180	295	255	235
	4	215	285	240	225	365	310	285

See Table 2 notes below.

Table 2 Notes:

[1] Furring material to be 7/16-inch thick, 24/16 Rated OSB (minimum specific gravity, G = 0.50), or equivalent. As shown in Figure 2, furring may be applied as a continuous sheet or in vertical or horizontal strips not less than 3-inches wide. Wood framing to have a minimum specific gravity, G = 0.42, (Spruce-Pine-Fir). Screw shall have sufficient length and be installed so that it penetrates the stud a minimum of 1.5-inches. The placement of structural sheathing over the framing is optional for the purposes of the connection designed herein. Use of sheathing over the framing shall be determined by the building designer.

[2] Tabulated vertical fastener spacing, *g*, does not consider the following: 1) the adequacy of the furring material and foam panels to span between fasteners; 2) securement of the water resistive barrier, flashing, and weather-resistive exterior covering. These items must be considered independently from this report in accordance with accepted practice. The more restrictive fastener spacing based on this report and these considerations shall apply.

[3] Rigid foam plastic insulation shall be expanded polystyrene (EPS) conforming to ASTM C578, or polyisocyanurate (ISO) conforming to ASTM C1289.

[4] Determined in accordance with the *National Design Specification for Wood Construction* (2005 Edition).

[5] Determined from fastener head pull-through testing in accordance with ASTM D1037. The allowable withdrawal strength and pull-through strength were taken as the average ultimate load divided by a factor of safety of 5.0 and multiplied by a load duration factor of 1.6 (allowable pull-through strength = 179 lbf, allowable withdrawal strength = 319 lbf).

[6] Three-second-gust wind speed; based on a building height of 30-feet, Zone 5, Importance Factor, I_w=1.0 and Topographic Factor, K_{zt}=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 in accordance with ASCE 7, 2005 edition, Section 6.4.2.2 (Component and Cladding); ASCE 7, 2010 edition, Section 30.4.2 and IRC Section R301.2.1. Pressure Equalization Factor, PEF=1.0.

[7] Insulation Assembly Weight shall include all materials supported including, but not limited to, furring, sheathing, continuous insulation, water-resistive barrier, flashing and weather-resistive exterior covering.

[8] Furring or sheathing type and thickness shall be selected based on the cladding manufacturer's installation instructions.

[9] Interpolation between table values is permitted.

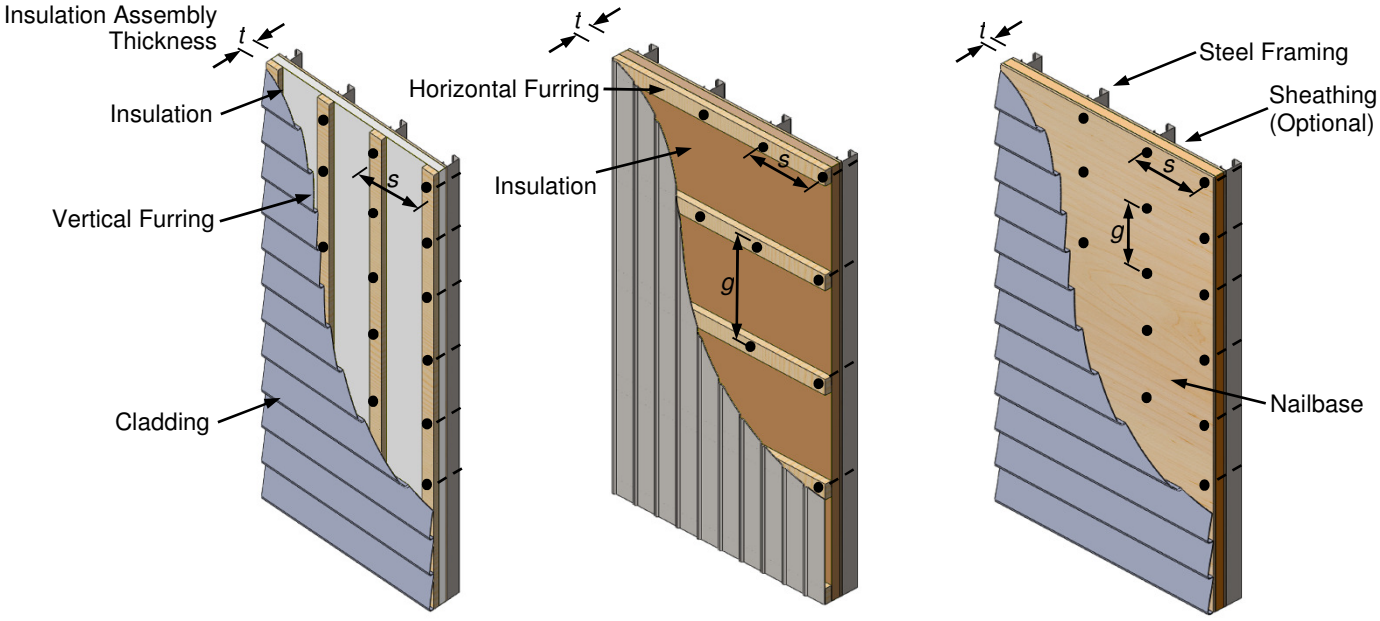


Figure 3: TRUFAST SIP LD into Cold-Formed Steel Studs

Table 3a: Recommended Fastener Spacing for SIP LD Fasteners When Used to Support the Shear Load of Various Insulation Thicknesses and Assembly Weights into Cold-Formed Steel Framing (0.0346" minimum thickness 20 ga.) [1,2]

Horizontal Fastener Spacing, *s* (in. oc)	Insulation Assembly Thickness,[3] *t* (in.)	Shear Strength[4] *V* (lbf/fastener)	Vertical Fastener Spacing, *g* (in. oc)						
			Maximum Insulation Assembly Weight to be Supported[7,8,9] (psf)						
			5	7.5	10	15	20	25	30
16"	1	21.0	16"	16"	16"	12"	8"	6"	6"
	1.5	14.0	16"	16"	12"	8"	6"	4"	4"
	2	10.5	16"	12"	8"	6"	4"	2"	2"
	3	7.0	12"	8"	6"	4"	2"	2"	2"
	4	5.3	8"	6"	4"	2"	2"		
	5	4.2	6"	4"	2"	2"			
	6	3.5	6"	4"	2"	2"			
24"	1	21.0	16"	16"	12"	8"	6"	4"	4"
	1.5	14.0	16"	8"	8"	4"	4"	2"	2"
	2	10.5	12"	8"	6"	4"	2"	2"	2"
	3	7.0	8"	4"	4"	2"	2"		
	4	5.3	6"	4"	2"	2"			
	5	4.2	4"	2"	2"				
	6	3.5	4"	2"	2"				

See Table 3 notes on next page.

Table 3b: Allowable Wind Pressure and Maximum Wind Speed for SIP LD Fastener into Cold-Formed Steel Based on Fastener Spacing and Wind Exposure[1,2,3]

Steel Design Thickness (in.)	Horizontal Fastener Spacing, *s* (in. oc)	Vertical Fastener Spacing, g (in. oc)	Allowable Wind Pressure[5], *p* (psf)	Maximum Wind Speed (mph) Based on Wind Exposure[5]					
				ASCE 7 – 05 IRC, 2006/2009 IBC			ASCE 7 – 10 2012 IBC		
				B	C	D	B	C	D
0.0346" (20 ga.)	16	16	64.8	160	135	125	205	175	160
		12	86	185	155	145	240	200	185
		8	130	230	195	180	295	250	230
		6	173	265	225	205	340	285	265
		4	259	325	275	250	420	355	325
	24	16	130	110	100	130	170	140	130
		12	150	130	120	150	195	165	150
		8	185	155	145	185	240	200	185
		6	215	180	165	215	275	235	215
		4	265	225	205	265	340	285	265
0.0451" (18 ga.)	16	16	80.6	175	145	135	220	190	175
		12	108	200	170	155	255	220	200
		8	161	245	210	195	315	270	250
		6	215	285	240	225	365	310	285
		4	323	350	295	275	450	380	355
	24	16	53.8	140	120	110	180	155	140
		12	71.7	165	140	130	210	175	165
		8	108	200	170	155	255	220	200
		6	143	230	195	180	295	255	235
		4	215	285	240	225	365	310	285

See Table 3 notes below.

Table 3 Notes:

[1] Furring material to be 7/16-inch thick, 24/16 Rated OSB (minimum specific gravity, $G = 0.50$), or equivalent. As shown in Figure 3, furring may be applied as a continuous sheet or in vertical or horizontal strips not less than 3-inches wide. Steel framing to have a minimum delivered base metal thickness of 33 mils (0.0346-inch design thickness) and a minimum tensile strength of 45.0 ksi. Screw shall have sufficient length and be installed so that it extends three threads beyond the inside face of the stud flange.

[2] Tabulated areas do not consider the following: 1) adequacy of the furring and/or foam sheathing to span between the wall framing members; 2) the adequacy of the furring material and foam sheathing to span between fasteners; 3) securement of the water resistive barrier, flashing, and weather-resistive exterior covering. These items must be considered independently from this report in accordance with accepted practice. The more restrictive fastener spacing based on this report and these considerations shall apply.

[3] Rigid foam plastic insulation shall be expanded polystyrene (EPS) conforming to ASTM C578, or polyisocyanurate conforming to ASTM C1289.

[4] Determined from assembly lateral strength testing. The allowable lateral strength was taken as the average ultimate load divided by a factor of safety of 5.0. The ultimate load was taken as the 5% offset yield load.

[5] Determined from fastener head pull-through testing in accordance with ASTM D1037. The allowable pull-through force was taken as the average ultimate load divided by a factor of safety of 5.0 and multiplied by a load duration factor of 1.6 (allowable pull-through strength = 179 lbf) and fastener pull-out strength determined using the *AISI S100-2007*, *North American Specification for the Design of Cold-Formed Steel Structural Members*, Chapter F (P_{not} = 269 (20 ga.) and P_{not} = 449 (18 ga.) with $\phi = 0.86$).

[6] Three-second-gust wind speed; based on a building height of 30-feet, Zone 5, Importance Factor, I_w=1.0 and Topographic Factor, K_{zt}=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 in accordance with ASCE 7, 2005 edition, Section 6.4.2.2 (Component and Cladding) ; ASCE 7, 2010 edition, Section 30.4.2 and IRC Section R301.2.1. Pressure Equalization Factor, PEF=1.0.

[7] Insulation Assembly Weight shall include all materials supported including, but not limited to, furring, sheathing, continuous insulation, water-resistive barrier, flashing and weather-resistive exterior covering.

[8] Furring or sheathing type and thickness shall be selected based on the cladding manufacturer's installation instructions.

[9] Interpolation between table values is permitted.

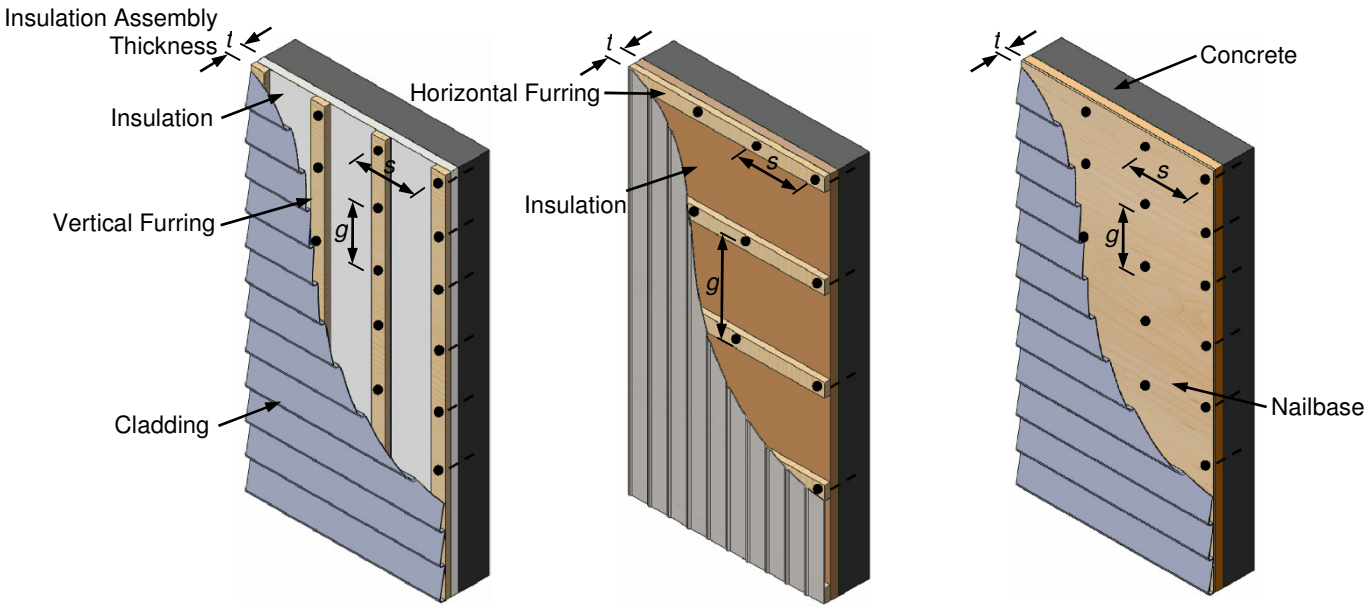


Figure 4: TRUFAST Tru-Grip into Concrete

Table 4a: Recommended Fastener Spacing for TRUFAST Tru-Grip Fasteners When Used to Support the Shear Load of Various Insulation Thickness and Assembly Weights into Concrete Substrates[1,2]

Horizontal Fastener Spacing, *s* (in. oc)	Insulation Assembly Thickness,[3] *t* (in.)	Shear Strength,[4] *V* (lbf/fastener)	Vertical Fastener Spacing, *g* (in. oc) — Maximum Insulation Assembly Weight to be Supported[7,8,9] (psf)						
			5	7.5	10	15	20	25	30
16”	1	68.4	24"	24"	24"	24"	24"	24"	16"
	1.5	50.6	24"	24"	24"	24"	16"	16"	12"
	2	40.0	24"	24"	24"	16"	16"	12"	8"
	3	28.0	24"	24"	24"	16"	12"	8"	8"
	4	21.4	24"	24"	16"	12"	8"	6"	6"
	5	17.4	24"	16"	12"	8"	6"	6"	4"
	6	14.6	24"	16"	12"	8"	6"	4"	4"
24”	1	68.4	24"	24"	24"	24"	16"	16"	12"
	1.5	50.6	24"	24"	24"	16"	12"	12"	8"
	2	40.0	24"	24"	16"	12"	8"	8"	6"
	3	28.0	24"	16"	16"	8"	8"	6"	4"
	4	21.4	24"	16"	12"	8"	6"	4"	4"
	5	17.4	16"	12"	8"	6"	4"	4"	
	6	14.6	16"	8"	8"	4"	4"		

See Table 4 notes on next page.

Table 4b: Allowable Wind Pressure and Maximum Wind Speed for TRUFAST Tru-Grip Fastener into Concrete Based on Fastener Spacing and Wind Exposure[1,2,3]

Horizontal Fastener Spacing, *s* (in. oc)	Vertical Fastener Spacing, g (in. oc)	Allowable Wind Pressure[5] *p* (psf)	Maximum Wind Speed (mph) Based on Wind Exposure[7,8,9]					
			ASCE 7 – 05 IRC, 2006/2009 IBC			ASCE 7 – 10 2012 IBC		
			B	C	D	B	C	D
16	24	31.4	105	90	85	135	115	105
	16	47.2	130	110	105	170	145	130
	12	62.9	155	130	120	195	165	155
	8	94.3	185	160	145	240	205	190
	6	126	215	185	170	280	235	220
	4	189	265	225	210	340	290	270
24	24	21.0	85	75	70	110	95	85
	16	31.4	105	90	85	135	115	105
	12	41.9	125	105	95	160	135	125
	8	62.9	155	130	120	195	165	155
	6	83.8	175	150	140	225	190	175
	4	126	215	185	170	280	235	220

See Table 4 notes below.

Table 4 Notes:

[1] Furring material to be 7/16-inch thick, 24/16 Rated OSB (minimum specific gravity, G = 0.50), or equivalent. As shown in Figure 4, may be applied as a continuous sheet or in vertical or horizontal strips not less than 3-inches wide. Concrete to have a minimum specified compressive strength of 2500 psi. Nail shall have sufficient length and be installed so that it penetrates the concrete a minimum of 1.5-inches.

[2] Tabulated areas do not consider the following: 1) the adequacy of the furring material and foam sheathing to span between fasteners; 2) the concrete strength in holding the fastener as a post-installed embedment; 3) securement of the water resistive barrier, flashing, and weather-resistive exterior covering. These items must be considered independently from this report in accordance with accepted practice. The more restrictive fastener spacing based on this report and these considerations shall apply.

[3] Rigid foam plastic insulation shall be expanded polystyrene (EPS) conforming to ASTM C578, or polyisocyanurate conforming to ASTM C1289.

[4] Determined in accordance with the *National Design Specification for Wood Construction* (2005 Edition). Shear strength does not consider concrete strength in holding the fastener as a post-installed embedment in accordance with ACI 318, Appendix D.

[5] Determined from fastener head pull-through testing in accordance with ASTM D1037. The allowable pull-through force was taken as the average ultimate load divided by a factor of safety of 5.0 and multiplied by a load duration factor of 1.6 (allowable pull-through strength = 179 lbf) . Allowable pressure does not consider concrete strength in holding the fastener as a post-installed embedment in accordance with ACI 318, Appendix D.

[6] Three-second-gust wind speed; based on a building height of 30-feet, Zone 5, Importance Factor, I_w=1.0 and Topographic Factor, K_{zt}=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 in accordance with ASCE 7, 2005 edition, Section 6.4.2.2 (Component and Cladding) ; ASCE 7, 2010 edition, Section 30.4.2 and IRC Section R301.2.1. Pressure Equalization Factor, PEF=1.0.

[7] Insulation Assembly Weight shall include all materials supported including, but not limited to, furring, sheathing, continuous insulation, water-resistive barrier, flashing and weather-resistive exterior covering.

[8] Furring or sheathing type and thickness shall be selected based on the cladding manufacturer's installation instructions.

[9] Interpolation between table values is permitted.

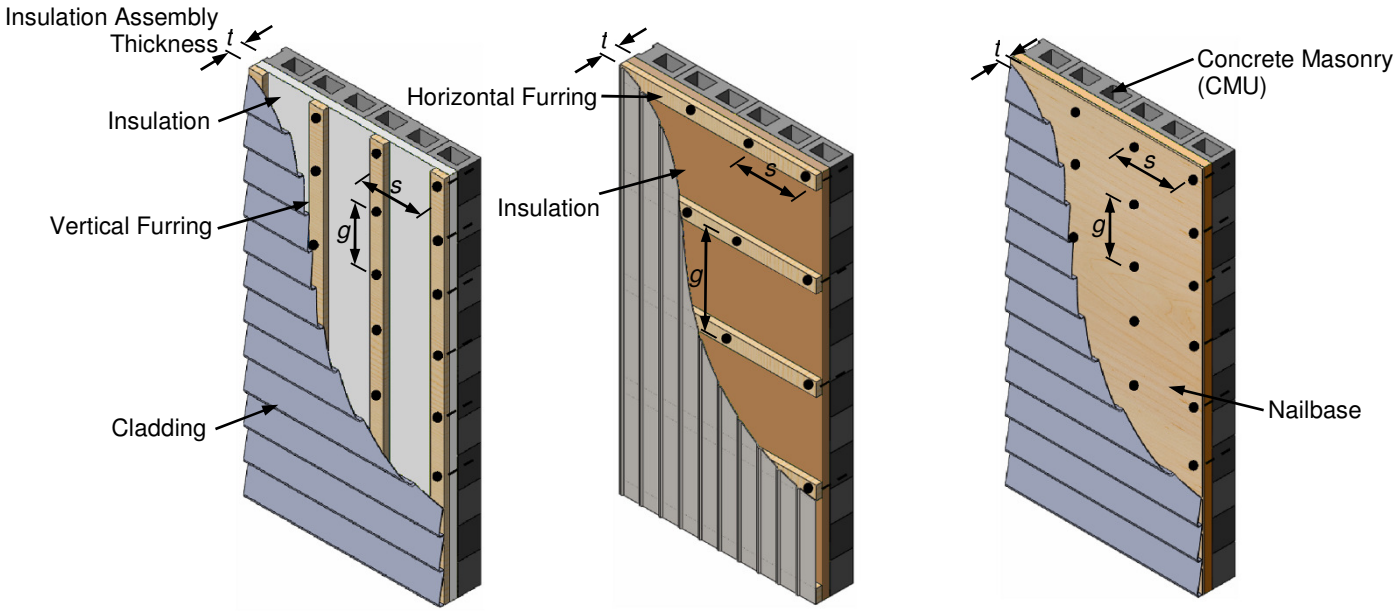


Figure 5: SIP LD into Concrete Masonry (CMU)

Table 5a: Recommended Fastener Spacing for SIP LD Fasteners When Used to Support the Shear Load of Various Insulation Thickness and Assembly Weights into Concrete Masonry (CMU) Substrates[1,2]

Horizontal Fastener Spacing, *s* (in. oc)	Insulation Assembly Thickness,[3] *t* (in.)	Shear Strength,[4] *V* (lbf/fastener)	Vertical Fastener Spacing, *g* (in. oc) — Maximum Insulation Assembly Weight to be Supported[7,8,9] (psf)						
			5	7.5	10	15	20	25	30
16”	1	52.9	24"	24"	24"	24"	16"	16"	12"
	1.5	38.9	24"	24"	24"	16"	16"	12"	8"
	2	30.6	24"	24"	24"	16"	12"	8"	8"
	3	21.3	24"	24"	16"	12"	8"	6"	6"
	4	16.4	24"	16"	12"	8"	6"	4"	4"
	5	13.2	16"	12"	8"	6"	4"	4"	--
	6	11.2	16"	12"	8"	6"	4"	4"	--
24”	1	52.9	24"	24"	24"	16"	12"	12"	8"
	1.5	38.9	24"	24"	16"	12"	8"	8"	6"
	2	30.6	24"	24"	16"	12"	8"	6"	6"
	3	21.3	24"	16"	12"	8"	6"	4"	4"
	4	16.4	16"	12"	8"	6"	4"	--	--
	5	13.2	12"	8"	6"	4"	--	--	--
	6	11.2	12"	8"	6"	4"	--	--	--

See Table 5 notes on next page.

Table 5b: Allowable Wind Pressure and Maximum Wind Speed For SIP LD Fastener into Concrete Masonry (CMU) Based on Fastener Spacing and Wind Exposure[1,2,3]

Horizontal Fastener Spacing, *s* (in. oc)	Vertical Fastener Spacing, g (in. oc)	Allowable Wind Pressure[5] *p* (psf)	Maximum Wind Speed (mph) Based on Wind Exposure[7,8,9]					
			ASCE 7 – 05 IRC, 2006/2009 IBC			ASCE 7 – 10 2012 IBC		
			B	C	D	B	C	D
16	24	33.6	110	95	85	140	120	110
	16	50.4	135	115	105	175	150	135
	12	67.2	160	135	125	200	170	160
	8	101	195	165	150	250	210	195
	6	134	225	190	175	290	245	225
	4	202	275	235	215	355	300	280
24	24	22.4	90	75	70	115	95	90
	16	33.6	110	95	85	140	120	110
	12	44.8	130	110	100	165	140	130
	8	67.2	160	135	125	200	170	160
	6	89.6	185	155	145	235	200	185
	4	134	225	190	175	290	245	225

See Table 5 notes below.

Table 5 Notes:

[1] Furring material to be 7/16-inch thick, 24/16 Rated OSB (minimum specific gravity, $G = 0.50$), or equivalent. As shown in Figure 4, may be applied as a continuous sheet or in vertical or horizontal strips not less than 3-inches wide. Masonry to have a minimum specified compressive strength of 2500 psi. Screw shall have sufficient length and be installed so that it penetrates the masonry a minimum of 1.5-inches.

[2] Tabulated areas do not consider the following: 1) the adequacy of the furring material and foam sheathing to span between fasteners; 2) the masonry strength in holding the fastener as a post-installed embedment; 3) securement of the water resistive barrier, flashing, and weather-resistive exterior covering. These items must be considered independently from this report in accordance with accepted practice. The more restrictive fastener spacing based on this report and these considerations shall apply.

[3] Rigid foam plastic insulation shall be expanded polystyrene (EPS) conforming to ASTM C578, or polyisocyanurate conforming to ASTM C1289.

[4] Determined in accordance with the *National Design Specification for Wood Construction* (2005 Edition). Shear strength does not consider masonry strength in holding the fastener as a post-installed embedment in accordance with ACI 318, Appendix D.

[5] Determined from fastener head pull-through testing in accordance with ASTM D1037. The allowable pull-through force was taken as the average ultimate load divided by a factor of safety of 5.0 and multiplied by a load duration factor of 1.6 (allowable pull-through strength = 179 lbf). Allowable pressure does not consider masonry strength in holding the fastener as a post-installed embedment in accordance with ACI 318, Appendix D.

[6] Three-second-gust wind speed; based on a building height of 30-feet, Zone 5, Importance Factor, I_w=1.0 and Topographic Factor, K_{zt}=1.0, Internal Pressure Coefficient, GC_{pi}=+/-0.18 in accordance with ASCE 7, 2005 edition, Section 6.4.2.2 (Component and Cladding) ; ASCE 7, 2010 edition, Section 30.4.2 and IRC Section R301.2.1. Pressure Equalization Factor, PEF=1.0.

[7] Insulation Assembly Weight shall include all materials supported including, but not limited to, furring, sheathing, continuous insulation, water-resistive barrier, flashing and weather-resistive exterior covering.

[8] Furring or sheathing type and thickness shall be selected based on the cladding manufacturer's installation instructions.

[9] Interpolation between table values is permitted.

Definitions:

a. **Cladding** is the exterior skin of a building which is intended to control the infiltration of weather elements and for aesthetic purposes. The cladding consists of not less than a weather-resistive covering, a water-resistive barrier, drainage plane, and flashing.
b. **Sheathing** is a continuous layer of boards or other wood or fiber materials secured to the structural members of a wall to strengthen the structure and serve as a substrate for an external weatherproof cladding.
c. **Furring** is a strip of wood secured to the structural members of a wall to strengthen the structure and serve as a substrate for an external weatherproof cladding.
d. **Insulation Assembly Thickness and Weight** includes all the components on the exterior of a wall (including but not limited to, insulation, sheathing, water-resistive barrier, furring, cladding, etc.) that are connected to the structural wall elements.
e. **Continuous Insulation (c.i.)** is defined as insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior, exterior, or is integral to any opaque surface of the building envelope.

Design Example:

Given

Design Wind Speed/Exposure	100 mph, Exposure B
Seismic Design Category	SDC B
Occupancy Category	II
Foam Sheathing	4-inches, Type I EPS (1 pcf)
Cladding Material	Fiber cement lap siding
Cladding Weight	3 psf (from manufacturer's literature)
Wood Framing	2x6 SPF framing at 24-inches on-center
Furring Material	7/16-inch, 24/16 Rated OSB, Strips vertical

Solution

Determine Fastener Type:

Step 1: Based on the substrate (wood framing) Table 2a and Table 2b apply. The fasteners to be used shall be either SIP TP or SIP LD.

Check limits of use.

Step 2: Verify that the Seismic Design Category and Occupancy Category conform to the limits in Section 5.5. The specified Seismic Design Category and Occupancy Category are within the limits.

Step 3: Verify that the wind design criteria conform to Table 2, footnote 6.

Step 4: Verify substrate and furring material suitability. Table 2, footnote 1 provides the minimum material requirements. Note 1 specifically recognizes the materials specified; however, for other materials minimum requirements are provided, for example, the framing must have a minimum specific gravity G = 0.42.

Determine Fastener Spacing:

Step 5: Consult the siding manufacturer data for siding weight (3 psf), add 1 psf for furring. The foam weight may be negligible, for example the weight of the Type I EPS equals 0.1 psf (1 pcf x 4-inches thickness / 12 = 0.3 psf). The total supported assembly weight equals 4.3 psf.

Step 6: To verify the connection shear strength, using Table 2a with the stud spacing (24" oc), foam thickness (4"), and assembly weight (4.3 psf). Where design values don't match the table values exactly, the values should be rounded up to the next greater value. In this example, the assembly weight is rounded up to 5 psf. From Table 2a, the recommended spacing for 24" oc studs, with 4" of foam and an assembly weight of 5 psf is 16" oc.

Step 7: To verify the negative wind strength, using Table 2b with the stud spacing (24" oc), Wind Speed (100 mph), and Wind Exposure (Category B). Where design values don't match the table values exactly, the values should be rounded up to the next greater value. In this example, the next greatest wind speed in Table 2b is 115 mph and the corresponding fastener spacing is 24" oc.

Step 8: The recommended fastener spacing shall be taken as the smaller spacing determined in Step 6 and Step 7. In this example, both checks required a spacing of 16" oc.

Specify Fastener:

Step 9: Determine the fastener length by summing the material thicknesses and adding the minimum required penetration into the substrate, which is provide in Table 2, footnote 1. In this example, the minimum fastener length is 5.9" (7/16" furring + 4" insulation + 1.5" penetration). Consulting TRUFAST's literature, the fastener length must be rounded up to the next available size. In this example, a 6" SIP TP or SIP LD fastener installed at 16" oc should be specified.