

**SI-Strong Structural Insulation STYROFOAM
SIS™, SIS™ Plus – Canada – Limit States Design**

TER No. 1808-04

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DIVISION: 06 00 00 – WOOD, PLASTICS AND COMPOSITES

Section: 06 12 00 – Structural Panels
Section: 06 12 19 – Shear Wall Panels
Section: 06 16 00 – Sheathing

DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION

Section: 07 21 00 – Thermal Insulation
Section: 07 25 00 – Water-Resistive Barriers/Weather Barriers
Section: 07 27 00 – Air Barriers

1. Products Evaluated:

- 1.1. SI-Strong Structural Insulation
- 1.2. STYROFOAM SIS™
- 1.3. STYROFOAM SIS™ Plus
- 1.4. For the most recent version of this Technical Evaluation Report (TER), visit drjengineering.org. For more detailed state and provincial professional engineering and code-compliance legal requirements and references, visit drjengineering.org/statelaw. DrJ is fully compliant with all state/provincial professional engineering and code compliance laws. Douglas Consultants Inc. has collaborated with DrJ through the review of this technical evaluation and conformity to Canadian building codes.
- 1.5. This TER can be used to obtain product approval in any country that is an IAF MLA Signatory (all countries found [here](#)) and covered by an [IAF MLA Evaluation](#) per the [Purpose of the MLA](#) (as an example, see [letter to ANSI](#) from the Standards Council of Canada). Manufacturers can go to jurisdictions in the U.S., Canada and other [IAF MLA Signatory Countries](#) and have their products readily approved by authorities having jurisdiction using [DrJ's ANSI accreditation](#).

DrJ is a Professional Engineering Approved Source

 **Learn more about DrJ's Accreditation**

- DrJ is an ISO/IEC 17065 accredited product certification body through ANSI Accreditation Services.
- DrJ provides certified evaluations that are signed and sealed by a P.E.
- DrJ's work is backed up by professional liability insurance.

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- 1.6. Building code regulations require that evaluation reports be provided by an approved agency meeting specific requirements. Any agency accredited in accordance with ANSI ISO/IEC 17065 meets this requirement within ANSI's scope of accreditation. For a list of accredited agencies, visit ANSI's [website](#). For more information, see [drjcertification.org](#).
- 1.7. Requiring an evaluation report from a specific private company (i.e., ICC-ES, IAPMO, CCMC, DrJ, etc.) can be viewed as discriminatory and is a violation of international, federal, state, provincial and local anti-trust and free trade regulations.
- 1.8. DrJ's code compliance work:
 - 1.8.1. Conforms to code language adopted into law by individual states/provinces and relevant consensus-based standard such as an ANSI or ASTM standard.
 - 1.8.2. Complies with accepted engineering practice, all professional engineering laws and, by providing an engineer's seal, DrJ takes professional responsibility for its specified scope of work.

2. Applicable Codes and Standards:¹

- 2.1. *2010 and 2015 National Building Code of Canada (NBC)*
- 2.2. *2017 National Energy Code of Canada (NECC)*
- 2.3. *ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus*
- 2.4. *ASTM E72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction*
- 2.5. *ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference*
- 2.6. *ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference*
- 2.7. *ASTM E564 – Standard Practice for Static Load Test for Shear Resistance of Framed Walls for Buildings*
- 2.8. *ASTM E2126 – Standard Test Methods for Cyclic (Reversed) Load Test for Shear Resistance of Vertical Elements of the Lateral Force Resisting Systems for Buildings*
- 2.9. *ASTM E2178 – Standard Test Method for Air Permeance of Building Materials*
- 2.10. *Canadian Wood Council - Engineering Guide for Wood Frame Construction*
- 2.11. *CAN/CSA O86-14 – Engineering Design in Wood*
- 2.12. *CAN/ULC S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies*

3. Performance Evaluation:

- 3.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation were evaluated to determine:
 - 3.1.1. Structural performance under lateral load conditions for both wind and seismic loading in accordance with *NBC* Division B Subsection 9.23.13 and Subsection 4.1.8.
 - 3.1.2. Structural performance under lateral load conditions for both wind and seismic loading in accordance with *NBC* Division B Part 4 Structural Loads and Procedures and the *CWC Engineering Guide for Wood Frame Construction*.
 - 3.1.2.1. [Table 2](#) provides seismic design coefficients (SDC) that conform to the requirements in *NBC* Division B Subsection 4.1.8 for design of wall assemblies in buildings that require seismic design in accordance with *NBC* (i.e., all seismic design categories).

¹ Unless otherwise noted, all references in this code-compliant technical evaluation report (TER) are from the 2015 version of the *NBC*. This product is also approved for use with the 2010 *NBC* and the standards referenced therein. Where this TER is not approved, the building official shall respond in writing, stating the reasons this TER was not approved. For variations in state, provincial and local codes, if any see [Section 8](#).

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3.1.2.2. The basis for equivalency testing is outlined in Sentence 4.1.8.9.(5) of *NBC, Division B*:

If it can be demonstrated through testing, research and analysis that the seismic performance of a structural system is at least equivalent to one of the types of SFRS mentioned in Table 4.1.8.9., then such structural system will qualify for values of R_d and R_o corresponding to the equivalent type in that Table. (See Note A-4.1.8.9.(5).).

- 3.1.3.** Resistance to uplift loads for wall assemblies used for light-frame wood construction in accordance with *NBC* Division B Subsection 9.23.3.4.
- 3.1.4.** Resistance to transverse loads for wall assemblies used in light-frame wood construction in accordance with *NBC* Division B Subsection 4.1.7.
- 3.1.5.** Performance for use as foamed-plastic insulation in accordance with the *NBC* Division B Article 3.1.5.15.
- 3.1.6.** Performance for use as foamed-plastic insulation in accordance with *NBC* Division B Article 9.36.2.5 and *NECC* Division B Article 3.2.1.2.
- 3.1.7.** Performance for use as an air barrier in accordance with *NBC* Division B Section 5.4 and Subsection 9.25.3, and *NECC* Division B Subsection 3.2.4.
- 3.1.8.** Performance for use as a water-resistive barrier (WRB) in accordance with *NBC* Division B Note A-5.6.2.1.
- 3.1.9.** Performance for surface burning characteristics in accordance with *NBC* Division B Subsection 3.1.12 and 9.10.3.2.

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

4. Product Description and Materials:



Figure 1: STYROFOAM SIS™

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4.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation are structural rigid insulation sheathing products consisting of a proprietary fibrous sheathing board laminated to one side of a proprietary rigid foamed-plastic insulation.

4.1.1. The proprietary fibrous sheathing is made of specially treated plies that are pressure-laminated with a water-resistant adhesive. The surface finish consists of a facer on one or both sides, either using a 2.9 mm (0.113") nominal thickness or a 3.4 mm (0.135") nominal thickness fibrous sheathing board.

4.1.2. The rigid foamed-plastic insulation is a proprietary polyisocyanurate, which can have facings on one or both sides.

4.2. Material Availability

4.2.1. Thickness: 12.7 mm (0.5") up to 25.4 mm (1")

4.2.2. Standard product width: 1219 mm (48")

4.2.3. Standard lengths: 2438 mm (96"), 2749 mm (108") and 3048 mm (120")

5. Applications:

5.1. General

5.1.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation are Structural Insulated Sheathing (SIS) panels for use in the following applications as:

5.1.1.1. Wall sheathing in buildings constructed in accordance with the *NBC* for light-frame wood and steel construction.

5.1.1.2. Structural wall sheathing to provide lateral load resistance (wind and seismic) for braced wall panels used in light-frame construction.

5.1.1.3. Structural wall sheathing to provide resistance to transverse loads for wall assemblies used in wood construction.

5.1.1.4. Insulating sheathing applied as in-fill to portions of walls that are not designed as braced wall panels or shear walls.

5.1.1.5. Insulated sheathing in accordance with the *NBC* Division B Article 9.36.2.5 and *NECC* Division B Article 3.2.1.2.

5.1.1.6. An approved WRB in accordance with *NBC* Division B Note A-5.6.2.1, when installed with approved Construction Tape on all sheathing seams, as in [Section 5.3.3](#). See the manufacturer's product information for further details.

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5.1.1.6.1. Where the joints are not taped, a separate WRB shall be installed in accordance with the WRB manufacturer's installation instructions.

5.1.1.7. An air-barrier material as part of an air-barrier assembly in accordance with *NBC* Division B Section 5.4 and Subsection 9.25.3 and *NECC* Division B Subsection 3.2.4, in accordance with the manufacturer's installation instructions and this TER.

5.1.2. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation contain foamed plastics complying with *NBC* Division B, Article 3.1.5.15.

5.2. Structural Applications

5.2.1. General Provisions

5.2.1.1. Except as otherwise described in this TER, STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation shall be installed in accordance with the applicable building codes listed in [Section 2](#) using the provisions set forth therein for the design and installation of wood structural panels (WSP).

5.2.1.1.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation shall be permitted to be designed in accordance with *NBC* Division B Part 9 Articles 9.23.13.1, 9.23.13.2 and 9.23.13.3 for the design of lateral-load-resisting systems using the methods and conditions set forth therein.

5.2.1.2. Anchorage for in-plane shear shall be provided to transfer the induced shear force into and out of each shear wall.

5.2.1.2.1. For wind design, anchor bolt spacing shall not exceed 1.8 m (6') o.c.

5.2.1.2.2. For seismic design, anchor bolt spacing shall not exceed 1.2 m (4') o.c.

5.2.1.3. The maximum aspect ratio for STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation shall be 4:1.

5.2.1.4. The minimum full-height panel width shall be 610 mm (24").

5.2.1.5. All panel edges shall be blocked with lumber of a minimum thickness of 38 mm (2" nominal).

5.2.1.6. Fasteners may be countersunk beneath the outer surface of the foamed-plastic sheathing layer.

5.2.1.7. Installation is permitted for single-top-plate (advanced framing method) or double-top-plate applications.

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

5.2.2. Performance-Based Wood-Framed Construction

5.2.2.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation panels used in wall assemblies designed as shear walls:

5.2.2.1.1. Are permitted to be designed in accordance with the methodology used in CAN/CSA-O86 for WSP using the capacities shown in [Table 1](#),

5.2.2.1.2. Resist lateral wind load forces using the specified shear strengths set forth in [Table 1](#),

5.2.2.1.3. Resist uplift load forces using the specified uplift loads in [Table 3](#), and

5.2.2.1.4. Resist seismic load forces using the seismic specified shear strengths set forth in [Table 2](#) when seismic design is required in accordance with *NBC* Division B Subsection 4.1.8.

5.2.2.1.4.1. The ductility response modification factor, R_d , and the over-strength force modification factor, R_o , indicated in [Table 2](#) shall be used to determine the base shear, element design forces, and design story drift in accordance with *NBC* Division B Subsection 4.1.8.

5.2.2.2. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation panels are permitted to resist transverse wind load forces using the specified transverse resistances set forth in [Table 4](#). Required component-and-cladding loads to be resisted are found in *NBC* Division B Subsection 4.1.7 (See Sentence 4.1.7.1.(5)).

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STYROFOAM SIS™, SIS™ Plus, and SI-Strong Structural Insulation – Specified Shear Resistance for Limit States Design – Wind¹								
Structural Sheathing Product	Thickness mm (in.)	Fastener Spacing [edge/field] mm. (in.)	Maximum Stud Spacing mm (in.)	Gypsum Wallboard (GWB)^{2, 6}	Gypsum Wallboard Fastener Spacing (edge/field) mm. (in.)	Specified Shear Strength, kN/m (plf)		
STYROFOAM SIS™ or SI-Strong	12.7 (½)	76/76 (3/3)	406 (16) o.c.	12.7 (½) GWB	203/203 (8/8)	7.2 (490)		
		76/76 (3/3)			406/406 (16/16)	5.9 (405)		
		76/152 (3/6)			203/203 (8/8)	6.5 (440)		
		76/152 (3/6)			203/203 (8/8)	5.3 (365) ³		
STYROFOAM SIS™ Plus	25.4 (1)	76/76 (3/3)	610 (24) o.c.	15.9 (5/8) GWB	203/203 (8/8)	7.8 (535)		
		76/76 (3/3)			406/406 (16/16)	6.4 (440)		
STYROFOAM SIS™ Plus	25.4 (1)	76/76 (3/3)	610 (24) o.c.	15.9 (5/8) GWB	203/203 (8/8)	7.1 (485)		
		76/76 (3/3)			406/406 (16/16)	5.8 (406)		
STYROFOAM SIS™ or SI-Strong	12.7 (½)	76/76 (3/3)	610 (24) o.c.	12.7 (½) GWB ⁴	203/203 (8/8)	6.5 (450)		
		76/152 (3/6)			203/305 (8/12)	10.6 (730)		
STYROFOAM SIS™ or SI-Strong	12.7 (½)	76/76 (3/3)	406 (16) o.c.	No GWB	-	4.6 (315)		
		76/76 (3/3)	610 (24) o.c.			4.2 (290)		
STYROFOAM SIS™ Plus	25.4 (1)	76/76 (3/3)	406 (16) o.c.			No GWB	-	5.0 (340)
		76/76 (3/3)	610 (24) o.c.					4.6 (315)
STYROFOAM SIS™ or SI-Strong	25.4 (1)	76/76 (3/3)	610 (24) o.c.	12.7 (½) GWB and Thermo-Ply Red ⁵	203/203 (8/8)	8.3 (570)		

1" = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. STYROFOAM SIS™, SIS™ Plus, and SI-Strong Structural Insulation attached with a minimum 16-gauge, 25-mm-crown staples shall penetrate a minimum of 25 mm into the stud. Fasteners are to be installed with the crown parallel to the framing and spaced a maximum of 76 mm (3") o.c. at the panel edges and 76 mm (3") o.c. in the field. Fastener edge distance shall be a minimum of 9 mm. Fastener head shall be in contact with the panel surface. Alternatively, fastener heads are permitted to be overdriven into foam portion of the panel with no reduction in shear capacities.

2. Gypsum attached with minimum #6 type W or S screws 32 mm (1¼") long with a minimum edge distance of 10 mm (0.375").

3. SIS™ fastened with a minimum 2.9-mm (0.113") diameter nail.

4. 12.7 mm (½") GWB adhered with wall-and-floor adhesive (ASTM C557) and #6 (152 mm x 32 mm (6" x 1¼")) bugle-head, coarse-thread drywall screws, edges blocked.

5. Install Thermo-Ply Red on opposite side of wall from the Styrofoam SIS™ with minimum 16-gauge, 25-mm-crown staples fastened 76 mm (3") o.c edge/ 76 mm (3") o.c. field. Separately attach 12.7 mm (½") gypsum over Thermo-Ply Red with minimum #6 type W or S screws 32 mm (1¼") long fastened 203 mm (8") o.c edge/ 203 mm (8") o.c. field.

6. NBC Table 9.23.13.6 requires minimum 15.9 mm (5/8") thick gypsum with framing 610 mm (24") o.c..

Table 1: Specified Shear Resistance for Limit States Design for STYROFOAM SIS™, SIS™ Plus, and SI-Strong Structural Insulation -- Wind

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Specified Shear Resistance for Limit States Design and Seismic Design Coefficients for STYROFOAM SIS™, SIS™ Plus, and SI-Strong Structural Insulation ¹											
Seismic Force Resisting System (SFRS)	Thickness mm. (in.)	Gypsum Wallboard Fastening Schedule mm (in.)	Maximum stud spacing mm (in.)	Specified Shear Strength, kN/m (plf)	Ductility Factor, R _d ^{4,5}	Overstrength Force Modification Factor, R _o ⁵	Structural System Limitations and Building Height Limit ⁸ , m (ft)				
							I _E F _a S _a (0.2)				I _E F _a S _a (1.0)
							< 0.2	≥ 0.2 to < 0.35	≥ 0.35 to ≤ 0.75	> 0.75	>0.3
Light-Frame (Wood) Walls Sheathed with STYROFOAM SIS™ or SI-Strong	12.7 (½)	406/406 (16/16)	406 (16) o.c.	5.9 (405)	2.0	1.7	NL	NL	20 (65.6)	20 (65.6)	20 (65.6)
		203/203 (8/8)		7.2 (490)							
Light-Frame (Wood) Walls Sheathed with STYROFOAM SIS™ Plus	25.4 (1)	406/406 (16/16)	406 (16) o.c.	6.4 (440)	2.0	1.7	NL	NL	20 (65.6)	20 (65.6)	20 (65.6)
		203/203 (8/8)		7.8 (535)							
Light-Frame (Wood) Walls Sheathed with STYROFOAM SIS™ Plus	25.4 (1)	406/406 (16/16)	610 (24) o.c.	5.8 (400)	2.0	1.7	NL	NL	20 (65.6)	20 (65.6)	20 (65.6)
		203/203 (8/8)		7.1 (485)							

1" = 25.4 mm, 1 lb/ft = 0.0146 kN/m

1. STYROFOAM SIS™, SIS™ Plus, and SI-Strong Structural Insulation attached with a minimum 16-gauge, 25-mm-crown staples shall penetrate a minimum of 25 mm (1") into the stud. Fasteners are to be installed with the crown parallel to the framing and spaced a maximum of 76 mm (3") o.c. at the panel edges and 76 mm (3") o.c. in the field. Fastener edge distance shall be a minimum of 10 mm (0.375"). Fastener head shall be in contact with the panel surface. Alternatively, fastener heads are permitted to be overdriven into foam portion of the panel with no reduction in shear capacities.
2. Walls installed with minimum 12.7 mm (½") Gypsum wallboard attached with minimum #6 type W or S screws 32 mm (1¼") long. Fasteners shall maintain a minimum edge distance of 10 mm (0.375").
3. All seismic design parameters follow the equivalency as defined in [Section 3](#) of this TER.
4. Response modification coefficient, R_d, for use throughout *NBC*.
5. For combinations of different types of SFRS acting in the same direction in the same storey, R_dR_o shall be taken as the lowest value of R_dR_o corresponding to these systems. See *NBC* Division B, Article 4.1.8.9.
6. Consider the additional system restrictions in Article 4.1.8.10 of *NBC* Division B.
7. Heights are maximum height limits above grade, as defined in *NBC* Division B Table 4.1.8.9.
8. NL = Not Limited
9. *NBC* Table 9.23.13.6 requires 15.9 mm (5/8") thick gypsum with framing 610 mm (24") o.c.

Table 2: Seismic Performance of STYROFOAM SIS™, SIS™ Plus, and SI-Strong Structural Insulation

Uplift Performance of STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation			
Structural Sheathing Product	Specified Uplift Resistance N/m (lbs/ft)	Maximum Stud Spacing mm. (in.)	Fastener Schedule
STYROFOAM SIS™ or SI-Strong: Single Top Plate	3.9 (265)	406 (16) o.c.	25-mm (1") crown, 32-mm (1¼") leg 16-gauge galvanized staples or 3 mm (0.120") x 32 mm (1¼") roofing nails, 76 mm (3") o.c. to perimeter/field
STYROFOAM SIS™ Plus: Single Top Plate	4.8 (330)		
STYROFOAM SIS™ Plus: Double Top Plate	9.5 (650)		

1" = 25.4 mm; 1 lb = 0.00445 kN; 1 lb/ft = 0.01459 kN/m

1. Staple crowns to be installed parallel to grain.
2. The resistances shown are for the purpose of providing information on the hold-down resistance of the sheathing-to-top-plate connection independent of lateral loading. Where combined shear and uplift loading is needed, consult a professional engineer.

Table 3: Uplift Performance of STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation

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Summary of Specified Pressures for STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation Resisting Transverse Wind Loads		
Structural Sheathing Product	Transverse Wind Load Resistance	
	Maximum Stud Spacing mm (in.)	Hourly 1-in-50 Wind Pressure ² , kPa
STYROFOAM SIS™, SIS™ Plus, and SI-Strong	610 (24) o.c.	6.5
1" = 25.4 mm; 1 psf = 0.04788 kPa 1. Fastener Schedule: 11-mm (7/16") crown, 32-mm (1¼") leg, 16-gauge galvanized staples, 76 mm (3") o.c. at the perimeter, 152 mm (6") o.c. in the field. Staple crowns to be installed parallel to grain. 2. Hourly Wind Pressure (1-in-50) for selected locations can be located in NBC Division B, Appendix C, Table C-2.		

Table 4: Transverse Load Performance of STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation

5.2.3. Steel-Framed Construction

STYROFOAM Structural Sheathing Product	Thickness mm (in.)	Framing Condition ² mm (in.)	Maximum Stud ¹ Spacing mm (in.)	Factored Shear Resistance kN/m (plf)			
				0.100 Pins ³ 76 mm (3") o.c. edges 152 mm (6") o.c. field	0.100 Pins ³ 76 mm (3") o.c. edges 76 mm (3") o.c. field	#8 Screws ⁴ 76 mm (3") o.c. edges 152 mm (6") o.c. field	#8 Screws ⁴ 76 mm (3") o.c. edges 76 mm (3") o.c. field
SIS™ or SI-Strong	12.7 (½)	No GWB	610 (24) o.c.	NT ⁶	NT ⁶	7.0 (480)	NT ⁶
		15.9 (5/8) GWB Fasten 203/305 (8/12) ⁵		5.7 (390)	6.9 (470)	NT ⁶	8.9 (610)
		15.9 (5/8) GWB Fasten 152/305 (6/12) ⁴		7.9 (555)	NT ⁶	11.2 (770)	NT ⁶
SIS™ Plus	25.4 (1)	15.9 (5/8) GWB Fasten 203/305 (8/12) ⁵		6.5 (450)	6.7 (455)	NT ⁶	10.9 (745)
1" = 25.4 mm; 1 lb/ft = 0.0146 kN/m 1. 20-gauge 50-ksi 89-mm (3.5") metal studs @ 610 mm (24") o.c. Mid-height horizontal brace installed every other cavity space. 2. NBC Table 9.23.13.6 requires 15.9 mm (5/8") thick gypsum with framing 610 mm (24") o.c. 3. AeroSmith 2359 2.5-mm (0.100") diameter pins. 4. No. 8-18 x 1¼ Phillips modified truss-head self-drilling screws. 152 mm (6") at the edges and 305 mm (12") in the field. 5. No. 6-20 x 1¼ Phillips Bugle D/W SDS self-drilling screws. 203 mm (8") at the edges and 305 mm (12") in the field. 6. NT = Not Tested							

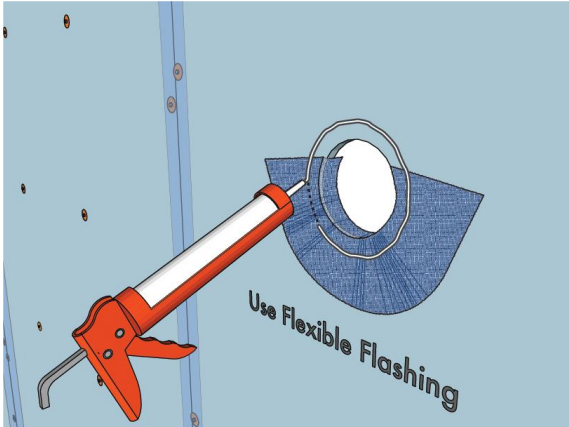
Table 5: Factored Shear Resistances for STYROFOAM SIS™, SIS™ Plus, and SI-Strong Structural Insulation on 20-gauge 50-ksi Metal Studs

5.3. Water-Resistive Barrier (WRB)

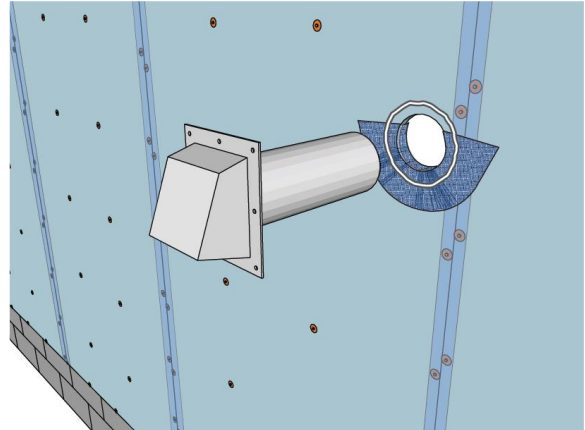
- 5.3.1.** STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation may be used as a WRB as prescribed in NBC Division B Note A-5.6.2.1 when installed on exterior walls as described in this section.
- 5.3.2.** STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation shall be installed with board joints placed directly over exterior framing spaced a maximum of 610 mm (24") o.c. The fasteners used to attach the board shall be installed in accordance with [Table 2](#) through [Table 4](#) and [Section 6](#) as applicable.
- 5.3.3.** All seams and joints between boards shall be sealed with an approved construction tape in accordance with [Section 6](#). Approved construction tape includes 63-mm (2-½") wide construction tape by 3M (8087) or Venture (1585-P2) 102-mm (4") wide self-adhered flashing tape meeting AAMA 711 (3M All Weather Flashing Tape 8067 or equivalent) with release liner may be required for effective taping of inside and outside corners.

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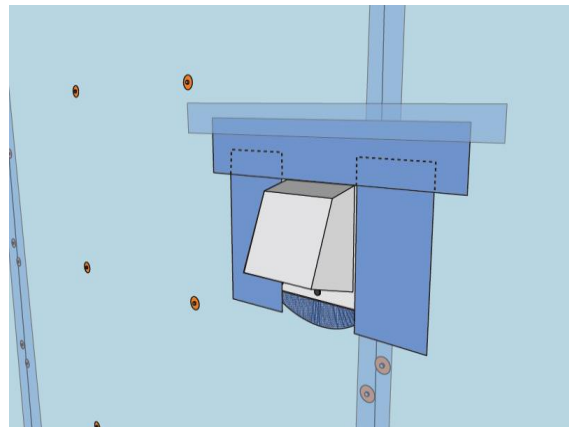
- 5.3.4. A separate WRB may also be provided. If a separate WRB method is used, overlapping or taping of the sheathing joints is not required.
- 5.3.5. Flashing of penetrations shall comply with the applicable code and must be installed at all sheathing penetrations. Use qualified flashing material such as self-adhered flashing tape meeting AAMA 711 (3M All Weather Flashing Tape 8067 or equivalent). See [Figure 3](#), [Figure 4](#) and [Figure 5](#) for typical penetration flashing details.
- 5.3.6. Flashing Details – Typical Flanged and Unflanged Penetrations and Window



STEP 1



STEP 2



STEP 3

Figure 3: Typical Penetration Flashing Detail – Flanged

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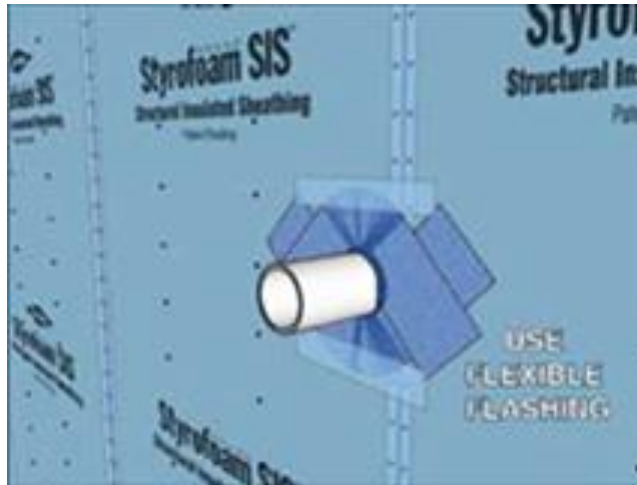


Figure 4: Typical Penetration Flashing Detail – Unflanged

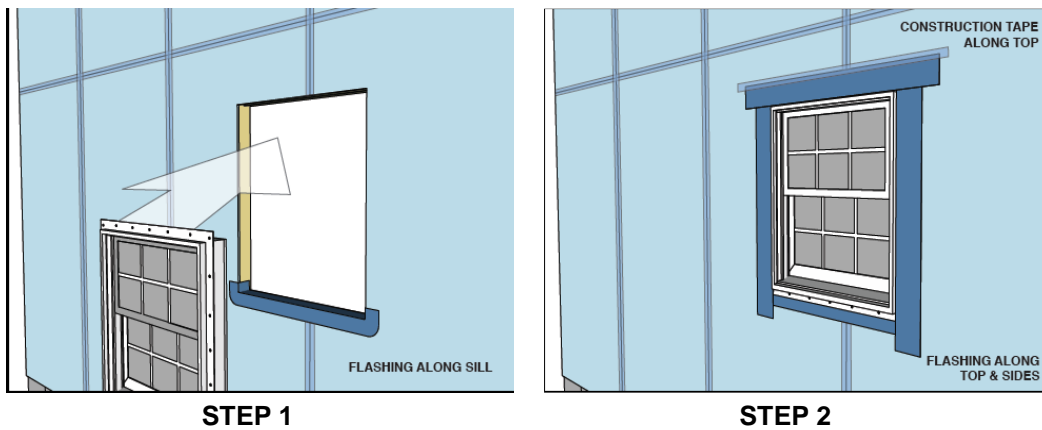


Figure 5: Typical Window Flashing Detail

5.4. Thermal Resistance (RSI- and R-Values)

- 5.4.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation meet the continuous insulated sheathing requirements complying with the provisions of *NECC* Division B Part 3.
- 5.4.2. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation have the thermal resistances shown in [Table 6](#).

STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation RSI/R-Values	
Thickness	RSI (R) Value, m ² K/W (h·ft ² ·°F/Btu)
½" SI-Strong or ½" SIS™	0.53 (3.0)
1" SIS™ Plus	1.1 (6.0)
1" SI-Strong	1.1 (6.0)
1 m ² K/W = 5.678 hr ² ·ft ² ·°F/Btu	

Table 6: STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation Thermal Resistance Properties

5.5. Air Barrier

- 5.5.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation meet the requirements of *NECC* Division B Part 3 for use as a component of the air barrier when installed in accordance with the manufacturer's installation instructions and this TER with all seams, including the top and bottom edges, taped (see [Table 7](#)).

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STYROFOAM SIS™, and STYROFOAM SIS™ Plus Air Barrier Properties	
ASTM E2178	< 0.02 (L/s.m ²) ¹
1. Liter per second per square meter	

Table 7: STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation Air Barrier Properties

5.6. Thermal Barrier Requirements – Attic, Crawlspace or Other Uninhabitable Space Applications

5.6.1. Installation shall be fully protected from the interior of the building by an approved 15-minute thermal barrier or ignition barrier as required by *NBC* Division B Article 9.10.17.10.

5.7. Fire Safety Performance

5.7.1. Surface Burn Characteristics

5.7.1.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus & SI-Strong Structural Insulation have the flame-spread ratings as shown in [Table 8](#), when tested in accordance with *CAN/ULC-S102* per *NBC* Division B Subsection 3.1.12 and 9.10.3.2.

Products	Flame Spread	Smoke Developed
STYROFOAM SIS™, STYROFOAM SIS™ Plus & SI-Strong ¹	60	35
¹ = 25.4 mm 1. Foam portion only tested in accordance with <i>CAN/ULC-S102</i> , with maximum foam thickness of 2".		

Table 8: Surface Burn Characteristics of STYROFOAM SIS™, STYROFOAM SIS™ Plus & SI-Strong Structural Insulation

5.8. Non-Structural Applications

5.8.1. Where other means of wall bracing are provided, or are not required, and an approved exterior wall covering capable of separately resisting loads perpendicular to the face of the walls is installed over the sheathing, STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation may be installed in accordance with [Section 6.6](#).

6. Installation:

6.1. General

6.1.1. 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. Orientation

6.2.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation may be installed vertically or horizontally over studs, with framing that has a thickness of not less than 38 mm (nominal 2") and spaced a maximum of 610 mm (24") o.c.

6.2.2. Sheathing joints must be butted at framing members, and all panel edges must be blocked. A single row of fasteners must be applied to each panel edge into the stud or blocking below. Each panel must be completely fastened once fastening begins, not simply tacked.

6.3. Attachment

6.3.1. General

6.3.1.1. Fasteners shall be installed with a nominal edge distance of 9 mm (0.35") for STYROFOAM SIS™, STYROFOAM SIS™ Plus, and gypsum.

6.3.1.2. Where used, always fasten staples with the crown parallel to the framing member.

6.3.2. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation

6.3.2.1. Minimum 25-mm (1") crown by 32-mm (1¼") leg, 16-gauge staples with a 25 mm (1") minimum embedment into the stud unless otherwise stated in [Section 5](#).

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6.3.2.2. Fastener spacing shall be a maximum of 76 mm (3") o.c. along the edge and 76 mm (3") o.c. in the field unless otherwise permitted in [Section 5](#).

6.3.3. Gypsum Wallboard

6.3.3.1. For NBC Division B Part 9 applications, gypsum nail fasteners shall be spaced a maximum of 152 mm (6") o.c. on vertical wall supports and 305 mm (12") o.c. along intermediate supports.

6.3.3.2. For NBC Division B Part 9 applications, gypsum screw fasteners shall be spaced a maximum of 152 mm (6") o.c. on vertical wall supports and 305 mm (12") o.c. along intermediate supports.

6.3.3.3. Where required, gypsum wallboard shall be a minimum 12.7 mm (½") thickness and shall be attached with #6 x 32 mm (1¼") Type W or S screws, diameter 3.3 mm (0.13") spaced as shown in [Section 5](#).

6.4. Treatment of Joints

6.4.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation sheathing joints must be butted at framing members, and a single row of fasteners must be applied to each panel edge into the stud below, with the staple crowns parallel to framing.

6.5. Window Treatments

6.5.1. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation must be installed with appropriate flashing and counter flashing in conformance with accepted building standards and in compliance with local building codes and the flashing manufacturer's installation instructions.

6.6. Non-Structural Applications

6.6.1. Install panels with nails that have a minimum shank diameter of 2.9 mm (0.113") and a 25 mm (1") minimum stud embedment or 16-gauge 11-mm-(7/16") crown staples and a 25-mm (1") minimum stud embedment.

6.6.2. The fastener spacing shall be 152 mm (6") o.c. along the top, bottom and vertical panel edges and 305 mm (12") o.c. in the field. Each panel shall be completely fastened once fastening begins, not simply tacked.

7. Test and Engineering Substantiating Data:

7.1. Lateral load testing and data for determining comparative equivalency for use as an alternative material, in accordance with *ASTM E72*, *E564* and *E2126*.

7.2. Transverse load testing in accordance with *ASTM E330*.

7.3. Test reports and data for determining use as a WRB material, in accordance with *ASTM E331*.

7.4. Test reports and data for determining use as a component of an air barrier, in accordance with *ASTM E2178*.

7.5. Test reports and data for determining surface burning characteristics in accordance with *CAN/ULC S102*.

7.6. Test reports and data for determining comparative equivalency for use as an alternative material in accordance with NBC Division A Section 1.2.

7.7. Manufacturer installation recommendations for structural sheathing on exterior walls.

7.8. Quality Control Manual in accordance with a third-party quality control program with inspections conducted by an approved agency.

7.9. The product(s) evaluated by this TER fall within the scope of one or more of the model, state, provincial, or local building codes for building construction. The testing and/or substantiating data used in this TER is limited to buildings, structures, building elements, construction materials and civil engineering related specifically to buildings.

7.10. The provisions of model, state, provincial, or local building codes for building construction do not intend to prevent the installation of any material or to prohibit any design or method of construction. Alternatives shall use consensus standards, performance-based design methods or other engineering mechanics-based means of compliance. This TER assesses compliance with defined standards, accepted engineering analysis, performance-based design methods, etc. in the context of the pertinent building code requirements.

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- 7.11. Some information contained herein is the result of testing and/or data analysis by other sources, which DrJ relies on to be accurate, as it undertakes its engineering analysis.
- 7.12. DrJ has reviewed and found the data provided by other professional sources to be credible. The information in this TER conforms with DrJ's procedure for acceptance of data from approved sources.
- 7.13. DrJ's responsibility for data provided by approved sources conforms with relevant professional engineering law.
- 7.14. Where appropriate, DrJ relies on the derivation of design values which have been codified into law through codes and standards (e.g., *NBC*, *CAN/CSA*, etc.). This includes review of code provisions and any related test data that aids in comparative analysis or provides support for equivalency to an intended end-use application. Where the accuracy of design values provided herein is reliant upon the published properties of commodity materials (e.g., lumber, steel, concrete, etc.), DrJ relies upon grade/properties provided by the raw material supplier to be accurate and conforming to the mechanical properties defined in the relevant material standard.

8. Findings

- 8.1. When installed in accordance with the manufacturer's installation instructions and this TER, STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation comply with, or are a suitable alternative to, the applicable sections of the codes listed in [Section 2](#) for the following applications:
 - 8.1.1. Lateral (in-plane) load resistance due to wind and seismic loads carried by shear walls and braced wall bands.
 - 8.1.2. Resistance to uplift loads in single- and double-top-plate applications.
 - 8.1.3. Transverse (perpendicular-to-plane) load resistance due to components-and-cladding pressures on building surfaces.
 - 8.1.4. Performance of the foamed-plastic component for conformance to *NBC* Division B Article 3.1.5.15.
 - 8.1.5. Performance for use as foamed-plastic insulating sheathing in accordance with *NBC* Division B Article 9.36.2.5.
 - 8.1.6. Performance for use as a WRB in accordance with *NBC* Division B Note A-5.6.2.1.
 - 8.1.7. Performance for use as an air barrier in accordance with *NBC* Division B Section 5.4 and Subsection 9.25.3, and *NECC* Division B Subsection 3.2.4.
 - 8.1.8. Surface burning characteristics in accordance with *NBC* Division B Subsection 3.1.12 and 9.10.3.2.
- 8.2. *NBC* Section 1.2.1 states:
 - 1.2.1 Compliance with this Code**
 - 1) Compliance with this Code shall be achieved by
 - a) complying with the applicable acceptable solutions in Division B (see Appendix A), or
 - b) using alternative solutions that will achieve at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the applicable acceptable solutions (see Appendix A).
 - 2) For the purposes of compliance with this Code as required in Clause 1.2.1.1.(1)(b), the objectives and functional statements attributed to the acceptable solutions in Division B shall be the objectives and functional statements referred to in Subsection 1.1.2. of Division B.
- 8.3. *NBC* Division C Section 2.3 includes additional guidance for Alternative Solutions.
- 8.4. This product has been evaluated with the codes listed in [Section 2](#), and is compliant with all known state, provincial, and local building codes. Where there are known variations in state or local codes that are applicable to this evaluation, they are listed here:
 - 8.4.1. No known variations
- 8.5. This TER uses professional engineering law, the building code, ANSI/ASTM consensus standards and generally accepted engineering practice as its criteria for all testing and engineering analysis. DrJ's professional engineering work falls under the jurisdiction of each state or provincial board of professional engineers, when signed and sealed.

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9. Conditions of Use:

- 9.1. Where required by the authority having jurisdiction (AHJ), as defined in *NBC* Division A Section 1.4, in which the project is to be constructed, this report and the installation instructions shall be submitted at the time of permit application.
- 9.2. Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the code official for review and approval.
- 9.3. Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.
 - 9.3.1. This TER and the installation instructions shall be available to the jurisdiction in which the project is to be constructed.
 - 9.3.2. Walls shall not be used to resist horizontal loads from concrete and masonry walls.
 - 9.3.3. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation shall not be used as a nailing base.
 - 9.3.4. This product shall be fully protected from the interior of the building by an approved 15-minute thermal barrier.
 - 9.3.5. In areas where termites are known to occur, and foundations are insulated or otherwise finished in a manner that could conceal a termite infestation, in accordance with *NBC* Division B Article 9.3.2.9, a metal or plastic barrier shall be installed through the insulation to control the passage of termites behind or through the insulation.
 - 9.3.6. Specified shear strengths shall not exceed values in [Table 1](#) for wind loads and [Table 2](#) for seismic loads.
 - 9.3.7. Specified uplift loads shall not exceed values in [Table 3](#).
 - 9.3.8. Transverse design loads shall not exceed those described in [Table 4](#), unless an approved exterior wall covering capable of separately resisting loads perpendicular to the face of the walls is installed over the sheathing.
 - 9.3.9. STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation are manufactured under a quality control program with quality control inspections established by the governing legislation of the adopting province or territory, as described in the *NBC* Volume 1 commentary on Conformity Assessment.
- 9.4. When installed as a wall sheathing but not installed per structural requirements, light-framed walls shall be braced by other means.
- 9.5. When used as a WRB, installation shall be in accordance with [Section 5.3](#).
- 9.6. Design
 - 9.6.1. Building Designer Responsibility
 - 9.6.1.1. Unless the AHJ allows otherwise, the Construction Documents shall be prepared by a Building Designer (e.g., a registered design professional, etc.) for the Building and shall be in accordance with *NBC* Division C Sentence 2.2.4.3.(1).
 - 9.6.1.2. The Construction Documents shall be accurate and reliable and shall provide the location, direction and magnitude of all applied loads and shall be in accordance with *NBC* Division C Sentence 2.2.4.3.(1) and A-2.2.6.2.(1).
 - 9.6.2. Construction Documents
 - 9.6.2.1. Construction Documents shall be submitted to the Building Official for approval and shall contain the plans, specifications and details needed for the Building Official to approve such documents.
- 9.7. Responsibilities
 - 9.7.1. The information contained herein is a product, material, detail, design and/or application TER evaluated in accordance with the referenced building codes, testing and/or analysis through the use of accepted engineering practice, experience and technical judgment.

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- 9.7.2. DrJ TERs provide an assessment of only those attributes specifically addressed in the Products Evaluated or Code Compliance Process Evaluated sections.
- 9.7.3. The engineering evaluation was performed on the dates provided in this TER, within DrJ's professional scope of work.
- 9.7.4. The limits of DrJ's responsibility as stated in this document shall also apply to the responsibility of Douglas Consultants Inc.
- 9.7.5. 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, and the TER shall be reviewed for code compliance by the Building Official.
- 9.7.6. The use of this TER is dependent on the manufacturer's in-plant QC, the ISO/IEC 17020 third-party quality assurance program and procedures, proper installation per the manufacturer's instructions, the Building Official's inspection and any other code requirements that may apply to demonstrate and verify compliance with the applicable building code.

10. Identification:

- 10.1. All STYROFOAM SIS™, STYROFOAM SIS™ Plus, and SI-Strong Structural Insulation boards described in this TER are identified by a label on the board or packaging material bearing the manufacturer's name, product name, label of the third-party inspection agency, and other information to confirm code compliance.
- 10.2. Additional technical information can be found at oxengineeredproducts.com.

11. Review Schedule:

- 11.1. This TER is subject to periodic review and revision. For the most recent version of this TER, visit drjengineering.org.
- 11.2. For information on the current status of this TER, contact DrJ Engineering.



- [Mission and Professional Responsibilities](#)
- [Product Evaluation Policies](#)
- [Product Approval – Building Code, Administrative Law and P.E. Law](#)