Product Information Bulletin

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PlastiSpan® Insulation use as Continous Insulating Sheathing 2012 Ontario Building Code

PlastiSpan® insulation board is a moulded expanded polystyrene (EPS) insulation that meets or exceeds CAN/ULC-S701, ***Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering***. PlastiSpan insulating sheathing applied over the exterior of wood framed walls provide continuous insulation eliminating thermal bridges at wood stud locations.

Table 1 - PlastiSpan Insulation Material Properties

Material Property	ASTM Test Method	Units	CAN/ULC-S701[1] Type 1
Thermal Resistance *Minimum per 25 mm (inch)*	C518	$m^2 \cdot {}^oC/W$ ($ft^2 \cdot h \cdot {}^oF/BTU$)	0.65 (3.75)
Compressive Resistance *Minimum @ 10% Deformation*	D1621	kPa (psi)	70 (10)
Flexural Strength *Minimum*	C203	kPa (psi)	170 (25)
Water Vapour Permeance[2] *Maximum*	E96	$ng/(Pa \cdot s \cdot m^2)$ (Perms)	300 (5.0)
Water Absorption[3] *Maximum*	D2842	% By volume	6.0
Dimensional Stability *Maximum, 7 Days @ 70 ± 2°C (158 ± 4°F)*	D2126	% Linear Change	1.5
Limiting Oxygen Index *Minimum*	D2863	%	24

1. ***PlastiSpan*** insulation properties are third party certified under a quality listing program administered by Intertek and listed by the Canadian Construction Materials Centre (CCMC) under evaluation listing number 12424-L (Type 1).
2. WVP values quoted are maximum values for 25-mm thick samples with natural skins intact. Lower values will result for thicker materials.
3. The water absorption laboratory test method involves complete submersion under a head of water for 96 hours. The water absorption values above are applicable to specific end-use design requirements only to the extent that the end-use conditions are similar to test method requirements.

This bulletin addresses the use of ***PlastiSpan*** continuous insulation as exterior insulating sheathing applied to above grade walls in compliance with the 2012 Ontario Building Code of (OBC).

1. *Thermal Resistance* of Wall Assemblies with *PlastiSpan* Insulation

2012 OBC, MMA Supplementary Standard SB-12, Chapter 3 provides prescriptive compliance packages which include requirements for the minimum thermal performance and energy efficiency of building envelope and space heating equipment, domestic hot water heating equipment and heat recovery ventilator equipment. Compliance packages are presented in table format in SB-12, Chapter 3 as follows:

a) Zone 1 Building Locations – Tables 3.1.1.2.A (SI), 3.1.1.2.A (IP), 3.1.1.2.B (SI), and 3.1.1.2.B (IP).
b) Zone 2 Building Locations – Tables 3.1.1.3.A (SI), 3.1.1.3.A (IP), 3.1.1.3.B (SI), and 3.1.1.3.B (IP).

The approximate limits of Climate Zones 1 and 2 are illustrated in Figure 1.

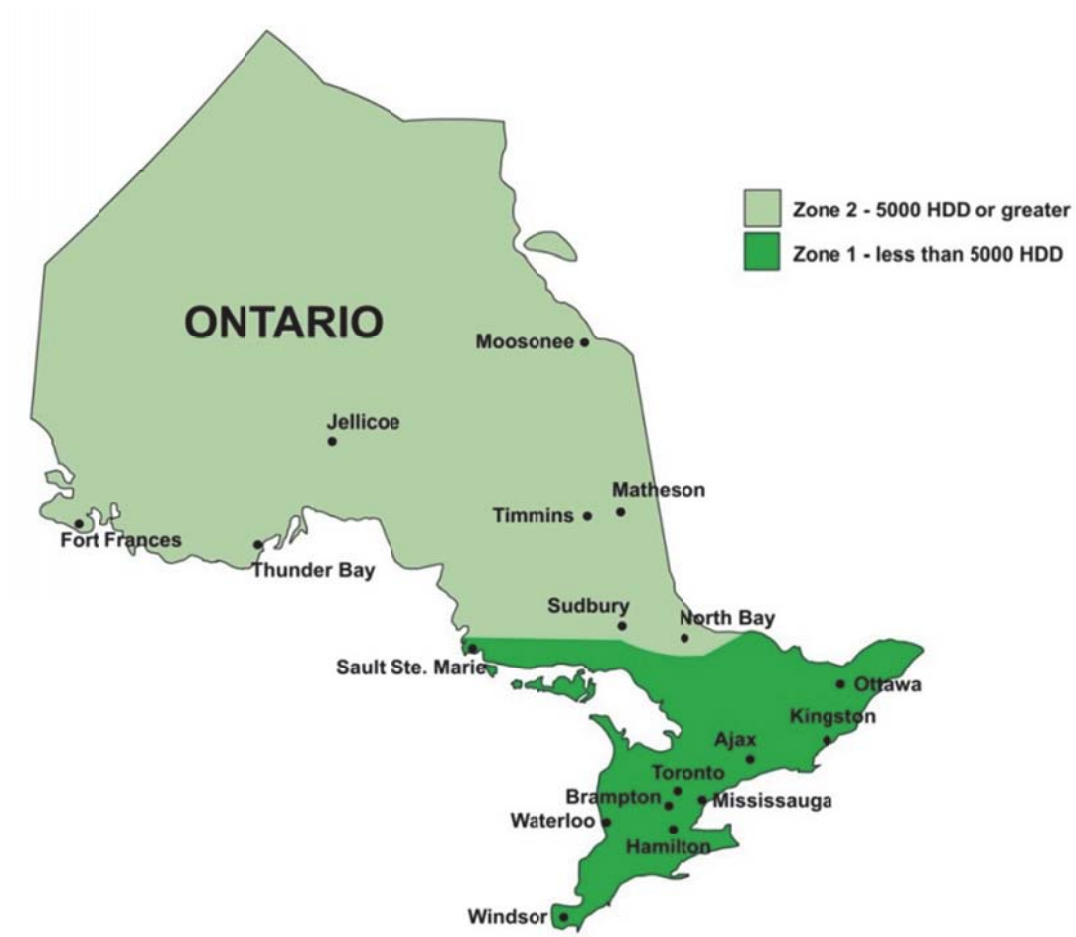

Figure 1 – Ontario Climate Zone Map

Table 2 provides ***PlastiSpan*** continuous insulation options to meet MMA SB-12 requirements.

Table 2 – *PlastiSpan* Continuous Insulation for Above Grade Walls

MMA SB-12 Reference	Compliance Package	Effective RSI (R)[1]	*PlastiSpan* Continuous Insulation		
			RSI (R)	Thickness	
				mm	in.
Zone 1 – Table 3.1.1.2.A Space Heating Equipment AFUE ≥ 92%	A2, A5	3.58 (20.3)	0.88 (5.0)	35	1 3/8
	A3	3.28 (18.6)	1.32 (7.5)	51	2
	A4, A6	3.77 (21.4)	0.88 (5.0)	35	1 3/8
Zone 2 – Table 3.1.1.2.B Space Heating Equipment 84% ≤ AFUE < 92%	B1, B2	3.77 (21.4)	0.88 (5.0)	35	1 3/8
	B3, B4	4.21 (23.9)	1.32 (7.5)	51	2
	B5, B6	4.46 (25.3)	1.76 (10.0)	70	2 3/4
Zone 1 – Table 3.1.1.3.A Space Heating Equipment AFUE ≥ 92%	A1	3.58 (20.3)	0.88 (5.0)	35	1 3/8
	A2, A5	4.46 (25.3)	1.76 (10.0)	70	2 3/4
	A3	1.77 (21.4)	0.88 (5.0)	35	1 3/8
	A4, A6	4.21 (23.9)	1.32 (7.5)	51	2
Zone 2 – Table 3.1.1.3.B Space Heating Equipment 84% ≤ AFUE < 92%	B1, B2	4.21 (23.9)	1.32 (7.5)	51	2
	B3, B4, B5, B6	4.65 (26.4)	1.76 (10.0)	70	2 3/4

The *effective RSI/R values* for all compliance packages include the entire exposed above grade wall assembly components, from interior air film to exterior air film. ***RSI_{eff}/R_{eff}*** is calculated using the formula below from NBC 2010.

$$\mathbf{RSI_{eff}\,(R_{eff})} = \frac{100\%}{\dfrac{\%\text{ with Framing}}{RSI_F\ (R_F)} + \dfrac{\%\text{ Area Cavity}}{RSI_C\ (R_C)}} + \text{RSI(R) Continuous Material Layers}$$

Where: RSI_F (R_F) = thermal resistance of wood framing, and
RSI_C (R_C) = thermal resistance of cavity insulation

2. Air Barrier System Requirements

Article 9.25.3.1. requires wall, ceiling and floor assemblies separating conditioned space from unconditioned space or from the ground to be constructed so as to include an air barrier system that will provide a continuous barrier to air leakage. ***PlastiSpan*** insulation may be used as one component in an air barrier system; however, air barrier system design must consider requirements for sealing of all penetrations of the air barrier system, such as those created by the installation of doors, windows, electrical wiring, electrical boxes, piping or ductwork

3. Vapour Barrier System Requirements

Article 9.25.4.1. requires all thermally insulated wall, ceiling and floor assemblies to be constructed have a vapour barrier with a vapour permeance less than 60 ng/(Pa•s•m^2) as per Sentence 9.25.4.2.(1) to prevent condensation. ***PlastiSpan*** insulating sheathing is not intended to provide the principal protection against vapour diffusion in an above grade wall application.

4. Insulating Sheathing in lieu of Sheathing Membrane

Subclause 9.27.3.4.(2)(b)(i) states that a separate sheathing membrane is not required over insulating sheathing where the joints between boards are sealed. Therefore, when the joints between ***PlastiSpan*** insulation boards are sealed, a separate sheathing membrane is not required. Refer to PIB 206 for additional information on installation requirements.

5. Position and Properties of *PlastiSpan* Continuous Insulating Sheathing

Subsection 9.25.5.1. addresses low air and vapour permeance materials and implications for moisture accumulation. ***Dependent upon thickness***, ***PlastiSpan*** insulating sheathing may have an air leakage characteristic less than 0.1 L/(s•m^2) at 75 Pa and a vapour permeance characteristic less than 60 ng/(Pa•s•m^2).

Article 9.25.5.2 permits the use of low air and vapour permeance insulating sheathing on the exterior of an insulated wood frame wall for specific heating degree-day (HDD) ranges based upon the ***ratio of outboard to inboard thermal resistance***. Wall assemblies with a ratio of outboard to inboard thermal resistance value greater than those given in Table 2 ensure that the inner surface of the insulating sheathing is likely to be warm enough for most of the heating season such that no significant accumulation of moisture will occur.

Table 3 - Minimum Ratio of Outboard to Inboard Thermal Resistance (2012 OBC, Table 9.25.5.2.)

Heating Degree-Days	Ratio	Heating Degree-Days	Ratio
up to 4999	0.20	9000 to 9999	0.55
5000 to 5999	0.30	10000 to 10999	0.60
6000 to 6999	0.35	11000 to 11999	0.65
7000 to 7999	0.40	12000 or higher	0.75
8000 to 8999	0.50		

In this type of wall assembly, it is assumed the vapour barrier function will be provided by a separate building element installed on the warm side of the assembly. For additional information on assumptions used in developing Table 9.25.5.2., refer to 2012 OBC, Volume 2, Appendix Note A-9.25.5.2.

Energy consumption required to keep the interior of a small building at 21°C when the outside air temperature is below 18°C is roughly proportional to the difference between 18°C and the outside temperature. This relationship holds true for average conditions of wind, radiation, exposure, and internal sources. A heating degree-day (HDD) is defined as the number of degrees the mean temperature (average of high and low temperature) for a given day is below 18°C. The sum of all the daily HDD contributions results in the annual HDD for a location.

Table 4 provides minimum ratio of outboard to inboard thermal resistance for various locations in Ontario based upon Climatic Data provided in 2012 OBC, Supplementary Standard SB-1, Table 1.2.

Table 4 – Minimum Ratio Outboard to Inboard Thermal Resistance for Locations

OBC Zone 1 (< 5000 Celsius Degree-Days)			OBC Zone 2 (≥5000 Celsius Degree-Days)		
Location	HDD	Minimum Ratio	Location	HDD	Minimum Ratio
Barrie	4,380	0.20	Big Trout Lake	7,450	0.40
Belleville	3,910	0.20	Cochrane	6,200	0.35
Brampton	4,100	0.20	Dryden	5,150	0.30
Burlington	3,740	0.20	North Bay	5,300	0.30
Kitchener	4,200	0.20	Moosonee	6,800	0.35
Niagara Falls	3,600	0.20	Sault Ste. Marie	4,960	0.30
Ottawa	4,400	0.20	Sudbury	5,180	0.30
Peterborough	4,400	0.20	Timmins	6,000	0.35
Toronto	3,800	0.20	White River	6,150	0.35

Tables 5 and 6 provide examples of effective thermal resistance and ratio of outboard to inboard thermal resistance calculations for above-grade wall assemblies using PlastiSpan continuous insulating sheathing in combination with cavity insulation to provide a minimum RSI_{eff}/R_{eff} per 2012 OBC, SB-12.

Table 5 — Above-Grade Wall RSI_{eff}/R_{eff} and Ratio Calculations - Zone 1 Wall Construction

			Zone 1 - HDD < 5,000				
SB-12 Compliance Packages			**A2, A5**	**A3**	**A4, A6 B1, B2**	**B3, B4**	**B5, B6**
Outboard Components	**Continuous Materials**		**RSI**	**RSI**	**RSI**	**RSI**	**RSI**
Outside Air Film	0.03		0.03	0.03	0.03	0.03	0.03
Cladding	0.11		0.11	0.11	0.11	0.11	0.11
PlastiSpan Continuous Insulation			***0.88***	***1.32***	***0.88***	***1.32***	***1.76***
Total Outboard RSI			**1.02**	**1.46**	**1.02**	**1.46**	**1.90**
Inboard Components	**Continuous Materials**						
Stud cavity insulation			3.34	2.46	3.87	3.87	3.34
Gypsum board		0.08	0.08	0.08	0.08	0.08	0.08
Inside air film		0.12	0.12	0.12	0.12	0.12	0.12
Total Inboard RSI			**3.54**	**2.66**	**4.07**	**4.07**	**3.54**
Ratio of Outboard RSI to Inboard RSI			**0.29**	**0.55**	**0.25**	**0.36**	**0.54**

Table 6 — Zone 2 Above-Grade Wall Ratio of Outboard to Inboard Calculations

			Zone 2 - HDD ≥ 5,000					
SB-12 Compliance Packages			**A1**	**A2, A5**	**A3**	**A4, A6 B1, B2**	**B3, B4**	**B5, B6**
Outboard Components	**Continuous Materials**		**RSI**	**RSI**	**RSI**	**RSI**	**RSI**	**RSI**
Outside Air Film	0.03		0.03	0.03	0.03	0.03	0.03	0.03
Cladding	0.11		0.11	0.11	0.11	0.11	0.11	0.11
PlastiSpan Continuous Insulation			***0.88***	***1.76***	***1.32***	***1.32***	***1.76***	***1.76***
Total Outboard RSI			**1.02**	**1.90**	**1.46**	**1.46**	**1.90**	**1.90**
Inboard Components	**Continuous Materials**							
Stud cavity insulation			3.34	3.34	3.87	3.87	3.87	3.87
Gypsum board		0.08	0.08	0.08	0.08	0.08	0.08	0.08
Inside air film		0.12	0.12	0.12	0.12	0.12	0.12	0.12
Total Inboard RSI			**3.54**	**3.54**	**4.07**	**4.07**	**4.07**	**4.07**
Ratio of Outboard RSI to Inboard RSI			**0.29**	**0.54**	**0.36**	**0.36**	**0.47**	**0.47**