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Product Information Bulletin

NBC 2010 - PlastiSpan® Insulation for Interior Basement Applications

A Canada Mortgage and Housing Corporation (CMHC)/Canadian Home Builders Association (CHBA) report concluded that use of insulation partway down the interior of a basement wall, as is typical for many residential applications, actually increases heat loss to the adjacent soil because the upper zone insulation is appreciably short-circuited by the heat loss from below.

PlastiSpan® insulation is a rigid closed cell, expanded polystyrene (EPS) insulation. It is an ideal solution to provide full-height interior basement wall insulation. Table 1 below provides material properties for PlastiSpan insulation material.

Table 1 – PlastiSpan Insulation – CAN/ULC-S701, Type 1 Material Properties

Material Property[1]	ASTM Test Method	Units	PlastiSpan Insulation
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·s·m^2) (Perms)	300 (5.0)
Water Absorption[3] *Maximum*	D2842	% By volume	6.0
Dimensional Stability *Maximum*	D2126	% Linear Change	1.5
Limiting Oxygen Index *Minimum*	D2863	%	24

This bulletin highlights some of the typical details that should be considered when using ***PlastiSpan*** insulation for this application.

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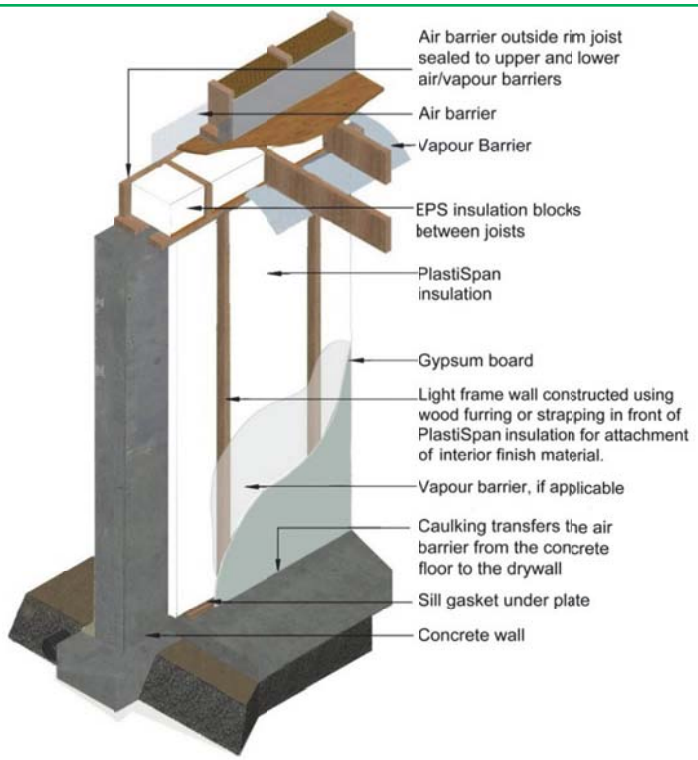
1. ***PlastiSpan*** insulation properties are third party certified to CAN/ULC-S701, ***Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering***, under a certification program administered by Intertek and are listed by the Canadian Construction Materials Centre (CCMC) under evaluation listing number 12424-L.
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.



PlastiSpan insulation can be attached using an adhesive compatible with EPS insulation directly to the interior face of the basement wall to provide a continuous layer of insulation. Special attention is required to ensure the area between the top of the basement wall and the upper building envelope is sealed to reduce air leakage. ***PlastiSpan*** insulation blocks can be used to insulate the rim joist and seal the space between the floor joists.

When applied as the sole insulation on the interior of the basement wall ***PlastiSpan*** insulation addresses the following requirements in the National Building Code of Canada (NBC) 2010:

1. Provides moisture protection for interior finishes as per Sentence 9.13.2.6.(1) of NBC 2010.
2. May eliminate the need for a separate vapour barrier as per Sentence 9.13.2.6.(3) of NBC 2010.
3. ***Effective thermal resistance*** required as per NBC 2010 Article 9.36.2.8.

NBC 2010 – Moisture Protection

Using a continuous layer of ***PlastiSpan*** insulation attached directly to the basement wall allows construction of a light frame wall using wood furring or strapping built in front of the insulation for attachment of the interior finish material.

NBC 2010, Sentence 9.13.2.6.(1) requires that the interior surface of basement walls below ground level be protected by a material that minimizes the ingress of moisture from the basement wall into interior spaces, where

a) a separate interior finish is applied to a concrete or unit masonry wall that is in contact with the soil, or

b) wood members are placed in contact with such walls for the installation of finish materials.

PlastiSpan insulation applied as a continuous layer on the interior of a basement wall provides protection for interior finish materials and wood framing members.

NBC 2010 – Vapour Barrier Requirements

The NBC 2010 indicate that where low-permeance insulation such as EPS insulation is the sole thermal insulation in a building assembly, the temperature of the inner surface of the insulation will be close to the interior room temperature. NBC 2010 states that if the foamed plastic insulation has a vapour permeance below 60 ng/Pa•s•m^2, it can fulfill the function of a vapour barrier to control condensation within the assembly due to vapour diffusion.

NBC 2010, Sentence 9.13.2.6.(3) contains the additional requirement that where the insulation functions as both moisture protection for interior finishes and as a vapour barrier in accordance with Subsection 9.25.4., it shall be applied over the entire interior surface of the foundation wall.

As indicated in Table 1, ***PlastiSpan*** insulation has a maximum vapour permeance of 300 ng/Pa•s•m^2 for a 25 mm (1”) thickness. Therefore, a separate vapour barrier on the warm side of the insulation would be required in wall assemblies using ***PlastiSpan*** insulation at a thickness less than 125 mm (5”).

NBC 2010 – Energy Efficiency Requirements

NBC 2010, Section 9.36 provides energy efficiency requirements for buildings 3 storeys or less in building height, having a building area not exceeding 600 m^2 and used for major occupancies classified as residential occupancies. Energy efficiency requirements in NBC 2010, Subsection 9.36.2. are based upon minimum ***effective thermal resistance (RSI_{eff}/R_{eff})*** of building assemblies which includes the effect of thermal bridging due to repetitive structural members such as wood framing members in wall or roof assemblies calculated using the following formula.

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

Table 2 provides ***RSI_{eff} (R_{eff})*** **for** basement walls per NBC 2010, Tables 9.36.2.8.A and 9.36.2.8.B.

Table 2 - Minimum RSI_{eff} (R_{eff}) – Basement Walls Below or In Contact with Ground

NBC 2010 Climate Zones	Zone 4	Zone 5	Zone 6	Zone 7a	Zone 7b	Zone 8
Heating Degree-Days (HDD) Celsius Degree-Days	**< 3,000**	**3,000 to 3,999**	**4,000 to 4,999**	**5,000 to 5,999**	**6,000 to 6,999**	**≥ 7,000**
Table 9.36.2.8.A. – Buildings Without a Heat-Recovery Ventilator						
RSI_{eff} - m^2•°C/W	1.99	2.98	2.98	3.46	3.46	3.97
R_{eff} - ft^2•hr•°F/BTU	11.3	16.9	16.9	19.6	19.6	22.5
Table 9.36.2.8.B. – Buildings With a Heat-Recovery Ventilator						
RSI_{eff} - m^2•°C/W	1.99	2.98	2.98	2.98	2.98	2.98
R_{eff} - ft^2•hr•°F/BTU	11.3	16.9	16.9	16.9	16.9	16.9

Table 3 provides annual HDD for some building locations across Canada per NBC 2010, Division B, Appendix C

Table 3 – Annual HDD

Province	Building Location	HDD (Celsius Degree Days)	Province	Building Location	HDD (Celsius Degree Days)
British Columbia	Victoria	2,650	**Quebec**	Montréal	4,200
	Vancouver	2,950		Trois-Rivières	4,900
	Kelowna	3,400		Québec	5,080
	Whistler	4,180		Gaspé	5,500
	Dawson Creek	5,900		Baie-Comeau	6,020
Alberta	Lethbridge	4,650		Schefferville	8,550
	Calgary	5,000	**New Brunswick**	Campbellton	5,500
	Edmonton	5,400		Edmunston	5,400
	Fort McMurray	6,550		Fredericton	4,650
Saskatchewan	Moose Jaw	5,270	**Nova Scotia**	Digby	4,020
	Regina	5,600		Truro	4,650
	Saskatoon	5,700		Halifax	4,200
	Prince Albert	6,100	**PEI**	Charlottetown	4,600
	Uranium City	7,500	**Newfoundland**	St. John's	4,800
Manitoba	Winnipeg	5,670		Labrador City	7,900
	Flin Flon	6,440	**NWT**	Inuvik	10,050
	Thompson	7,600	**Nunavut**	Alert	13,200
	Churchill	8,950	**Yukon**	Dawson	8,400

Table 4 provides the ***RSI$_{eff}$ (R_{eff})*** for a basement wall assembly using ***PlastiSpan*** insulation to provide a continuous insulation layer over the interior of the basement wall to meet minimum requirements for NBC 2010 Climate Zone 4.

Table 4 – *PlastiSpan* Insulation Interior Basement Example – NBC 2010 Climate Zone 4

System Description	RSI$_F$	RSI$_C$	Continuous Materials
203 mm (8") Basement wall	----	----	0.08
102 mm (2.5") ***PlastiSpan*** Insulation	----	----	1.65
Wood Strapping @ 600 mm (24")	0.54	----	----
13 mm (1/2") Gypsum wall board	----	----	0.08
Inside Air Film	----	----	0.12
Total	**0.54**	**NA**	**1.93**
% Area of Each Component	**13%**	**NA**	**100%**
RSI$_{eff}$ (R_{eff})	**RSI-2.00 (R11.4)**		

Table 5 provides the ***RSI$_{eff}$ (R_{eff})*** for a basement wall assembly using ***PlastiSpan*** insulation board to provide a continuous insulation layer over the interior of the basement wall to meet minimum requirements for NBC 2010, Table 9.36.2.8.A. for Climate Zones 5 to 6 & Table 9.36.2.8.B. for Climate Zones 5 to 8.

Table 5 – *PlastiSpan* Insulation Interior Basement Example – NBC 2010 Climate Zones 5 to 8

System Description	RSI$_F$	RSI$_C$	Continuous Materials
203 mm (8") Basement wall	----	----	0.08
102 mm (4") ***PlastiSpan*** Insulation	----	----	2.64
Wood Stud @ 600 mm (24")	0.54	----	----
13 mm (1/2") Gypsum wall board	----	----	0.08
Inside Air Film	----	----	0.12
Total	**0.54**	**NA**	**2.92**
% Area of Each Component	**13%**	**NA**	**100%**
RSI$_{eff}$ (R_{eff})	**RSI-2.99 (R17.0)**		