Plasti·Fab® EPS PRODUCT SOLUTIONS

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Product Information Bulletin

PlastiSpan® HD 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.

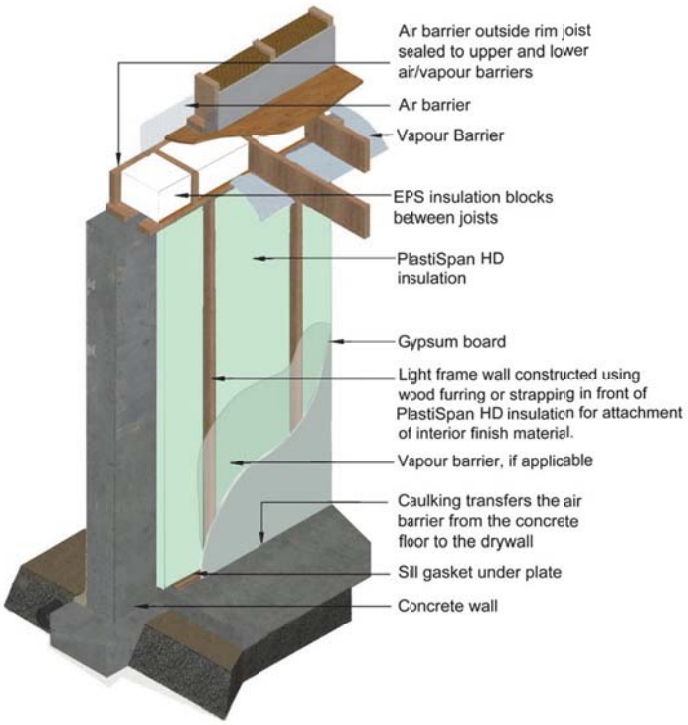
PlastiSpan® HD insulation is a moulded expanded polystyrene (EPS) insulation that meets the requirements of CAN/ULC-S701, ***Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering***. It is an ideal solution to provide full-height interior basement wall insulation. Table 1 below provides material properties for PlastiSpan HD insulation material.

Table 1 – PlastiSpan HD Insulation Material Properties

Material Property[1]	ASTM Test Method	Units	PlastiSpan HD Insulation
Thermal Resistance *Minimum per 25 mm (inch)*	C518	$m^2 \cdot {}^oC/W$ ($ft^2 \cdot h \cdot {}^oF/BTU$)	0.70 (4.04)
Compressive Resistance *Minimum @ 10% Deformation*	D1621	kPa (psi)	110 (16)
Flexural Strength *Minimum*	C203	kPa (psi)	240 (35)
Water Vapour Permeance[2] *Maximum*	E96	ng/(Pa·s·m^2) (Perms)	200 (3.5)
Water Absorption[3] *Maximum*	D2842	% By volume	4.0
Dimensional Stability *Maximum*	D2126	% Linear Change	1.5
Limiting Oxygen Index *Minimum*	D2863	%	24

This bulletin highlights typical details that should be considered when using PlastiSpan HD insulation for this application.

1. PlastiSpan HD insulation properties are third party certified CAN/ULC-S701, Type 2 under a quality listing program administered by Intertek Testing Services. PlastiSpan HD insulation is listed by the Canadian Construction Materials Centre (CCMC) under evaluation listing number12425-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 HD 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 HD insulation addresses the following requirements in the National Building Code (NBC) 2005 and 2010:

1. Moisture protection for interior finishes per Sentence 9.13.2.6.(1) of NBC 2005 and 2010.
2. **May** eliminate need for a separate vapour barrier per Sentence 9.13.2.6.(3) of NBC 2010.
3. ***Effective thermal resistance*** (**RSI_{eff}/R_{eff}**) required per Article 9.36.2.8. of NBC 2010.

NBC 2010 and 2005 – Moisture Protection

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

NBC 2005 and 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 HD insulation applied as a continuous layer on the interior of a basement wall provides protection for interior finish materials and wood framing members.

NBC 2005 and 2010 – Vapour Barrier Requirements

The NBC 2005 and 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. The 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) includes the additional clarification 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, the vapour permeance for PlastiSpan HD insulation is 200 ng/Pa•s•m^2 for a 25 mm thickness. PlastiSpan HD insulation at a minimum thickness of 76 mm (3") with joints sealed or taped would meet the vapour barrier requirement. A separate vapour barrier on the warm side of the insulation would be required in wall assemblies with PlastiSpan HD insulation at a thickness less than 76 mm (3").

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. Table 2 provides minimum ***effective thermal resistance*** (**RSI_{eff}/R_{eff}**) requirements as per Table 9.36.2.8.B. of NBC 2010 for basement walls below grade or in contact with the ground in buildings where a heat recovery ventilator (HRV) is installed. **RSI_{eff}/R_{eff}** of building assemblies calculated using the formula below includes the effect of the thermal bridging effect due to repetitive structural members such as wood framing members in walls.

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

Table 2 - Minimum RSI_{eff}/R_{eff} – Foundation 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
RSI - m^2•°C/W	1.99	2.98	2.98	2.98	2.98	2.98
R-value - ft^2•hr•°F/BTU	11.3	16.9	16.9	16.9	16.9	16.9

Annual HDD for Building Locations Across Canada per NBC 2010, Division B, Appendix C

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 3 provides the ***RSI_{eff} (R_{eff})*** of a basement wall assembly using PlastiSpan HD insulation board to provide continuous insulation layer over the entire basement wall to meet requirements for NBC 2010 Climate Zone 4. In this assembly, the sole insulation in the assembly is PlastiSpan HD insulation so the ***RSI_{eff} (R_{eff})*** calculation can be simplified by adding the RSI(R) for the continuous layers in the assembly and ignoring the RSI_F (R_F) of the light frame wall without cavity insulation built in front of rigid insulation for attachment of the interior finish material.

Table 3 – PlastiSpan HD Insulation Interior Basement Example – NBC 2010 Climate Zone 4

RSI_{eff} (R_{eff}) for below grade wall assembly with continuous PlastiSpan HD insulation applied over foundation wall with light framing for attachment of gypsum board wall in front of insulation	RSI Continuous Layers	R-value Continuous Layers
203 mm (8") Basement wall	0.08	0.46
64 mm (2.5") PlastiSpan HD Insulation	***1.78***	***10.11***
13 mm (1/2") Gypsum wall board	0.08	0.45
Inside Air Film	0.12	0.68
RSI_{eff} (R_{eff})	**2.06**	**11.70**

Table 4 provides the ***RSI_{eff} (R_{eff})*** of a basement wall assembly using PlastiSpan HD insulation board to provide continuous insulation layer over the entire basement wall to meet requirements for NBC 2010 Climate Zones 5 to 8.

Table 4 – PlastiSpan HD Insulation Interior Basement Example – NBC 2010 Climate Zones 5 to 8

RSI_{eff} (R_{eff}) for below grade wall assembly with continuous PlastiSpan HD insulation applied over foundation wall with light framing for attachment of gypsum board wall in front of insulation	RSI Continuous Layers	R-value Continuous Layers
203 mm (8") Basement wall	0.08	0.46
102 mm (4") PlastiSpan HD Insulation	***2.84***	***16.13***
13 mm (1/2") Gypsum wall board	0.08	0.45
Inside Air Film	0.12	0.68
RSI_{eff} (R_{eff})	**3.12**	**17.72**