Plasti·Fab® EPS PRODUCT SOLUTIONS

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Product Information Bulletin

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2012 BCBC - 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.

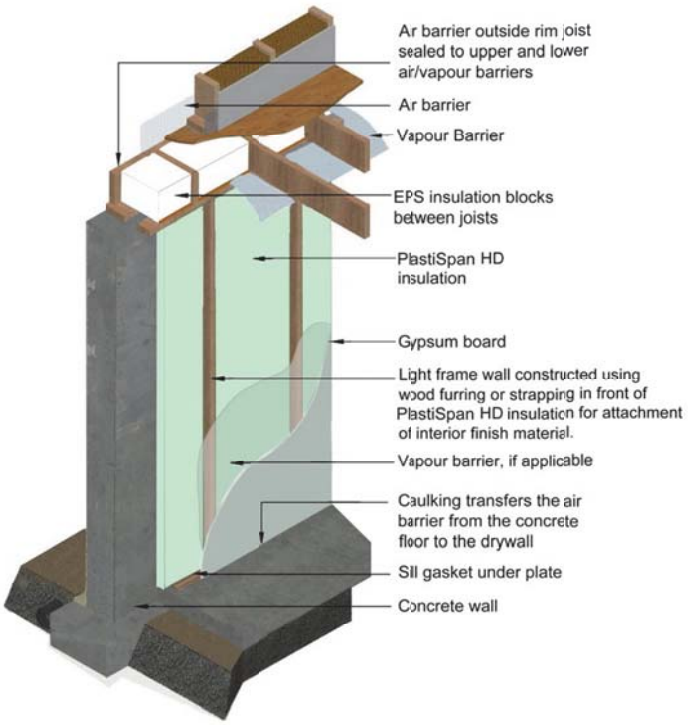
PlastiSpan® HD insulation is a moulded expanded polystyrene (EPS) insulation that meets the requirements of CAN/ULC-S701, ***Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering***. It is an ideal solution to provide full-height interior basement wall insulation. Table 1 below provides 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 2012 British Columbia Building Code (2012 BCBC):

1. Moisture protection for interior finishes per Sentence 9.13.2.6.(1) of 2012 BCBC.
2. **May** eliminate need for a separate vapour barrier per Sentence 9.13.2.6.(3) of 2012 BCBC.
3. ***Effective thermal resistance*** (**RSI_{eff}/R_{eff}**) required per Article 9.36.2.8. of 2012 BCBC.

2012 BCBC – 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.

2012 BCBC, 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.

2012 BCBC – Vapour Barrier Requirements

The 2012 BCBC 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 2012 BCBC 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.

2012 BCBC, 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.

2012 BCBC, Table A-9.25.5.1.(1) indicates the typical vapour permeance for 25-mm thick EPS insulation meeting CAN/ULC-S701, Type 2 would be 86 to 160 ng/Pa•s•m^2. Therefore, ***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").

2012 BCBC – Energy Efficiency Requirements

2012 BCBC, 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. ***Effective thermal resistance*** (**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.

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

Table 2 provides ***RSI_{eff} (R_{eff})*** **for** basement walls per 2012 BCBC, Tables 9.36.2.8.A. (for buildings without a heat-recovery ventilator) and 9.36.2.8.B. (for buildings with a heat-recovery ventilator).

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

2012 BCBC 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. Effective Thermal Resistance						
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. Effective Thermal Resistance						
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 heating degree days for some building locations in Climate Zones 4 to 7a as per 2012 BCBC, Division B, Appendix C.

Table 3 - Annual HDD (Celsius Degree Days) for Building Locations

Climate Zone 4		Climate Zone 5		Climate Zone 6		Climate Zone 7a	
Locations	**HDD**	**Locations**	**HDD**	**Location**	**HDD**	**Locations**	**HDD**
Duncan	2980	Hope	3000	Cranbrook	4400	100 Mile House	5030
Victoria	2650	Nanaimo	3000	Golden	4750	Smithers	5040
West Vancouver	2950	Burnaby	3100	Terrace	4150	Dawson Creek	5900
Abbotsford	2860	Kamloops	3450	Whistler	4180	Mackenzie	5550
Chilliwack	2780	Kelowna	3400	Prince George	4720	Glacier	5800

Table 4 provides the ***RSI_{eff} (R_{eff})*** of basement wall assemblies using ***PlastiSpan HD*** insulation board to provide continuous insulation layer over the entire basement wall to meet requirements for 2012 BCBC requirements as indicated. In this assembly, ***PlastiSpan HD*** insulation is the sole insulation in the assembly so the ***RSI_{eff} (R_{eff})*** calculation could be simplified by adding the RSI(R) for the

continuous layers in the assembly only, however, 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 increases the effective thermal resistance of the assembly slightly.

Table 4 – *PlastiSpan HD* Insulation Interior Basement Examples

Meets Tables 9.36.2.8.A. and 9.36.2.8.B. for Climate Zone 4			
System Description	**RSI_F**	**RSI_C**	**Continuous Materials**
203 mm (8") Basement Wall	----	----	0.08
64 mm (2.5") ***PlastiSpan HD*** Insulation	----	----	1.78
Wood Strapping @ 610 mm (24")	0.54	----	----
13 mm (1/2") Gypsum Wall Board	----	----	0.08
Inside Air Film	----	----	0.12
Total	**0.54**	**NA**	**2.06**
% Area of Each Component	**13%**	**NA**	**100%**
Total RSI_{eff} (R_{eff})	**RSI-2.13 (R12.1)**		
Meets Table 9.36.2.8.A. for Climate Zones 5 to 6 & Table 9.36.2.8.B. for Climate Zones 5 to 8			
System Description	**RSI_F**	**RSI_C**	**Continuous Materials**
203 mm (8") Basement Wall	----	----	0.08
102 mm (4") ***PlastiSpan HD*** Insulation	----	----	2.84
Wood Strapping @ 610 mm (24")	0.54	----	----
13 mm (1/2") Gypsum Wall Board	----	----	0.08
Inside Air Film	----	----	0.12
Total	**0.54**	**NA**	**3.13**
% Area of Each Component	**13%**	**NA**	**100%**
Total RSI_{eff} (R_{eff})	**RSI-3.20 (R18.1)**		