

# Product Information Bulletin 315

## **2012 BCBC - PlastiSpan HD Insulation for Heated Basement Floors**

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**PlastiSpan® HD** insulation is a rigid closed cell, expanded polystyrene (EPS) insulation. Continuous **PlastiSpan HD** insulation used as a component beneath a heated floor system minimizes heat loss, allows uniform heat distribution to the floor area and ensures the floor area will be warmed faster.

**Table 1 – PlastiSpan HD Insulation – CAN/ULC-S701, Type 2 Material Properties**

| Material Property   | ASTM Test Method | Units   | Values <sup>1</sup> |
|---|------------------|---|---------------------|
| <b>Thermal Resistance</b><br><i>Minimum RSI per 25 mm (R per inch)</i>        | C518             | m <sup>2</sup> ·°C/W<br>(ft <sup>2</sup> ·h·°F/BTU) | 0.70<br>(4.04)      |
| <b>Compressive Resistance</b><br><i>Minimum @ 10% Deformation</i>             | D1621            | kPa<br>(psi)  | 110<br>(16)         |
| <b>Flexural Strength</b><br><i>Minimum</i>                                    | C203             | kPa<br>(psi)  | 240<br>(35)         |
| <b>Water Vapour Permeance<sup>2</sup></b><br><i>Maximum</i>                   | E96              | ng/(Pa·s·m <sup>2</sup> )<br>(Perms)                | 200<br>(3.5)        |
| <b>Water Absorption<sup>3</sup></b><br><i>Maximum</i>                         | D2842            | % By volume   | 4.0                 |
| <b>Dimensional Stability</b><br><i>Maximum, 7 Days @ 70 ± 2°C (158 ± 4°F)</i> | D2126            | % Linear Change                                     | 1.5                 |
| <b>Limiting Oxygen Index</b><br><i>Minimum</i>                                | D2863            | %   | 24                  |

#### 2012 BCBC – Energy Efficiency Requirements

2012 British Columbia Building Code (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<sup>2</sup> and used for major occupancies classified as residential occupancies. **Effective thermal resistance RSI<sub>eff</sub> (R<sub>eff</sub>)** of building assemblies is calculated using the following formula which includes the thermal bridging effect due to repetitive structural members such as wood framing members in walls.

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

- PlastiSpan HD** 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 12425-L.
- WVP values quoted are maximum values for 25-mm thick samples with natural skins intact. Lower values will result for thicker materials.
- The water absorption laboratory test method involves complete submersion under a head of water for 96 hours. The water absorption value above is applicable to specific end-use design requirements only to the extent that the end-use conditions are similar to test method requirements.

Table 2 provides minimum **effective thermal resistance** ( $RSI_{eff}/R_{eff}$ ) requirements as per 2012 BCBC, Tables 9.36.2.8.A. and 9.36.2.8.B. for heated floors below grade or in contact with the ground.

**Table 2 – Minimum  $RSI_{eff}/R_{eff}$  for Below-Grade Heated Floors in Contact with Ground**

| 2012 BCBC Climate Zones                          | Zone 4  | Zone 5            | Zone 6            | Zone 7a           | Zone 7b           | Zone 8  |
|--|---------|-------------------|-------------------|-------------------|-------------------|---------|
| Heating Degree-Days (HDD)<br>Celsius Degree-Days | < 3,000 | 3,000 to<br>3,999 | 4,000 to<br>4,999 | 5,000 to<br>5,999 | 6,000 to<br>6,999 | ≥ 7,000 |
| RSI - $m^2 \cdot ^\circ C/W$                     | 2.32    | 2.32              | 2.32              | 2.84              | 2.84              | 2.84    |
| R-value - $ft^2 \cdot hr \cdot ^\circ F/ BTU$    | 13.2    | 13.2              | 13.2              | 16.1              | 16.1              | 16.1    |

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 |

Heat loss through an un-insulated basement slab can be a significant source of energy loss in a heated basement. Table 4 provides examples of basement slab construction using **PlastiSpan HD** insulation installed as a continuous insulation to reduce heat loss and ensures more uniform floor surface temperature. The **effective thermal resistance** of a fully insulated floor slab containing only continuous insulation materials is calculated by simply adding up the RSI (R-values) for each component in the heated basement slab system.

**Table 4 –  $RSI_{eff}$  ( $R_{eff}$ ) Calculation per 2012 BCBC Appendix Note A-9.36.2.4.(1)**

| 2012 BCBC Climate Zones 4, 5 and 6          |             |             |
|---|-------------|-------------|
| System Description                          | $RSI_{eff}$ | $R_{eff}$   |
| Horizontal Air Film (above floor)           | 0.16        | 0.9         |
| 102 mm (4") Basement Slab                   | 0.04        | 0.2         |
| 76 mm (3") <b>PlastiSpan HD</b> Insulation  | 2.13        | 12.1        |
| Polyethylene Moisture Barrier               | ----        | ----        |
| <b>Total Effective Thermal Resistance</b>   | <b>2.33</b> | <b>13.2</b> |
| 2012 BCBC Climate Zones 7a, 7b and 8        |             |             |
| Horizontal Air Film (above floor)           | 0.16        | 0.9         |
| 102 mm (4") Basement Slab                   | 0.04        | 0.2         |
| 102 mm (4") <b>PlastiSpan HD</b> Insulation | 2.84        | 16.2        |
| Polyethylene Moisture Barrier               | ----        | ----        |
| <b>Total Effective Thermal Resistance</b>   | <b>3.04</b> | <b>17.3</b> |

**Note:** The above calculations do not include the additional RSI (R-value) that would be provided by floor finish materials applied above the basement slab.