Product Information Bulletin

341

2014 ABC - PlastiSpan HD Insulation for Heated Basement Floors

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Product Information Bulletin

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2014 ABC - PlastiSpan® HD Insulation for Heated Basement Floors

Conventional forced air heating systems rely upon convection to force hot air towards the ceiling resulting in non-uniform heat distribution throughout the room area. With radiant floor heating systems, there are no vents blowing air into specific areas. The hydronic tubing cast into the concrete slab and PlastiSpan HD hydronic insulation beneath the concrete slab ensures that heat is spread uniformly throughout the entire floor area.

In radiant floor heating systems, hot water is circulated through hydronic tubing to keep all slab areas warm. PlastiSpan HD hydronic insulation board is installed on a prepared ground surface as the first component in the radiant floor heating system to ensure that heat loss will be minimized and the entire floor area will be warmed faster.

PlastiSpan HD hydronic insulation incorporates support grooves for the hydronic tubing. The supports ensure that hydronic tubing is held in position until the concrete floor is placed.

Radiant heating systems can also be used in a variety of other applications. Examples would be beneath exterior concrete slabs on walkways or driveways for melting snow and ice or beneath the concrete slab of your garage floor to keep your garage warm all year round.

The advantages of radiant floor heating systems using PlastiSpan HD hydronic insulation include:

- Provides monolithic insulation layer to ensure uniform heat distribution.
- Floor area will be noticeably warmer to anyone standing on it.
- Insulation installs quickly and easily with no special skills, tools or equipment required.
- Mechanical attachment of hydronic tubing is typically not required.
- Energy efficient method of constructing a heated basement floor slab.

PlastiSpan HD hydronic insulation is an expanded polystyrene (EPS) insulation used as the insulation component in radiant floor heating systems. PlastiSpan HD hydronic insulation decreases heat loss to ground, allows uniform heat distribution to the floor area above and ensures the floor area will be warmed faster.

The closed cellular structure of PlastiSpan HD hydronic board provides excellent resistance to moisture. In addition, the "long-term" thermal resistance (LTTR) is not subject to thermal drift as is the case with other foam plastic insulations such as extruded polystyrene (XPS) or polyisocyanurate insulation, which are manufactured with blowing agents intended to be retained in the cellular for greater than 180 days. See Plasti-Fab Product Information Bulletin 241 for additional information on LTTR of foam plastic insulation.

Table 1 provides PlastiSpan HD hydronic insulation material properties as per the National Standard of Canada, CAN/ULC-S701, ***Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering***. Typical thicknesses are also provided, however, custom thickness based upon the thermal resistance value required for specific applications are available.

Table 1 – PlastiSpan HD Hydronic Insulation Material Properties

Material Property	ASTM Test Method	Units	Values[1]
Thermal Resistance *Minimum RSI per 25 mm (R per 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	$ng/(Pa \cdot s \cdot m^2)$ (Perms)	200 (3.5)
Water Absorption[3] *Maximum*	D2842	% By volume	4.0
Dimensional Stability *Maximum, 7 Days @ 70 ± 2°C (158 ± 4°F)*	D2126	% Linear Change	1.5
Limiting Oxygen Index *Minimum*	D2863	%	24

Typical Dimensions		
Width – mm (feet)	**Length – mm (feet)**	**Thickness – mm (inches)**
1,220 (4)	1,220 (4)	38, 51, 76 or 102 (1-½, 2, 3 or 4)

1. PlastiSpan HD insulation properties are third party certified under a certification program administered by Intertek and listed by the Canadian Construction Materials Centre (CCMC) under evaluation listing number 12425-L (Type 2).
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 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.

2014 ABC – Energy Efficiency Requirements

Division B, Part 9, Section 9.36 of the 2014 Alberta Building Code (2014 ABC) 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 2014 ABC, Tables 9.36.2.8.A. and 9.36.2.8.B. for heated slabs below grade or in contact with the ground.

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

Climate Zones	Zone 6	Zone 7a	Zone 7b	Zone 8
Heating Degree-Days (HDD) Celsius Degree-Days	**4,000 to 4,999**	**5,000 to 5,999**	**6,000 to 6,999**	**≥ 7,000**
RSI - m^2•°C/W	2.32	2.84	2.84	2.84
R-value - ft^2•hr•°F/BTU	13.2	16.1	16.1	16.1

Table 3 provides annual heating degree days and applicable climate zones for building locations In Alberta as per 2014 ABC, Division B, Appendix C.

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

Zone 6		Zone 7a		Zone 7b		Zone 8	
Location	**HDD**	**Location**	**HDD**	**Location**	**HDD**	**Location**	**HDD**
Lethbridge	4500	Calgary	5000	Athabasca	6000	Fort Chipewayan	7170
Medicine Hat	4540	Edmonton	5120	Peace River	6050	Rainbow Lake	7200
Brooks	4880	Banff	5500	Lac la Biche	6100	Embarras Portage	7100
High River	4900	Grande Prairie	5790	Fort McMurray	6250		
Okotoks	4920	Cold Lake	5860	Lake Louise	6500		

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.

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

Heat loss through an un-insulated basement slab can be a significant source of energy loss in a heated basement. Installing PlastiSpan HD hydronic insulation reduces heat loss and ensures more uniform more floor surface temperature.

Table 4 provides examples of PlastiSpan HD hydronic insulation installed as a continuous insulation beneath the basement slab to meet minimum **RSI_{eff}/R_{eff}** requirements as per Table 2. The calculations below do not include the additional RSI/R that would be added for any floor finishes.

Table 4 – RSI_{eff} (R_{eff}) Calculation

System Description	Climate Zone 6		Climate Zones 7a, 7b & 8	
	RSI_{eff}	**R_{eff}**	**RSI_{eff}**	**R_{eff}**
Horizontal Air Film (above floor)	0.16	0.9	0.16	0.9
102 mm (4") Concrete Slab	0.04	0.2	0.04	0.2
PlastiSpan HD Hydronic Insulation	2.13	12.1	2.84	16.2
Polyethylene moisture barrier	----	----	----	----
Total Effective Thermal Resistance	**RSI-2.33**	**R-13.3**	**RSI-3.04**	**R-17.3**

Note: PlastiSpan HD hydronic insulation thickness used in Table 4 is 76 mm (3") for Climate Zone 6 and 102 mm (4") for Climate Zones 7a, 7b and 8.