

Product Information Bulletin

NECB 2011 - Plasti-Fab EPS Product Solutions

The National Energy Code for Buildings 2011 (NECB 2011) provides minimum requirements for the design and construction of energy efficient buildings. The NECB 2011 does not apply to farm buildings nor to housing and smaller buildings covered in National Building Code of Canada 2010 (NBC 2010), Division B, Part 9.

The NECB 2011 has been adopted by legislation in several provinces across Canada including British Columbia, Alberta, Manitoba and Ontario. NECB 2011, Division B provides three compliance options – prescriptive, trade-off or performance compliance – based upon the climatic zones that buildings are located in. This bulletin summarizes Plasti-Fab® expanded polystyrene (EPS) insulation solutions that can be used to comply with the prescriptive requirements for use in above-ground building assemblies complying with NECB 2011, Division B, Section 3.2., **Prescriptive Path**.



NECB 2011, Appendix Figure A-1.1.4.1.(1) – Contour Map of Approximate Annual Heating Degree Days

Table 1 provides annual heating degree days (HDD) for some specific locations in Canada from NBC 2010, Division B, Appendix C, Climatic Information.

Table 1 - Heating Degree Days (HDD) for Building Locations

Location	HDD	Zone	Location	HDD	Zone	Location	HDD	Zone
Victoria, BC	2,650	4	Golden, BC	4,750	6	Saskatoon, SK	5,700	7a
Chilliwack, BC	2,780	4	High River, AB	4,900	6	Glacier, BC	5,800	7a
Abbotsford, BC	2,860	4	Trois-Rivières, QC	4,900	6	Timmins, ON	5,940	7a
Vancouver, BC	2,950	4	Sault Ste. Marie, ON	4,960	6	Baie-Comeau, QC	6,020	7b
Duncan, BC	2,980	4	Calgary, AB	5,000	7a	Prince Albert, SK	6,100	7b
Nanaimo, BC	3,000	5	Québec, QC	5,080	7a	Fort McMurray, AB	6,250	7b
Kelowna, BC	3,400	5	Edmonton	5,120	7a	Flin Flon, MB	6,440	7b
Windsor, ON	3,400	5	North Bay, ON	5,150	7a	Fort Chipewan, AB	7,100	8
Hamilton, ON	3,460	5	Moose Jaw, SK	5,170	7a	Uranium City, SK	7,500	8
Toronto, ON	3,520	5	Banff, AB	5,500	7a	Thompson, MB	7,600	8
Whistler, BC	4,180	6	Gaspé, QC	5,500	7a	Dawson, Yukon	8,400	8
Montréal, QC	4,200	6	Mackenzie, BC	5,550	7a	Schefferville, QC	8,550	8
Ottawa, ON	4,440	6	Regina, SK	5,600	7a	Inuvik, NWT	10,050	8
Lethbridge, AB	4,500	6	Winnipeg, MB	5,670	7a	Alert, Nunavut	13,200	8

Prescriptive requirements for the thermal characteristics of above-ground building assemblies provided in NECB 2011, Division B, Section 3.2 are expressed as **overall thermal transmittance** (U-value). U-value is the rate, in $W/(m^2 \cdot K)$, at which heat is transferred through a building assembly that is subject to a temperature difference and represents the amount of heat transferred through a unit area in a unit of time induced under steady-state conditions by a unit temperature difference between the environments on its two faces.

U-value is the inverse of **effective thermal resistance** (RSI_{eff}), in $(m^2 \cdot K)/W$, of a building assembly representing the resistance to heat transfer. RSI_{eff} calculated using the formula below provided for NBC 2010, Section 9.36, includes the effect of thermal bridging due to repetitive structural members such as wood framing members in walls.

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

Table 2 provides maximum U-value from NECB 2011, Division B, Table 3.2.2.2. with equivalent RSI_{eff} (R_{eff}) for opaque above grade wall and roof assemblies.

Table 2 – Maximum Overall Thermal Transmittance for Above-Ground Opaque Wall & Roof Assemblies

Climate Zone	Zone 4	Zone 5	Zone 6	Zone 7a	Zone 7b	Zone 8						
	< 3,000	3,000 to 3,999	4,000 to 4,999	5,000 to 5,999	6,000 to 6,999	≥ 7,000						
Assembly	Maximum Overall Thermal Transmittance - $W/(m^2 \cdot ^\circ C)$											
Walls	0.315	0.278	0.247	0.210	0.210	0.183						
Roofs	0.227	0.183	0.183	0.162	0.162	0.142						
Minimum Effective Thermal Resistance¹												
Climate Zone	Zone 4	Zone 5	Zone 6	Zone 7a	Zone 7b	Zone 8						
Unit of Measure	RSI_{eff}	R_{eff}	RSI_{eff}	R_{eff}	RSI_{eff}	R_{eff}						
Walls	3.17	18.0	3.60	20.4	4.05	23.0	4.76	27.0	4.76	27.0	5.46	31.0
Roofs	4.41	25.0	5.46	31.0	5.46	31.0	6.17	35.1	6.17	35.1	7.04	40.0

Note:

1. RSI_{eff} expressed in $(m^2 \cdot ^\circ C)/W$ and R_{eff} expressed in $(ft^2 \cdot hr \cdot ^\circ F)/Btu$.

The minimum RSI_{eff} (R_{eff}) values in Table 2 for roofs can be achieved using Plasti-Fab EPS insulation. Table 3 provides examples of roof assemblies using continuous Plasti-Fab EPS insulation above a steel roof deck to meet NECB 2011 minimum RSI_{eff} (R_{eff}) requirements.

Table 3 – Plasti-Fab EPS Product Solutions for Roof Assemblies

Roof Assembly	Zone 4 Roof System	Zone 5 & 6 Roof System	Zone 7a & 7b Roof System	Zone 8 Roof System	
Outside Air Film	0.03	0.03	0.03	0.03	
Roof Membrane	Nil	Nil	Nil	Nil	
Cover Board	0.03	0.03	0.03	0.03	
Plasti-Fab EPS Insulation Solution	4.24	5.29	6.00	6.87	
Vapour Barrier	Nil	Nil	Nil	Nil	
Metal Roof Deck	Nil	Nil	Nil	Nil	
Inside Air Film	0.11	0.11	0.11	0.11	
RSI_{eff}	$(m^2 \cdot ^\circ C)/W$	4.41	5.46	6.17	7.04
R_{eff}	$(ft^2 \cdot hr \cdot ^\circ F)/Btu$	25	31	35	40

Notes:

1. RSI for component materials in above calculations are as per the NBC 2010, Division B, Table A-9.36.2.4.(1)-D.
2. To convert **Plasti-Fab EPS Insulation Solution** RSI in the table above, expressed in $(m^2 \cdot ^\circ C)/W$, to R-value, expressed in $(ft^2 \cdot hr \cdot ^\circ F)/Btu$, multiply by 5.678263.
3. Table 6 provides thermal resistance (RSI/R) values for Plasti-Fab continuous EPS insulation options.

Table 4 provides Plasti-Fab EPS insulation solutions that can be used to meet NECB 2011 minimum RSI_{eff} (R_{eff}) requirements for above grade wall assemblies built using wood frame construction.

Table 4 - Plasti-Fab EPS Product Solutions for Above Grade Wood-Frame Wall Assemblies

Wall Option Description	NECB Climate Zone	Minimum RSI_{eff} (R_{eff})	Base Wall ¹ RSI_{eff} (R_{eff})	RSI (R) Plasti-Fab Insulation
Wall Options with Plasti-Fab Continuous EPS Insulation²				
Option A Base wall - 2 x 4 wood studs @ 406 mm (16") on center with RSI-2.29 (R-13) cavity insulation	4	3.17 (18.0)	1.90 (10.8)	1.27 (7.2)
	5	3.60 (20.4)		1.70 (9.6)
	6	4.05 (23.0)		2.15 (12.2)
Option B Base wall - 2 x 6 wood studs @ 406 mm (16") on center with RSI-3.34 (R-19) cavity insulation	5	3.60 (20.4)	2.70 (15.3)	0.90 (5.1)
	6	4.05 (23.0)		1.35 (7.7)
	7a to 7b	4.76 (27.0)		2.06 (11.7)
	8	5.46 (31.0)		2.76 (15.7)

Notes:

1. RSI_{eff} (R_{eff}) calculations for base wall include contribution from wood studs with cavity insulation plus continuous elements other than Plasti-Fab EPS insulation – i.e., outside air film, cladding, gypsum board and inside air film.
2. Table 5 provides thermal resistance (RSI/R) values for Plasti-Fab continuous EPS insulation options.

Table 5 provides Plasti-Fab EPS insulation solutions that can be used to meet NECB 2011 minimum RSI_{eff} (R_{eff}) requirements for above grade wall assemblies built using steel stud construction.

Table 5 - Plasti-Fab EPS Product Solutions for Above Grade Steel Stud Wall Assemblies

Wall Option Description	NECB 2011 Climate Zone	Minimum RSI_{eff} (R_{eff})	Base Wall ¹ RSI_{eff} (R_{eff})	RSI (R) Plasti-Fab Insulation
Wall Options with Plasti-Fab Continuous EPS Insulation²				
Option A Base wall - 2 x 4 steel studs @ 406 mm (16") on center with RSI-2.47 (R-14) cavity insulation	4	3.17 (18.0)	1.55 (8.8)	1.62 (9.2)
	5	3.60 (20.4)		2.05 (11.6)
	6	4.05 (23.0)		2.50 (14.2)
	7a to 7b	4.76 (27.0)		3.21 (18.2)
Option B Base wall - 2 x 6 steel studs @ 406 mm (16") on center with RSI-3.52 (R-20) cavity insulation	4	3.17 (18.0)	2.03 (11.5)	1.14 (6.5)
	5	3.60 (20.4)		1.57 (8.9)
	6	4.05 (23.0)		2.02 (11.5)
	7a to 7b	4.76 (27.0)		2.73 (15.5)
	8	5.46 (31.0)		3.43 (19.5)

Notes:

1. RSI_{eff} (R_{eff}) calculations for base wall include contribution from steel studs with cavity insulation plus continuous elements other than Plasti-Fab EPS insulation – i.e., outside air film, cladding, gypsum board and inside air film.
2. Table 6 provides thermal resistance (RSI/R) values for Plasti-Fab continuous EPS insulation options.

Table 6 – RSI (R-value) Plasti-Fab Continuous EPS Insulation Options

Plasti-Fab Continuous EPS Insulation Option	RSI (R) Unit of Thickness
PlastiSpan® or DuroFoam® insulation	RSI-0.65 per 25 mm (R-3.75 per inch)
PlastiSpan HD or DuroFoam Plus insulation	RSI-0.70 per 25 mm (R-4.04 per inch)
EnerSpan® insulation	RSI-0.82 per 25 mm (R-4.7 per inch)

Table 7 provides maximum U-value from NECB 2011, Division B, Table 3.2.3.1. with equivalent RSI_{eff} (R_{eff}) for wall and floor assemblies in contact with the ground.

Table 7 – Maximum Overall Thermal Transmittance for Building Assemblies in Contact with the Ground

Climate Zone	Zone 4	Zone 5	Zone 6	Zone 7a	Zone 7b	Zone 8						
	< 3,000	3,000 to 3,999	4,000 to 4,999	5,000 to 5,999	6,000 to 6,999	≥ 7,000						
Assembly	Maximum Overall Thermal Transmittance - $W/(m^2 \cdot ^\circ C)$											
Walls	0.568	0.379	0.284	0.284	0.284	0.210						
Floors	0.757	0.757	0.757	0.757	0.757	0.379						
Minimum Effective Thermal Resistance¹												
Climate Zone	Zone 4		Zone 5		Zone 6		Zone 7a		Zone 7b		Zone 8	
Unit of Measure	RSI_{eff}	R_{eff}	RSI_{eff}	R_{eff}	RSI_{eff}	R_{eff}	RSI_{eff}	R_{eff}	RSI_{eff}	R_{eff}	RSI_{eff}	R_{eff}
Walls	1.76	10.0	2.64	15.0	3.52	20.0	3.52	20.0	3.52	20.0	4.76	27.0
Floors	1.32	7.5	1.32	7.5	1.32	7.5	1.32	7.5	1.32	7.5	2.64	15.0

Note:

RSI_{eff} expressed in $(m^2 \cdot ^\circ C)/W$ and R_{eff} expressed in $(ft^2 \cdot hr \cdot ^\circ F)/Btu$.

For foundation wall applications the above requirements apply for walls or parts thereof that are below the exterior ground level and are part of the building envelope. Insulation on walls in contact with the ground must extend 2.4 m down from ground level or to the bottom of the wall, whichever is less.

The above requirements apply to floors-on-ground separating conditioned space from the ground less than 0.6 m below grade. Floors-on-ground with no embedded heating ducts, cables or heating or cooling pipes must have insulation placed on their top or bottom surface for a distance of not less than 1.2 m from their perimeter for Climate Zones 4 to 7b or over their full area for Climate Zone 8. For floors-on-ground with embedded heating ducts or cables or heating and cooling pipes the insulation must be under the full floor area.

The minimum RSI_{eff} (R_{eff}) values in Table 7 for walls and floors in contact with the ground can be achieved using Plasti-Fab EPS insulation. Table 6 provides thermal resistance (RSI/R) values for Plasti-Fab EPS insulation options to provide the required effective thermal resistance as per Table 7.