

Product Information Bulletin

NBC 2010 - Manitoba Plasti-Fab EPS Product Solution

National Building Code of Canada 2010 (NBC 2010), Section 9.36., **Energy Efficiency**, provides energy efficiency requirements for buildings 3 storeys or less in building height, having a building area not exceeding 600 m² and used for major occupancies classified as residential occupancies. This bulletin summarizes Plasti-Fab® expanded polystyrene (EPS) product solutions for use in building assemblies complying with NBC 2010, Section 9.36.2. as modified for Manitoba by The Buildings and Mobile Homes Act.

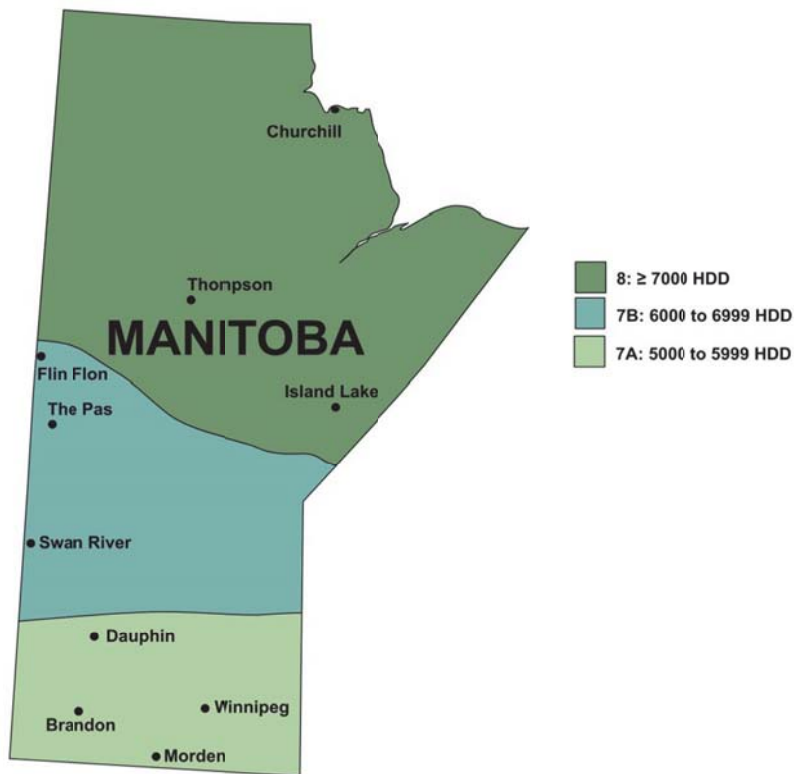


Figure 1: Manitoba Climate Zone Map

Table 1 – NBC 2010, Division B, Appendix C, Heating Degree Days (HDD) for Building Locations

| Zone 7a | | Zone 7b | | Zone 8 | |
|-----------|------|-------------|------|------------|------|
| Location | HDD | Location | HDD | Location | HDD |
| Morden | 5400 | Swan River | 6100 | Thompson | 7600 |
| Winnipeg | 5670 | Flin Flon | 6440 | Lynn Lake | 7770 |
| Steinbach | 5700 | The Pas | 6480 | Split Lake | 7900 |
| Brandon | 5760 | Island Lake | 6900 | Churchill | 8950 |

Effective thermal resistance (RSI_{eff}/R_{eff}) of building assemblies calculated using the formula below 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 minimum RSI_{eff} (R_{eff}) from NBC 2010 as modified by Manitoba regulation for above grade wall applications.

Table 2 – NBC 2010 RSI_{eff} (R_{eff}) for Above Grade Walls

| Climate Zone | Table 9.36.2.6.A. – Without HRV | | Table 9.36.2.6.B. – With HRV | |
|--------------|---------------------------------|-----------|------------------------------|-----------|
| | RSI_{eff} | R_{eff} | RSI_{eff} | R_{eff} |
| 7a | 3.08 | 17.5 | 2.80 | 15.9 |
| 7b | 3.85 | 21.9 | 2.80 | 15.9 |
| 8 | 3.85 | 21.9 | 3.08 | 17.5 |

Table 3 provides examples of Plasti-Fab EPS product solutions that can be used to meet NBC 2010 minimum RSI_{eff} (R_{eff}) requirements for above grade wall applications.

Table 3 - Plasti-Fab EPS Product Solutions for Above Grade Walls

| Plasti-Fab Wall Option Description | NBC 2010 Climate Zone | Minimum RSI_{eff} (R_{eff}) | Base Wall RSI_{eff} (R_{eff}) ¹ | RSI (R) Plasti-Fab Solution |
|---|-----------------------|-----------------------------------|--|-----------------------------|
| Wall Options with Plasti-Fab Continuous EPS Insulating Sheathing² | | | | |
| Option A – without HRV Base wall - 2 x 4 wood studs @ 406 mm (16") on center with RSI-2.29 (R-13) cavity insulation | 7a | 3.08 (17.5) | 1.90 (10.8) | 1.18 (6.7) |
| | 7b to 8 | 3.85 (21.9) | | 1.95 (11.1) |
| Option B – With HRV Base wall as per Option A | 7a to 7b | 2.80 (15.9) | 1.90 (10.8) | 0.90 (5.1) |
| | 8 | 3.08 (17.5) | | 1.18 (6.7) |
| Option C – Without HRV Base wall - 2 x 6 wood studs @ 406 mm (16") on center with RSI-3.34 (R-19) cavity insulation | 7b to 8 | 3.85 (21.9) | 2.68 (15.2) | 1.17 (6.7) ³ |
| Wall Options with Plasti-Fab Building Systems | | | | |
| Option E: With or Without HRV Advantage ICF System [®] wall – see Advantage ICF System PIB 222 for RSI_{eff}/R_{eff} calculated per note 4 | 7a to 8 | 3.85 (21.9) | NA | 4.14 (23.5) |
| Option F: With or Without HRV Insulspan [®] SIP System (6 1/2" SIP) – see Insulspan SIP System PIB 209 for RSI_{eff}/R_{eff} calculated per note 4 | 7a to 8 | 3.08 (17.5) | NA | 3.42 (19.4) |
| Option G: Without HRV Insulspan [®] SIP System (8 1/4" SIP) – see Insulspan SIP System PIB 209 for RSI_{eff}/R_{eff} calculated per note 4 | 7b to 8 | 3.85 (21.9) | NA | 4.32 (24.5) |

1. Base wall RSI_{eff} (R_{eff}) calculations include the 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. Determine Plasti-Fab EPS insulation thickness based upon RSI/R -values for Plasti-Fab EPS options in Table 6.
3. DuroFoam and DuroFoam Plus insulations are manufactured with a laminated film on each face and have a vapour permeance characteristic less than 60 ng/Pa•s•m². When applied as exterior insulating sheathing in Climate Zone 8, the minimum RSI (R) for these insulation options would be RSI-1.28 (R-7.3) to meet the minimum ratio of outboard to inboard insulation per NBC 2010, Article 9.25.5.2.
4. RSI(R) in table 3 is RSI_{eff}/R_{eff} for wall systems built with Plasti-Fab building system noted.

Table 4 provides minimum RSI_{eff} (R_{eff}) from NBC 2010, as modified by Manitoba regulation, for below grade wall applications.

Table 4 – RSI_{eff} (R_{eff}) of Below-Grade Foundation Walls

| Climate Zone | Table 9.36.2.8.A. – Without HRV | | Table 9.36.2.8.B. – With HRV | |
|--------------|---------------------------------|-----------|------------------------------|-----------|
| | RSI_{eff} | R_{eff} | RSI_{eff} | R_{eff} |
| 7a | 3.46 | 19.7 | 2.80 | 15.9 |
| 7b | 3.46 | 19.7 | 2.80 | 15.9 |
| 8 | 3.97 | 22.5 | 2.80 | 15.9 |

Table 5 provides examples of Plasti-Fab EPS product solutions that can be used to meet NBC 2010 minimum RSI_{eff} (R_{eff}) requirements for below-grade wall applications.

Table 5 - Plasti-Fab EPS Product Solutions for Foundation Below-Grade Walls

| Plasti-Fab Wall Option Description | NBC 2010 Climate Zone | Minimum RSI_{eff} (R_{eff}) | Base Wall RSI_{eff} (R_{eff}) ¹ | RSI (R) Plasti-Fab Solution |
|---|-----------------------|-----------------------------------|--|-----------------------------|
| Wall Options with Plasti-Fab Continuous EPS Interior or Exterior Insulation² | | | | |
| Option A – Without HRV Base wall – 2 x 3 wood studs @ 610 mm (24") on center | 7a to 7b | 3.46 (19.6) | 0.35 (2.0) | 3.11 (17.6) |
| | 8 | 3.97 (22.5) | | 3.62 (20.5) |
| Option B – Without HRV Base wall – 2 x 4 wood studs @ 610 mm (24") on center with RSI-2.11 (R-12) cavity insulation | 7a to 7b | 3.46 (19.6) | 1.99 (11.3) | 1.47 (8.3) |
| | 8 | 3.97 (22.5) | | 1.98 (11.2) |
| Option C – Without HRV Base wall – 2 x 6 wood studs @ 610 mm (24") on center with RSI-3.34 (R-19) cavity insulation | 7a to 7b | 3.46 (19.6) | 2.97 (16.9) | 0.49 (2.7) |
| | 8 | 3.97 (22.5) | | 1.00 (5.6) |
| Option D – With HRV Base wall – 2 x 3 wood studs @ 610 mm (24") on center | 7a to 8 | 2.80 (15.9) | 0.35 (2.0) | 2.45 (13.9) |
| Option E: With HRV Base wall – 2 x 4 wood studs @ 610 mm (24") on center with RSI-2.11 (R-12) cavity insulation | 7a to 8 | 2.80 (15.9) | 1.99 (11.3) | 0.81 (4.6) |
| Wall Option with Plasti-Fab Building System | | | | |
| Option F: With or Without HRV Advantage ICF System [®] wall – see Advantage ICF System PIB 222 for RSI_{eff}/R_{eff} calculated per note 3 | 7a to 8 | 3.97 (22.5) | NA | 4.00 (22.7) |

1. Base wall RSI_{eff} (R_{eff}) calculations include the contribution from framed portion of wall plus continuous elements other than Plasti-Fab EPS insulation – i.e., concrete foundation wall, gypsum board and inside air film.
2. Determine Plasti-Fab EPS insulation thickness based upon RSI/R-values for Plasti-Fab EPS options in Table 6.
3. RSI(R) in table 5 is RSI_{eff}/R_{eff} for wall system built with Advantage ICF System.

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 minimum RSI_{eff} (R_{eff}) from NBC 2010 for floors in contact with the ground.

Table 7 – NBC 2010 RSI_{eff} (R_{eff}) for Floors in Contact with the Ground

| Climate Zones | Zone 7a | Zone 7b | Zone 8 |
|--|--|----------------|-------------|
| Heating Degree-Days (HDD) Celsius Degree-Days | 5,000 to 5,999 | 6,000 to 6,999 | ≥ 7,000 |
| | Minimum $RSI_{eff} - m^2 \cdot ^\circ C/W$ ($R_{eff} - ft^2 \cdot hr \cdot ^\circ F/ BTU$) | | |
| Unheated Floors above frost Line | 1.96 (11.1) | 1.96 (11.1) | 1.96 (11.1) |
| Heated Floors | 2.84 (16.1) | 2.84 (16.1) | 2.84 (16.1) |

Table 8 provides Plasti-Fab EPS product solutions that can be used to meet NBC 2010 minimum RSI_{eff} (R_{eff}) requirements for floor slab applications.

Table 8 - Plasti-Fab EPS Product Solutions for Floors in Contact with the Ground

| Plasti-Fab Option Description | 2014 ABC Climate Zone | Minimum RSI_{eff} (R_{eff}) ¹ | Plasti-Fab EPS Insulation Min. RSI (R) ² |
|--|-----------------------|--|---|
| Options with Plasti-Fab EPS Insulation | | | |
| Option A – Unheated Slab Above Frost Line³ Plasti-Fab EPS insulation between 2 x 3 wood nailers @ 610 mm (24") on center above slab | 7a to 8 | 1.96 (11.1) | 1.83 (10.4) |
| Option B – Unheated Slab Above Frost Line⁴ Plasti-Fab EPS insulation below slab | 7a to 8 | 1.96 (11.1) | 1.76 (10.0) |
| Option C – Heated Slab⁵ Plasti-Fab continuous EPS insulation below slab | 7a to 8 | 2.84 (16.1) | 2.64 (15.0) |

- RSI_{eff} (R_{eff}) calculations include:
 - Contribution from wood nailers with Plasti-Fab EPS insulation for above slab option plus continuous elements in assembly – i.e., concrete floor slab, floor sheathing and inside air film.
 - Contribution from continuous Plasti-Fab EPS insulation below slab plus other continuous elements in assembly – i.e., concrete floor slab and inside air film.
- Determine Plasti-Fab EPS insulation thickness based upon RSI/R-values for Plasti-Fab EPS options in Table 9.
- Unheated slabs above the frost line shall be insulated within the wooden sleepers below the floor for a distance not less than 1.2 m (4 ft) horizontally from the perimeter of the slab
- Unheated slabs above the frost line shall be insulated beneath the slab for a distance not less than 1.2 m (4 ft) horizontally from the perimeter of the slab with a thermal break along the edge of the slab.
- Floors-on-ground with embedded heating ducts, cables or pipes (heated slabs) shall be insulated to the effective thermal resistance under their full bottom surface including the edges.

Table 9 – RSI (R-value) Plasti-Fab EPS Insulation Options

| Plasti-Fab 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) |
| Radon Guard™ insulation ¹ | RSI-0.70 per 25 mm (R-4.04 per inch) |

- Note Radon Guard insulation applicable for below slab insulation options. In addition to providing required thermal insulation, Radon Guard insulation is used as a component in a Radon mitigation system – for additional information see Plasti-Fab Product Information Bulletin 294.