CONTRACTORS GUIDE TO ENERGY EFFICIENCY REQUIREMENTS OF THE 2010 NATIONAL BUILDING CODE

This guide has been developed to assist residential builders/contractors in Oromocto New Brunswick to interpret and comply with the changes to the 2010 National Building Code (NBC). The focus is on the commonly used assemblies for Energy Efficiency (9.36) in residential housing and small buildings. The following information can also be used as part of the building permit application.

2010 NBC COMPLIANCE

- Buildings must comply with the prescriptive requirements of Subsections 9.36.2. through 9.36.4 of the 2010 NBC.

- Section 9.36 has six climate zones (Figure 1). The specific weather location may be determined by referencing the local authority or Appendix C of Division B in the Code.

  The Town of Oromocto is located within Climate Zone 6, this guide provides information specific to Climate Zone 6.

Climate Zones Map-figure 1

Changes to New Brunswick's NBC- Energy Efficiency Requirements

- Starting 01 January 2015, applications for building permits must comply with new requirements for energy efficiency in housing, small commercial and industrial buildings.

- The new building envelope requirements vary depending on your location. New Code requirements are also being added related to the energy efficiency of heating, ventilation and air conditioning (HVAC) equipment and service water heating (SWH).

- There are two pathways to achieve compliance:

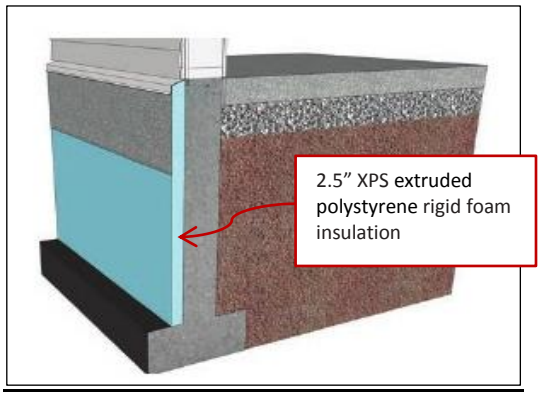
  1) The Prescriptive Pathway uses a checklist approach to make sure minimum requirements are met; and

  2) The Performance Pathway uses computer modeling to show that the house is meeting minimum energy efficiency requirements. This method will require the services of an energy design consultant or evaluator.

UNHEATED FLOORS ON GROUND-ABOVE THE FROST LINE - (2010 NBC-9.36.2.8)

Insulation Placement for Unheated Slabs

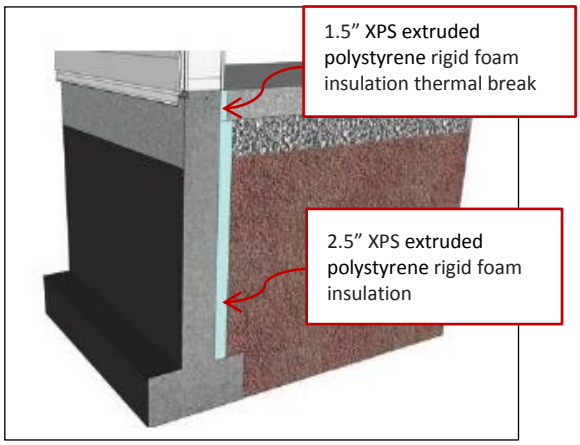
OPTION # 1 ☐



Slab on grade at foundation wall with exterior insulation to the footing.

- (2.5" XPS extruded polystyrene rigid foam insulation (0.88 RSI/in) = effective 2.20 RSI.
- Minimum effective insulation value will exceed the min RSI of 1.96 required.

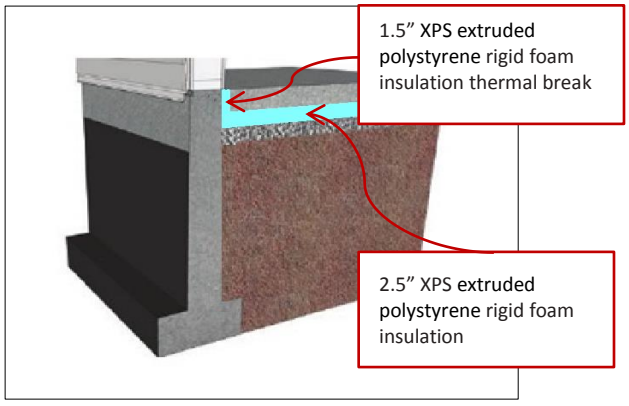
OPTION # 2 ☐



Slab on grade at foundation wall with interior insulation down 1.2 m, or to the footing with a thermal break at the slab.

- (2.5" XPS extruded polystyrene rigid foam insulation @ (0.88 RSI/in) with a 1.5" XPS extruded polystyrene rigid foam insulation at the thermal break will exceed the min RSI of 1.96 required.

OPTION # 3 ☐



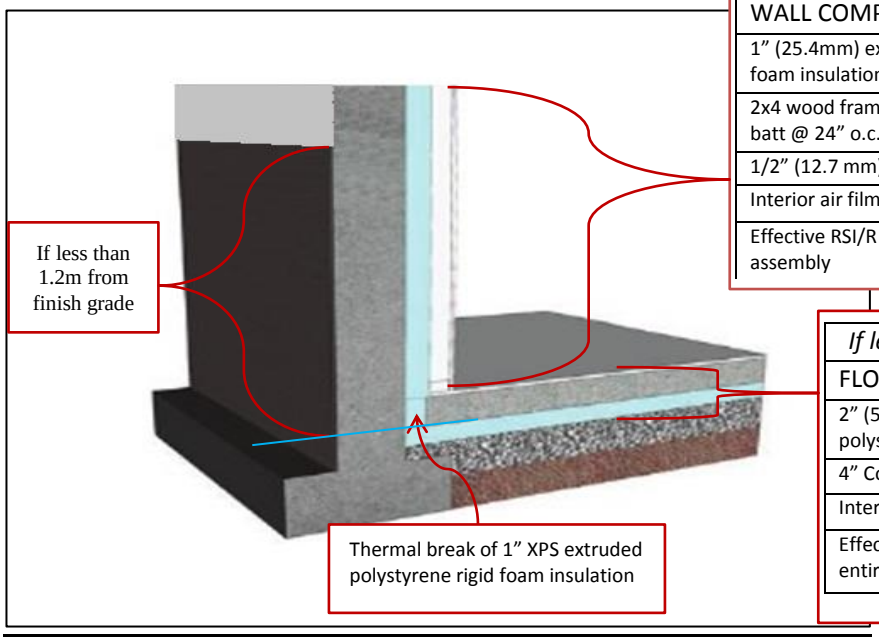
Slab on grade at foundation wall with interior insulation installed horizontal under the slab 1.2 m out from the foundation wall, with a thermal break at the slab.

- (2.5" XPS extruded polystyrene
- rigid foam insulation @ (0.88 RSI/in) with a 1.5" XPS extruded polystyrene rigid foam insulation at the thermal break will exceed the min RSI of 1.96 required.

BELOW GRADE WALL ASSEMBLY – (2010 NBC-9.36.2.8)

Insulation Placement for Unheated slabs above the Frost Line

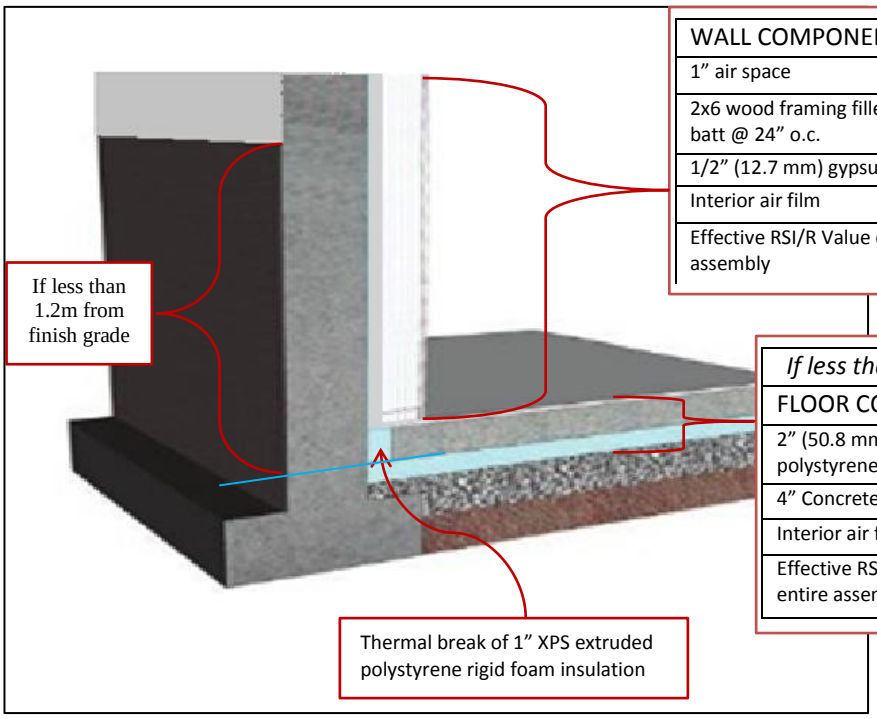
OPTION # 1 ☐



WALL COMPONENTS	RSI	R
1" (25.4mm) extruded polystyrene foam insulation	0.88	5.0
2x4 wood framing filled with R-12 batt @ 24" o.c.	1.71	9.70
1/2" (12.7 mm) gypsum board	0.08	0.45
Interior air film	0.12	0.68
Effective RSI/R Value of entire assembly	3.00	17.03

If less than 1.2 m from finished grade		
FLOOR COMPONENTS	RSI	R
2" (50.8 mm) extruded polystyrene foam insulation	1.76	9.99
4" Concrete floor	0.04	0.22
Interior air film	0.16	0.91
Effective RSI/R Value of entire assembly	1.96	11.11

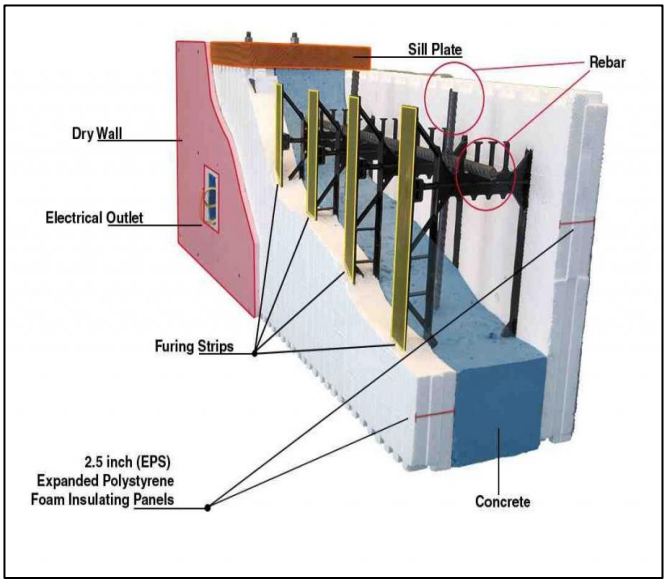
OPTION # 2 ☐



WALL COMPONENTS	RSI	R
1" air space	0.00	0.00
2x6 wood framing filled with R-20 batt @ 24" o.c.	2.78	15.78
1/2" (12.7 mm) gypsum board	0.08	0.45
Interior air film	0.12	0.68
Effective RSI/R Value of entire assembly	2.98	16.92

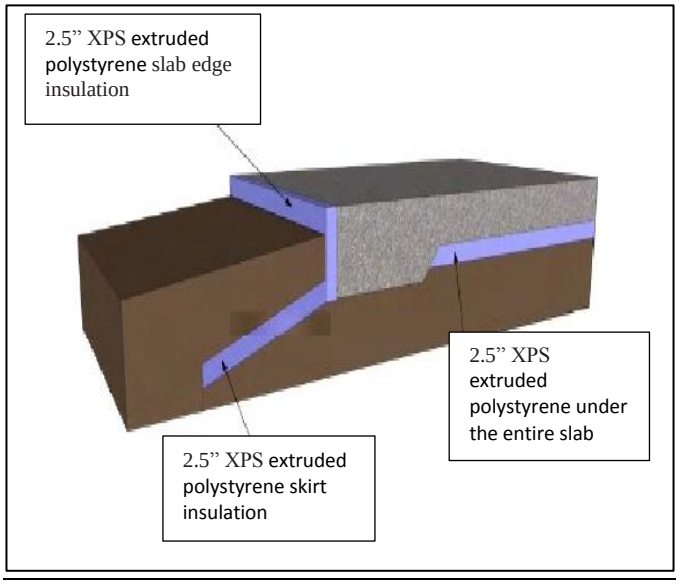
If less than 1.2 m from finished grade		
FLOOR COMPONENTS	RSI	R
2" (50.8 mm) extruded polystyrene foam insulation	1.76	9.99
4" Concrete floor	0.04	0.22
Interior air film	0.16	0.91
Effective RSI/R Value of entire assembly	1.96	11.11

ICF FOUNDATION



- Creates a higher continous R value due to the continuity of the high density insulation.
- Reduced air infiltration by elimination of insulation gaps in the wall cavity and post-construction leakage due to the movement of the wood framing in above grade construction.
- Will meet all efficiency targets for Zone 6 under 9.36.

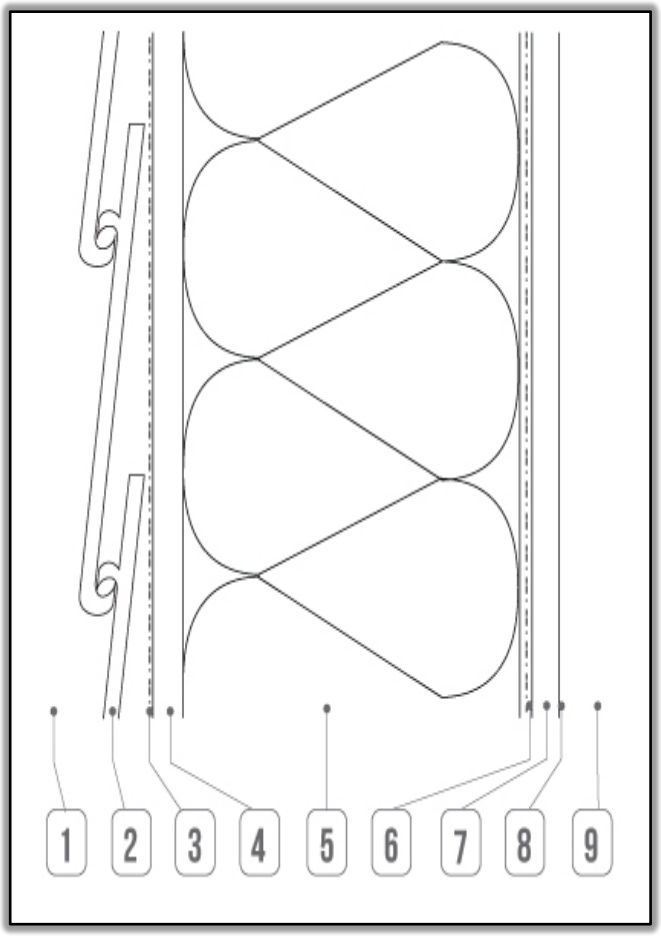
SLAB-ON-GRADE WITH INTEGRAL FOOTING WITH HRV

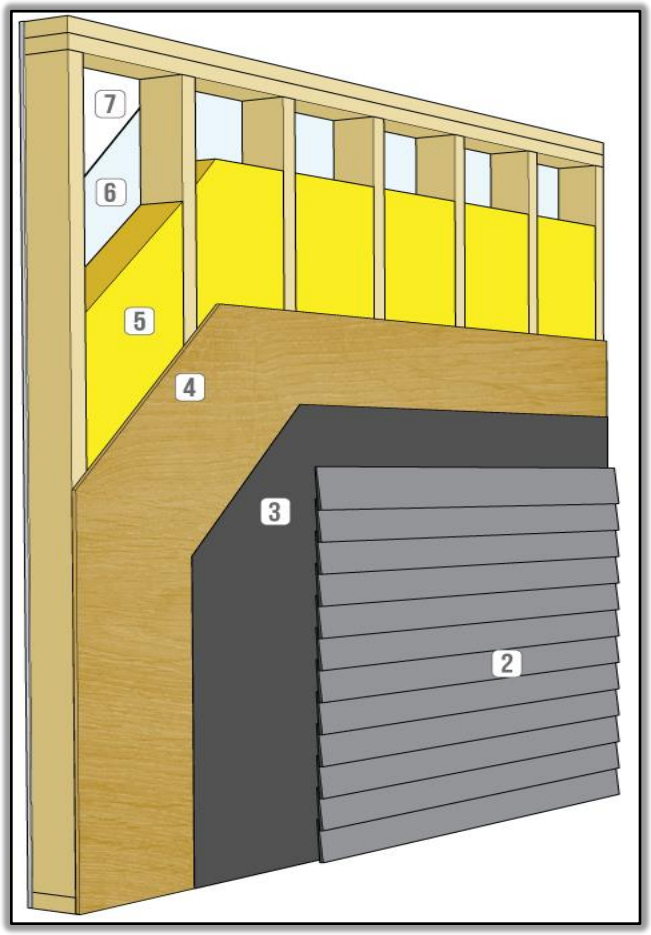


- 2.5"of extruded polystyrene (XPS) foam insulation at the slab edge, skirt and under the slab.
- (effective insulation value:R-11.24, RSI 1.98)

EFFECTIVE THERMAL RESISTANCE OF ABOVE GRADE ASSEMBLIES WITH A HEAT RECOVERY VENTILATOR

WALL ASSEMBLY –OPTION # 1 ☐



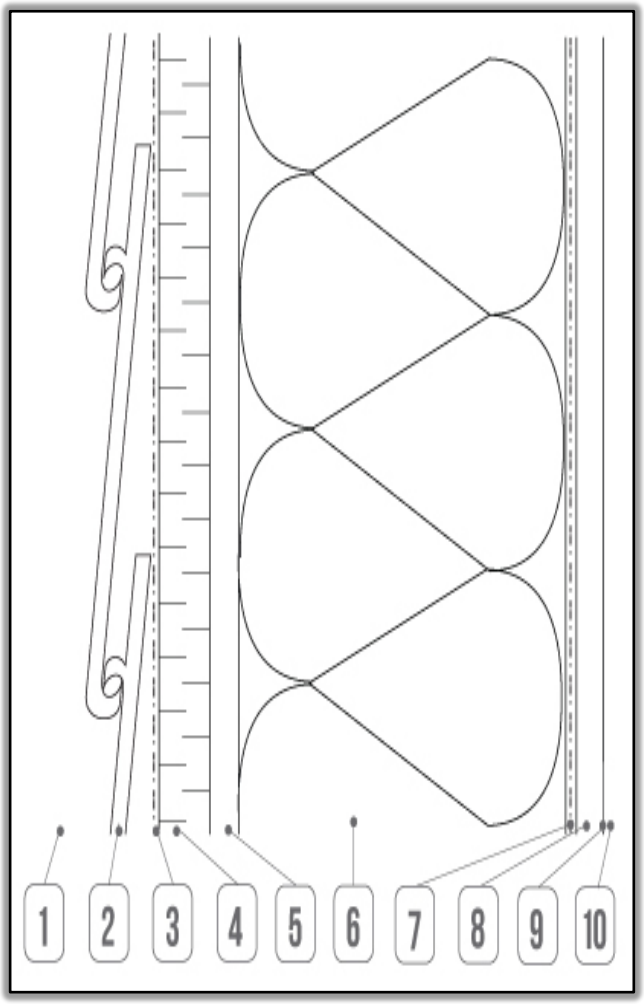


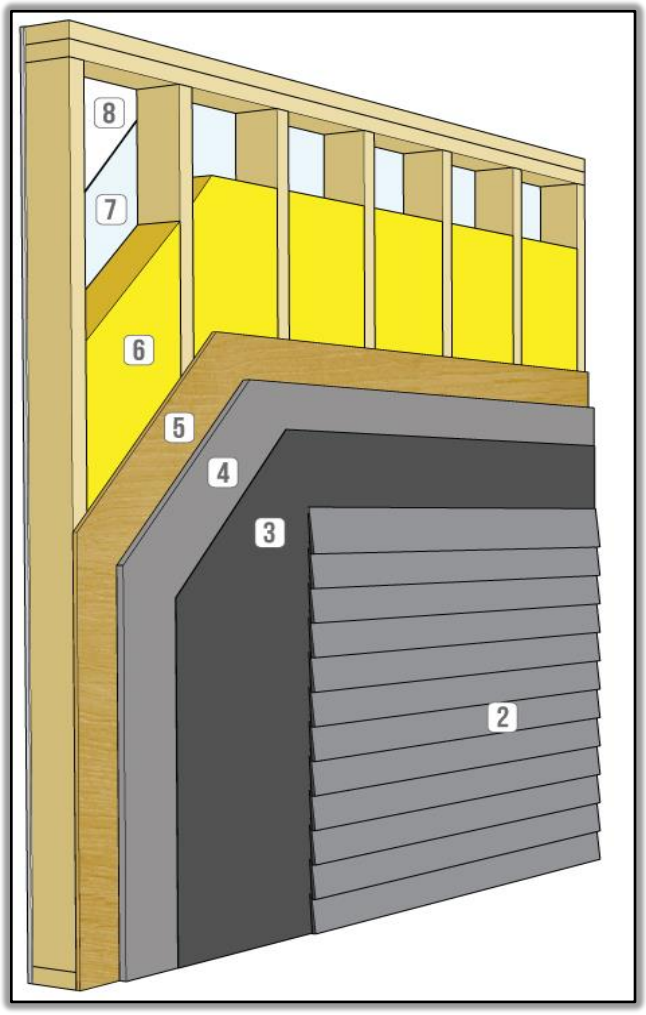
WALL ASSEMBLY COMPONENTS		RSI	R
1	Exterior air film	0.03	0.17
2	Vinyl siding (no air space)	0.11	0.62
3	Asphalt impregnated paper	0.00	0.00
4	7/16" (11.01mm) OSB sheathing	0.11	0.62
5	2x6 framing filled with R-22 batt @ 16" o.c.	2.55	14.48
6	Polyethylene	0.00	0.00
7	½" (12.7 mm) gypsum board	0.08	0.45
8	Finish: 1 coat of latex primer and latex paint	0.00	0.00
9	Interior air film	0.12	0.68
Effective RSI/R Value of Entire Assembly		**3.00**	**17.02**
Centre of Cavity RSI/R Value		4.32	24.54
Installed Insulation RSI/R Value (nominal)		3.87	22.00
Effective RSI/R Value of assembly with advanced framing (Advanced Framing as defined by NBC 9.36.4. (1))		3.12	17.70

I, _____ acknowledge
(print name)
that this will be the method and materials that will be used for the above grade wall construction and will ensure that any changes not identified on this form will be acknowledged in writing to the building inspector.

Photos and numerical values are courtesy of the Canadian Wood Council's Wall Thermal Design Calculator, cwc.ca/wtd.

WALL ASSEMBLY-OPTION # 2 ☐





WALL ASSEMBLY COMPONENTS		RSI	R
1	Exterior air film	0.03	0.17
2	Vinyl siding (no air space)	0.11	0.62
3	Asphalt impregnated paper	0.00	0.00
4	1" (25.4mm) Extruded polystyrene type 3/4	0.89	5.05
5	7/16" (11.0 mm) OSB sheathing	0.11	0.62
6	2x6 framing filled with R-19 batt @ 16" o.c.	2.36	13.40
7	Polyethylene	0.00	0.00
8	½" (12.7 mm) gypsum board	0.08	0.45
9	Finish: 1 coat of latex primer and latex paint	0.00	0.00
10	Interior air film	0.12	0.68
Effective RSI/R Value of Entire Assembly		**3.70**	**20.99**
Centre of Cavity RSI/R Value		4.69	26.59
Installed Insulation RSI/R Value (nominal)		4.24	24.05
Effective RSI/R Value of assembly with advanced framing (Advanced Framing as defined by NBC 9.36.4. (1))		3.79	21.50

I,_____ acknowledge
(print name)
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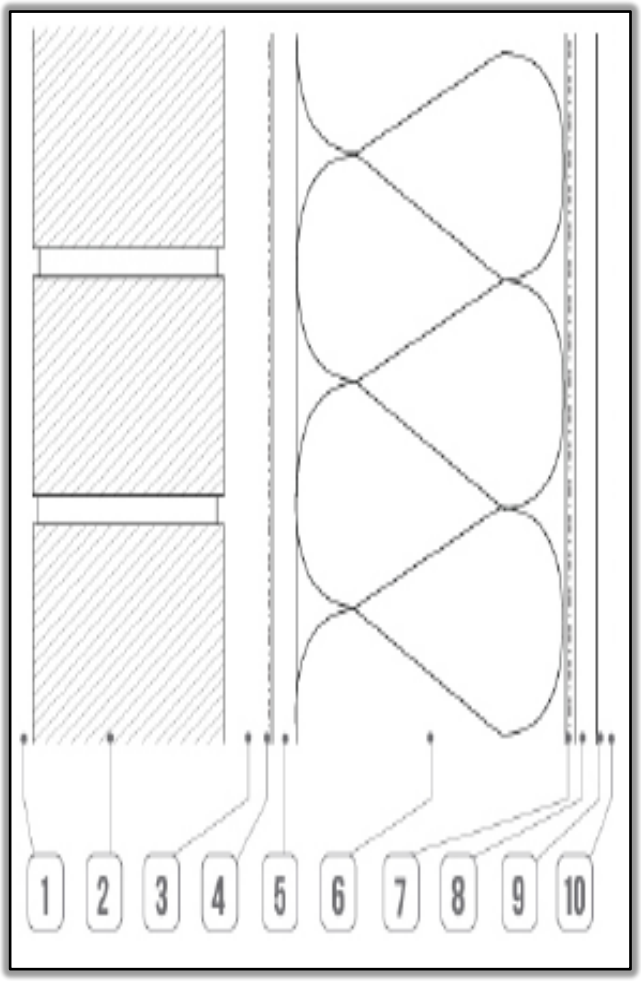
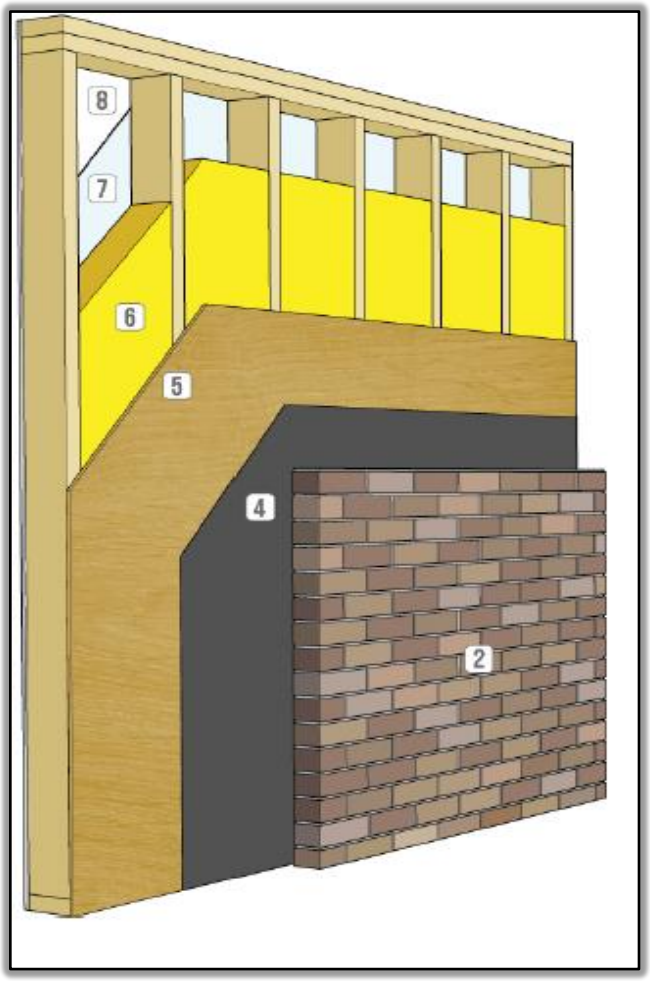
WALL ASSEMBLY- OPTION # 3 ☐





WALL ASSEMBLY COMPONENTS		RSI	R
1	Exterior air film	0.03	0.17
2	Fired clay brick 4" (102 mm) [2]	0.07	0.40
3	More than 3/4" (20 mm+) air space	0.18	1.02
4	Asphalt impregnated paper	0.00	0.00
5	7/16" (11.0 mm) OSB sheathing	0.11	0.62
6	2x6 framing filled with R-19 batt @ 24" o.c.	2.45	13.91
7	Polyethylene	0.00	0.00
8	1/2" (12.7 mm) gypsum board	0.08	0.45
9	Finish: 1 coat of latex primer and latex paint	0.00	0.00
10	Interior air film	0.12	0.68
Effective RSI/R Value of Entire Assembly		**3.04**	**17.25**
Centre of Cavity RSI/R Value		3.94	22.34
Installed Insulation RSI/R Value (nominal)		3.35	19.00
Effective RSI/R Value of assembly with advanced framing (Advanced Framing as defined by NBC 9.36.4. (1))		3.14	17.82

I,_____ acknowledge
(print name)
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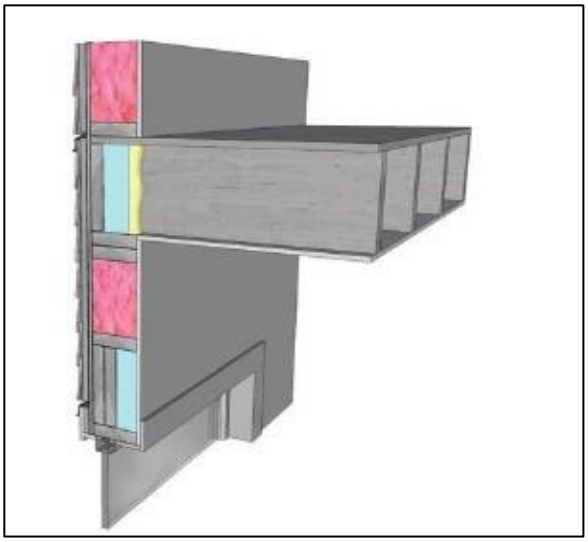
CONTINUITY OF INSULATION - (2010 NBC-9.36.2.5)

Two Planes of Insulation: (9.36.2.5 (5))

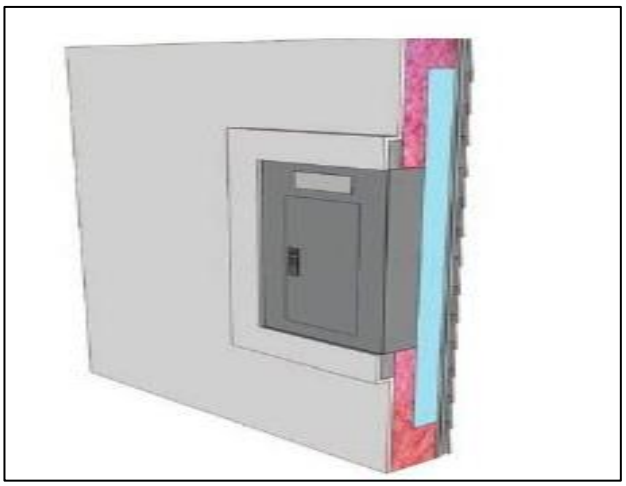
- Where two planes of insulation are separated by a building envelope assembly and cannot be physically joined, one of the planes of insulation must be extended for a distance equal to at least four times the thickness of the assembly separating the two planes.

Lintel/Header and Rim Joists: (9.36.2.6 (2))



- The thermal bridging effect of closely spaced, repetitive structural members like studs and joists, and of ancillary members like lintels, sills and plates, must be accounted for when calculating the thermal resistance of building envelope assemblies. The effective thermal resistance of rim joists shall not be less that that required for above-ground walls.

Electrical Panels: (9.36.2.5 (6)

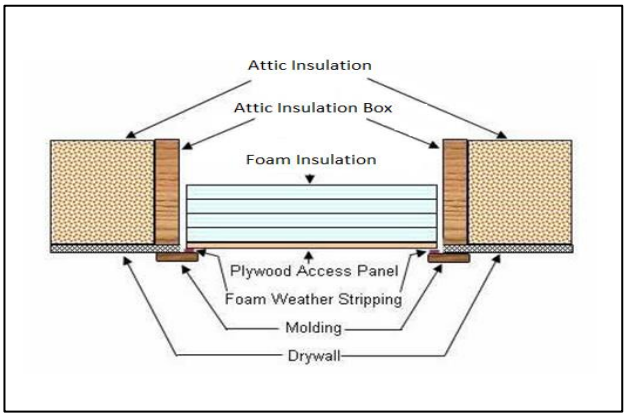


- Mechanical, electrical and plumbing components , such as pipes, ducts, conduits, cabinets, chases, panels, or recessed heaters that are placed within and parallel to a wall assembly, required to be insulated, the effective thermal resistance of that wall at the projected area of the system component shall not be less than required in Tables 9.36.2.6.A., 9.36.2.6.B., 9.36.2.8.A., and 9.36.2.8.B.,

Attic Insulation at Outside Walls: (9.36.2.6 (3))

- A reduction in the thermal resistance of the ceiling assembly in attics under sloped roofs is permitted for a length of no greater than 1200mm but only to the extent imposed by the roof slope and minimum venting clearance, provided the nominal thermal resistance of the insulation directly above the exterior wall is not less than R-19.99 / RSI-3.52 (m^2·K)/W.

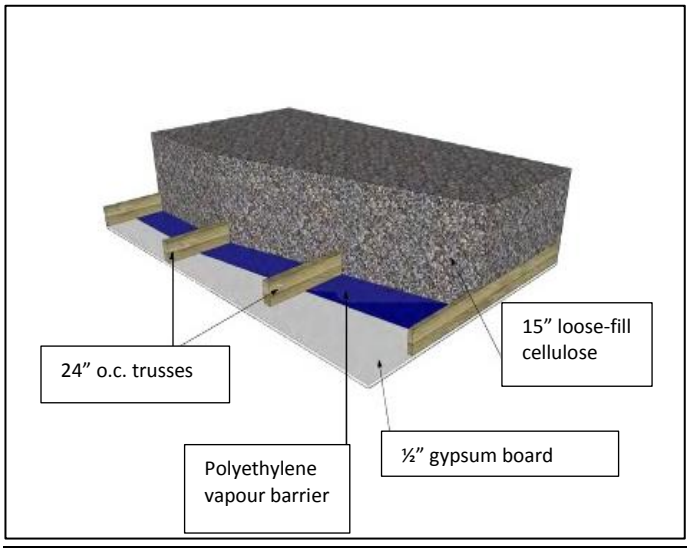
Attic Hatch Insulation: (9.36.2.7(8))



- Attic hatches separating a conditioned space from an unconditioned space shall be insulated to a nominal thermal resistance of not less than R-14.76 / RSI 2.6 (m^2·K)/W.

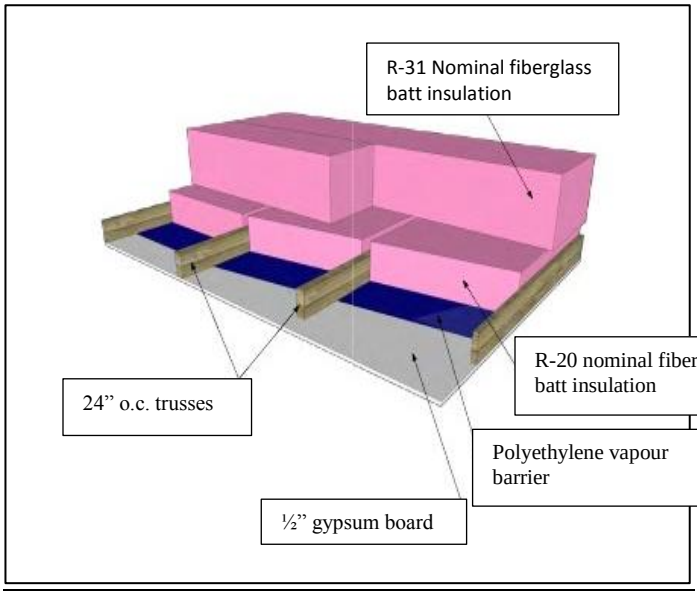
CEILING BELOW ATTICS WITH HRV's

Attic Insulation- OPTION # 1



- 2x4 manufactured trusses
- 24" on centre
- 1/2" gypsum board
- 15" of blown cellulose insulation
- (effective insulation value: R-53.15, RSI-9.36)

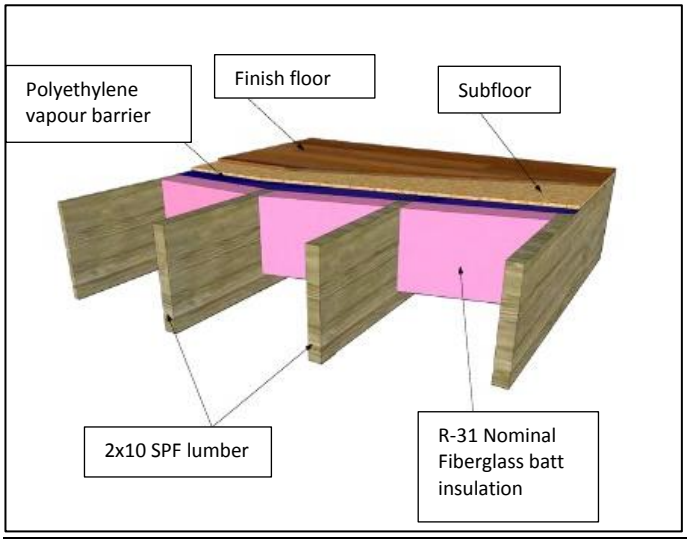
Attic Insulation- OPTION # 2



- 2x4 manufactured trusses
- 24" on centre
- 1/2" gypsum board
- R-31 nominal fibreglass batt insulation
- R-20 fibreglass batt insulation
- (effective insulation value: R-50.44, RSI-8.88)

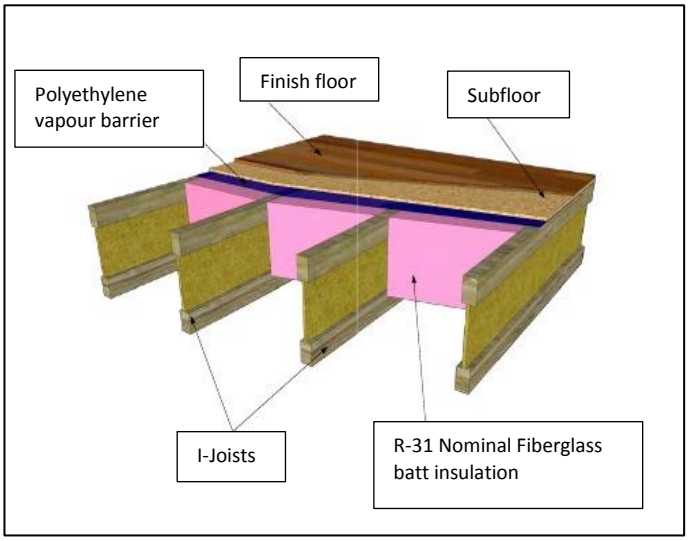
FLOORS OVER UNHEATED SPACES

OPTION # 1 ▭



- 2x10 SPF lumber
- 16” on centre
- R-31 nominal fibreglass batt
- 7/16”OSB
- (effective insulation value: R-28.84, RSI-5.08)

OPTION # 2 ▭



- I-Joists
- 16” on centre
- R-31 nominal fibreglass batt
- 7/16”OSB
- (effective insulation value: R-32.32, RSI-5.34)

WINDOWS, DOORS, and SKYLIGHTS - (2010 NBC 9.36.2.7)

All window, door and skylight assemblies have labeling requirements. A sample label showing the U-value requirements for a window is given in Figure 2 below.

One door separating a *conditioned space from an unconditioned space or the exterior is permitted to have an overall thermal transmittance up to 2.6 W/ (m^2K).*

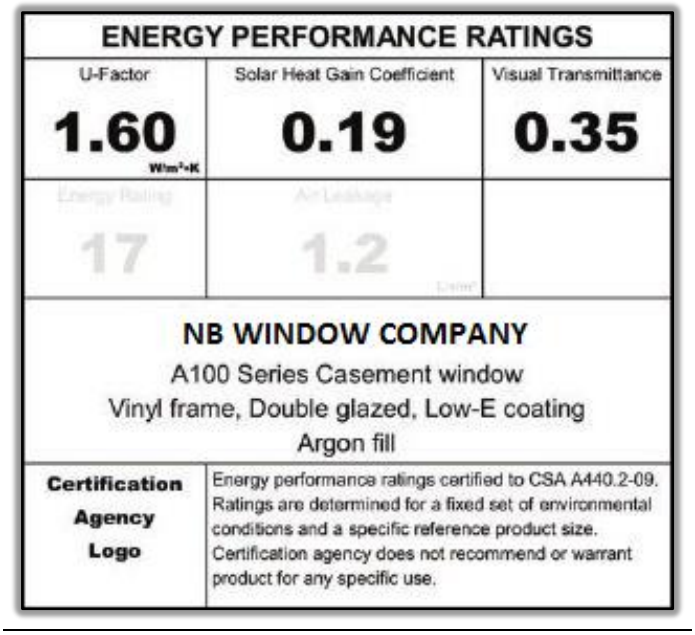


Figure 2: Example window label showing U-value

REQUIRED THERMAL CHARACTERISTICS		
	Windows and Doors	Skylights
Zone	Zone 6	Zone 6
Maximum U-Value	1.60	2.70
Minimum Energy Rating	25	n/a

HEATING, VENTALATION AND AIR CONDITIONING REQUIREMENTS (2010 NBC-9.36.3.2)

Requirements for ducts:

- Best practices maintain that it is best to keep any ducts or plenums carrying conditioned air inside the thermal plane of the building envelope to improve the durability of your system.

Running ducts outside of the heated envelope: (9.36.3.2)

- Seal all duct joints with appropriate materials (fabric-backed tape with rubber adhesives are not acceptable as a primary sealant); and

- All ducts (except for exhaust ducts leading directly outside- bathroom fan ducts) are insulated to the same level as required for aboveground walls.

Requirements for dampers: (9.36.3.3)

- Properly controlling the entry of air into your house through dampers minimizes the unnecessary entry of cold air into your house.

- The following two requirements apply except where air intakes and outlets on HRVs and other ventilation systems are designed to run continuously, and except where other regulations are in effect that do not permit dampers.

- Every exhaust duct opening needs to have either:
  1) a motorized damper, or
  2) a gravity or spring-operated backflow damper.

- Every outdoor air intake duct requires:
  1) a motorized damper that remains in the “open “position if the damper fails.

Requirements for heating and cooling pipes: (9.36.3.4)

In addition to requiring that piping for heating and cooling systems is properly designed and installed, the Code requires:

- All piping for heating and air-conditioning systems needs to be located within the plane of insulation (the building envelope), or be insulated to at least the levels required for above-ground walls.

Note: High-temperature refrigerant piping, such as the piping found in air-source heat pump installations, is exempt from this requirement.

HEAT RECOVERY VENTILATION SYSTEMS: (2010 NBC-9.36.3.9)

- Although heat recovery ventilation systems (HRVs) are not required by the 2010 revisions to the National Building Code, HRVs are now commonplace in the province and most people buying a new home will expect one.

- If you are installing an HRV, however, the 2010 revisions to the Code require that the HRV meets certain minimum performance requirements. HRV testing results can be found online at the Home Ventilating Institute (www.hvi.org). This organization maintains a Certified Home Ventilating Products Directory.

- A completed and signed ventilation balance form is to be completed at the time of final inspection. The Town will provide the form.

SERVICE HOT WATER (2010 NBC-9.36.4.2)

- The Code also requires that all hot water equipment is installed in a conditioned space, unless components are required to be installed outdoors.

- Electric hot water heater tanks must meet maximum standby loss requirements. Standby loss numbers are provided by manufacturers for their hot water heaters. Standby loss is the amount of heat lost to the surrounding air from the water in the tank.

- This can be achieved by ensuring the HWT meets the CAN/CSA-C191 requirements. This marking should be located on the tank

PIPING FOR HOT WATER SYSTEMS: (2010 NBC-9.36.4.4)

- The first 8 ft. (2 m) of outlet and inlet piping from a storage tank is insulated with piping insulation that is at least 0.5” (12 mm) thick.

- All piping that is part of a recirculating loop is insulated with piping insulation that is at least 0.5” (12 mm) thick.

- Any piping that is part of the hot water system that is located outside the building envelope or in unconditioned space is insulated to the same level as is required for aboveground walls.