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October, 2018
BUILDING DIVISION

PART 9 ENERGY EFFICIENCY AND VENTILATION REQUIREMENTS

(For Single and Two Family Dwellings)

British Columbia's commitment to reduce greenhouse gases related to buildings and construction has prompted building code requirements for energy efficiency since 2008. Effective December 19, 2014, substantial new energy efficiency and ventilation requirements in the BC Building Code apply to all Part 9 buildings. Effective April 7, 2017, the Energy Step Code has been introduced as an amendment to the 2012 BC Building Code. The Energy Step Code is a voluntary compliance path within the BC Building Code (via new Subsection 9.36.6 of Division B) that establishes progressive performance targets to support transformation from the current energy efficiency requirements in the BC Building Code to net zero energy–ready buildings by 2032. This bulletin has been prepared to summarize the relevant code changes and clarify building permit drawing submissions for single and two family dwellings.

General Information

The BC Building Code contains the acceptable solutions, objectives, and functional statements attributed to energy efficiency and ventilation. It is strongly recommended that designers and builders incorporate energy efficiency and ventilation considerations early in the design process, as well as collaborate with the various trades throughout the construction process, in order to achieve the greatest degree of flexibility and compliance. Building permits for single and two family dwellings, applied on or after December 19, 2014, must comply with the new requirements.

Energy Efficiency Requirements (Section 9.36)

The new energy efficiency provisions treat the building as an interconnected system and provide four compliance pathways for buildings within the scope of this bulletin. Compliance can be achieved through the:

1. Prescriptive path,
2. Performance path,
3. Energy Step Code path, or
4. National Energy Code of Canada for Buildings (NECB) path.

Most single and two family dwellings will likely utilize the prescriptive path. Climatic zones have been established in order to set the applicable requirements, and Surrey is located in Climate Zone 4 for all compliance paths. Part 3 single family dwellings must comply with ASHRAE 90.1-2010, NECB 2011, or the Energy Step Code of 10.2.3, although alternative solution proposals may be considered.

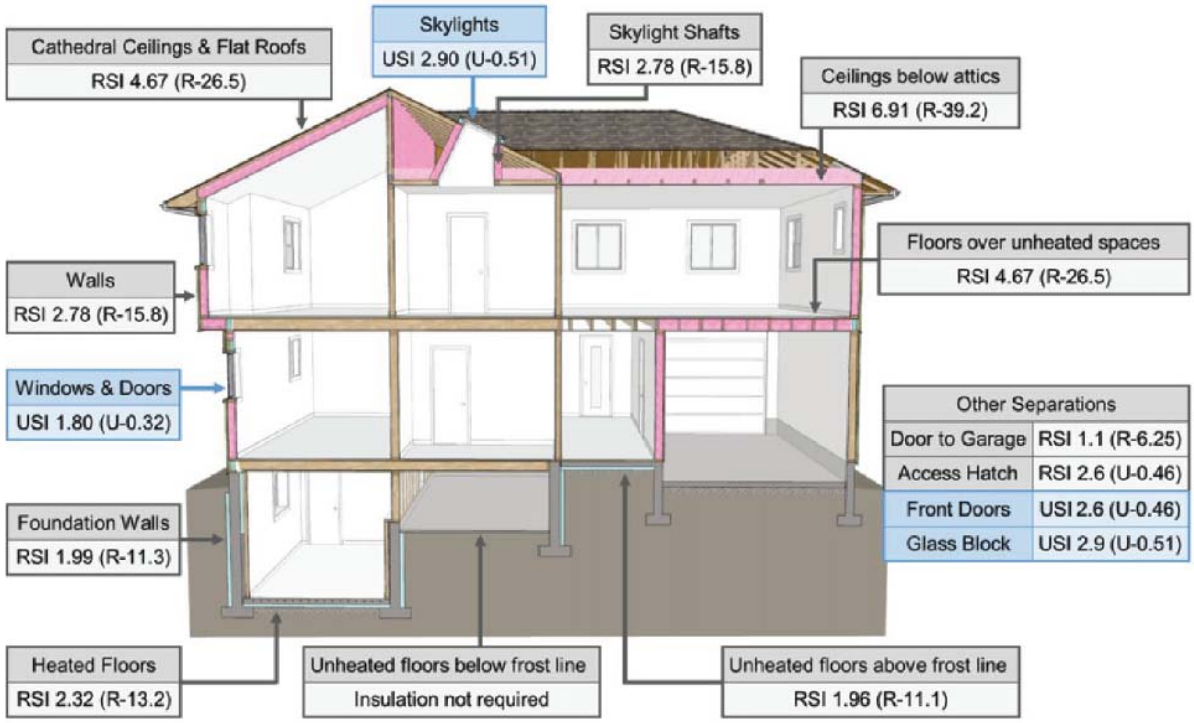
1. Prescriptive Path (Subsections 9.36.2 to 9.36.4)

The prescriptive requirements address building envelope assemblies in terms of effective thermal resistance and air leakage, and address heating, ventilating, and air-conditioning (HVAC) equipment and service water heating in terms of energy use efficiency. There are also trade-off options within each applicable Subsection. In order to apply these requirements appropriately within the building, the envelope assemblies have been grouped into three categories:

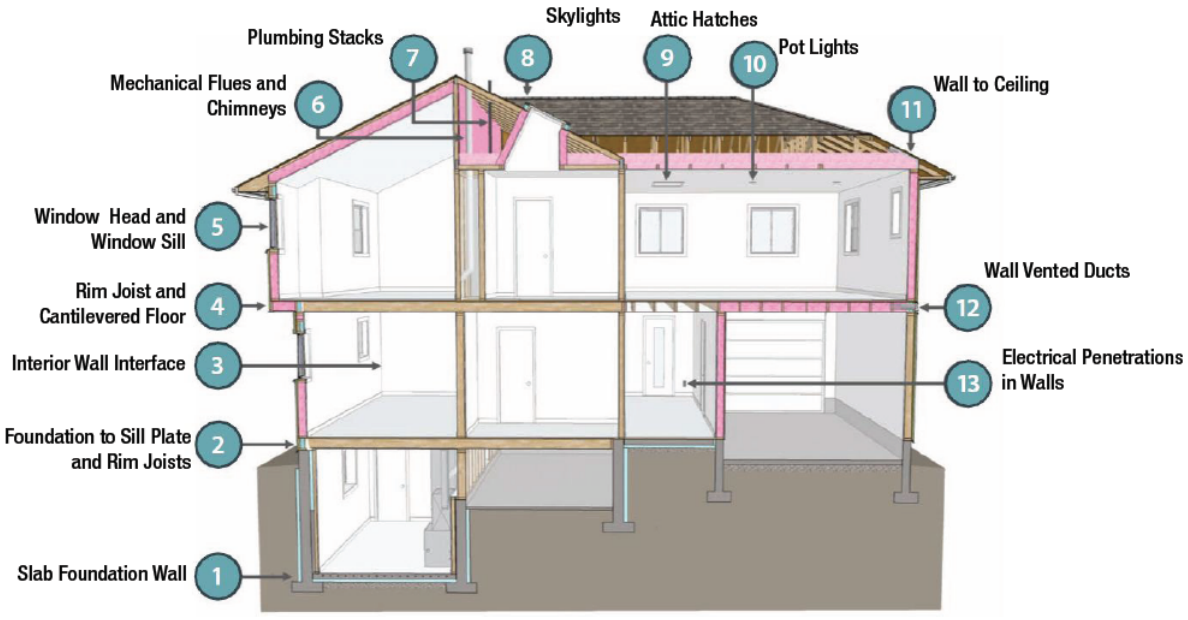
- Above-ground opaque assemblies,
- Fenestration and door assemblies, and
- Below-grade or in contact with the ground assemblies.

Attached garages are considered as unconditioned space even if insulated and heated. The use of a heat recovery ventilator (HRV) can be another factor in determining the requirements, although this does not affect Climate Zone 4.

For the building envelope requirements in Subsection 9.36.2, the minimum effective insulation requirements for various building elements are highlighted below. It is important to note that these are calculated values based on the thermal attributes of the assembly components, not nominal insulation values.



The air barrier considerations at various building locations are highlighted below. The air barrier must be continuous across joints, between assemblies, and around penetrations.



For more information and details on the above figures, refer to HPO Illustrated Guide: Energy Efficiency Requirements for Houses in British Columbia (Climate Zone 4).

The HVAC requirements in Subsection 9.36.3 are concerned with energy use efficiency by systems and equipment used for heating, ventilating, and air-conditioning. The major thrust of these requirements is improved energy efficiency through improved performance targets and standards, temperature control, heat recovery from ventilation systems, and heat recovery from dehumidification systems for spaces with indoor pools and hot tubs. Unless required to be located outside, HVAC equipment must be located inside the plane of insulation.

Similarly, the service water heating requirements in Subsection 9.36.4 are concerned with energy use efficiency by systems used to heat service water for household use and for indoor pools and hot tubs. The major thrust of these requirements is improved energy efficiency through improved performance targets and standards, and control of the equipment.

2. Performance Path (Subsection 9.36.5)

For the performance compliance path, energy model calculations are required to demonstrate that the proposed building's energy consumption does not exceed that of a reference building, under the same conditions. The reference building is one that exactly complies with the prescriptive requirements.

3. Energy Step Code Path (Subsection 9.36.6)

The Energy Step Code is a provincial standard that provides an incremental and consistent approach to achieving more energy efficient buildings that go beyond the base requirements of the BC Building Code by establishing a series of measurable, performance-based energy efficiency targets to be met. In the City of Surrey, the Energy Step Code is currently an optional compliance path to meet the applicable BC Building Code energy efficiency requirements.

4. NECB Path

NECB is a Canadian standard for energy efficiency in buildings, providing minimum requirements for building envelope, lighting, HVAC, service water heating, and electric power distribution. Compliance options within NECB also include prescriptive requirements, trade-offs, and energy-usage based modelling.

Ventilation Requirements (Section 9.32)

Significant refinements to the existing requirements for mechanical ventilation systems have been introduced in this Section for dwelling units. Dwelling units require a mechanical ventilation system that includes:

- A principal ventilation system that provides supply air and includes an exhaust fan,
- Kitchen and bathroom exhaust fans and
- If the building has a heated crawl space, components to integrate ventilation of the crawl space and the space above or beside it.

Some of the new concepts are the requirements for heat-recovery systems and ducted central-recirculation ventilation systems in which air is supplied to or exhausted from each bedroom in the building. For more information, refer to Information Bulletin No. B14-05 issued by the Building and Safety Standards Branch, which also includes examples of code compliant ventilation systems.

Building Permit Application

In general, the building permit drawings should include sufficient information and details to demonstrate energy efficiency and ventilation compliance, including:

- Energy efficiency compliance path used, including any trade-offs.
- Wall and floor section details, including effective insulation value calculations, for all applicable building assemblies.
- Window and door section details, including overall U-value calculations, for all fenestration, doors, and skylights.
- Assembly details to indicate location of air barrier in walls, floors, and roofs.
- Details of critical assembly junctions to demonstrate the continuity of insulation and air barrier.
- Locations of HRV (if provided), space-heating equipment, and service water heating equipment.
- Performance rating and energy source for all space-heating, space-cooling, and service water heating systems.
- If trade-offs are utilized within the prescriptive path, applicable documentation to be provided.
- If the performance path is utilized, documentation outlined in Subsection 2.2.8 (Division C of BCBC 2012) to be provided, including a house performance compliance calculation report.

- If the Energy Step Code Path is utilized, in addition to the documentation outlined in Subsection 2.2.8 (Division C of BCBC 2012), the following must be provided:
  - Documentation required at building permit application:
    - Completed BC Energy Compliance Report - Pre-Construction for Part 9 Buildings
    - Energy model report (Example: HOT2000 detailed report)
    - Energy model files (Example: HOT2000 model file)
  - Documentation required prior to final inspection:
    - Completed BC Energy Compliance Report – As-Built for Part 9 Buildings
    - Final energy model report
    - Final energy model files
    - Final air tightness test report
- If the NECB path is utilized, documentation outlined in Article 2.2.2.8 (Division C of NECB 2011) to be provided, including a building performance compliance calculation report.

Please refer to the attached sample drawings and calculations for the minimum required information to be shown on building permit drawings.

Additional Information

Portions of buildings not required to be conditioned space may not need to comply with the full requirements of Section 9.36. Additions and alterations to existing buildings, depending on the scope of work, may not need to comply with the full requirements of Sections 9.36 and 9.32. Requests for interpretations and exemptions will be evaluated on a case by case basis.

FLOORS OVER UNHEATED SPACES (CERAMIC TILE FLOORING)

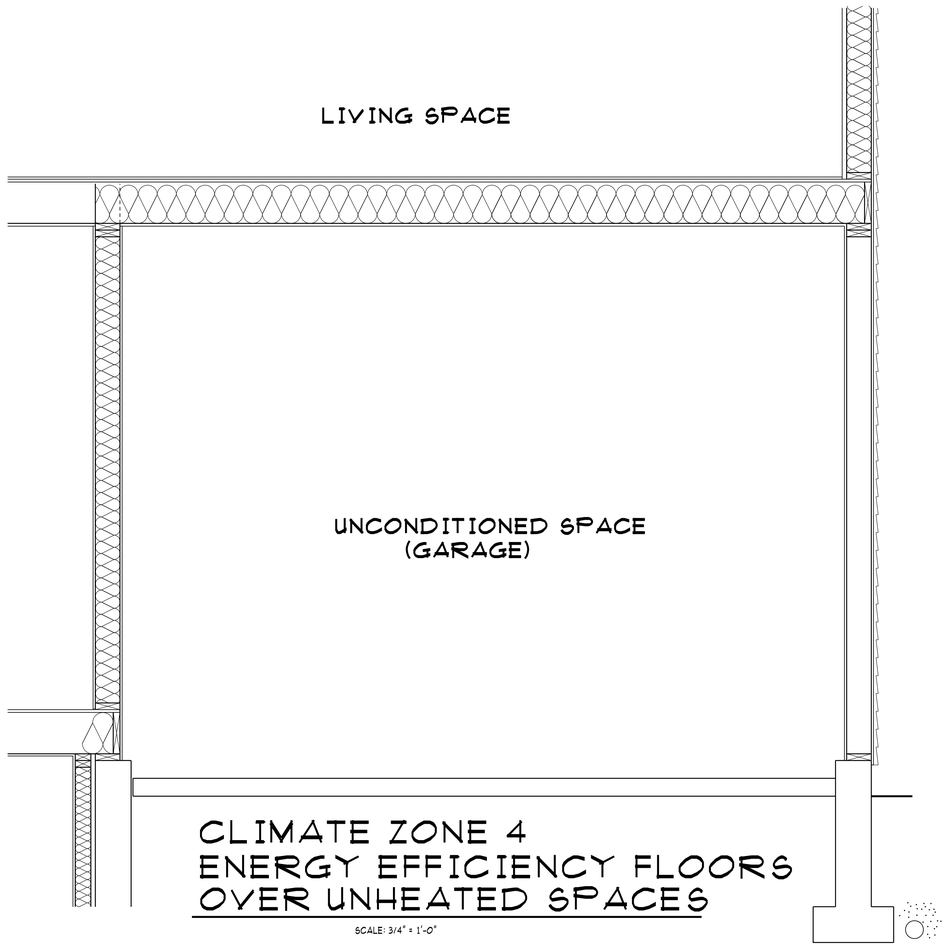
MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 4.67 (R-26.5) 2X10 JOISTS @ 12" O.C.	
ASSEMBLY DESCRIPTION: - CERAMIC TILE - 1/2" PLYWOOD SUBFLOOR - 5/8" T&G D.FIR PLYWOOD SUBFLOOR - 2X10 JOISTS @ 12" O.C. - R-31 FIBREGLASS BATT INSULATION IN CAVITIES - 1/2" GYPSUM BOARD OVER UNHEATED SPACE	
CONTINUOUS ELEMENTS: - INTERIOR AIR FILM - CERAMIC TILE - 1/2" PLYWOOD SUBFLOOR - 5/8" T&G D.FIR PLYWOOD SUBFLOOR - 1/2" GYPSUM BOARD - EXTERIOR AIR FILM	0.16 0.005 0.109 0.172 0.08 0.03 RSI 0.556 (R-3.15)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{14.5}{1.9875} + \frac{85.5}{5.46}} = 4.36$ RSI	RSI 4.36 (R-24.72)
TOTAL EFFECTIVE INSULATION VALUE	RSI 4.916 (R-27.87)

FLOORS OVER UNHEATED SPACES (CARPET FLOORING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 4.67 (R-26.5) 2X10 JOISTS @ 12" O.C.	
ASSEMBLY DESCRIPTION: - CARPET WITH FIBROUS PAD - 5/8" T&G D.FIR PLYWOOD SUBFLOOR - 2X10 JOISTS @ 12" O.C. - R-28 FIBREGLASS BATT INSULATION IN CAVITIES - 1/2" GYPSUM BOARD OVER UNHEATED SPACE	
CONTINUOUS ELEMENTS: - INTERIOR AIR FILM - CARPET WITH FIBROUS PAD - 5/8" T&G D.FIR PLYWOOD SUBFLOOR - 1/2" GYPSUM BOARD - EXTERIOR AIR FILM	0.16 0.37 0.172 0.08 0.03 RSI 0.812 (R-4.60)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{14.5}{1.9875} + \frac{85.5}{4.93}} = 4.06$ RSI	RSI 4.06 (R-23.02)
TOTAL EFFECTIVE INSULATION VALUE	RSI 4.872 (R-27.62)

FLOORS OVER UNHEATED SPACES (HARDWOOD FLOORING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 4.67 (R-26.5) 2X10 JOISTS @ 12" O.C.	
ASSEMBLY DESCRIPTION: - HARDWOOD FLOORING - 5/8" T&G D.FIR PLYWOOD SUBFLOOR - 2X10 JOISTS @ 12" O.C. - R-31 FIBREGLASS BATT INSULATION IN CAVITIES - 1/2" GYPSUM BOARD OVER UNHEATED SPACE	
CONTINUOUS ELEMENTS: - INTERIOR AIR FILM - HARDWOOD FLOORING - 5/8" T&G D.FIR PLYWOOD SUBFLOOR - 1/2" GYPSUM BOARD - EXTERIOR AIR FILM	0.16 0.12 0.172 0.08 0.03 RSI 0.562 (R-3.19)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{14.5}{1.9875} + \frac{85.5}{5.46}} = 4.36$ RSI	RSI 4.36 (R-24.72)
TOTAL EFFECTIVE INSULATION VALUE	RSI 4.922 (R-27.91)



CLIMATE ZONE 4
ENERGY EFFICIENCY FLOORS OVER UNHEATED SPACES

SCALE: 3/4" = 1'-0"

AS PER SECTION 9.36.2.10. - NOTES PERTAINING TO LEAKAGE PATHS IN PROBLEMATIC AREAS

 # FOUNDATION TO SILL PLATE AND RIM JOISTS

ALL JOINTS AT THE TRANSITION BETWEEN THE FOUNDATION WALL AND THE ABOVE GRADE WALL MUST BE MADE AIR-TIGHT BY SEALING ALL JOINTS AND JUNCTIONS BETWEEN THE STRUCTURAL COMPONENTS, OR COVERING THE STRUCTURAL COMPONENTS WITH AN AIR BARRIER MATERIAL

 # INTERIOR WALL INTERFACE

INTERIOR WALLS THAT MEET EXTERIOR WALLS OR CEILINGS WITH AN INTERIOR PLANE OF AIR TIGHTNESS MUST BE MADE AIRTIGHT BY EITHER SEALING ALL JUNCTIONS BETWEEN THE STRUCTURAL COMPONENTS, COVERING THE STRUCTURAL COMPONENTS WITH AN AIR BARRIER MATERIAL, OR MAINTAINING THE CONTINUITY OF THE AIR BARRIER SYSTEM THROUGH THE INTERIOR WALL

 # RIM JOIST

ALL JOINTS AT THE RIM JOIST ASSEMBLY MUST BE MADE AIRTIGHT BY SEALING ALL JOINTS AND JUNCTIONS BETWEEN THE STRUCTURAL COMPONENTS, OR COVERING THE STRUCTURAL COMPONENTS WITH AN AIR BARRIER MATERIAL

 # CANTILEVERED FLOOR

CANTILEVERED FLOORS AND FLOORS OVER UNHEATED SPACES /EXTERIOR SPACE MUST BE MADE AIRTIGHT BY SEALING ALL JOINTS AND JUNCTIONS BETWEEN THE STRUCTURAL COMPONENTS AND/OR COVERING THE STRUCTURAL COMPONENTS WITH AN AIR BARRIER MATERIAL AND SEALING IT TO THE ADJACENT AIR BARRIER MATERIAL

 # WINDOW HEAD

THE INTERFACE BETWEEN WINDOW HEAD/JAMB AND WALL ASSEMBLY MUST BE MADE AIRTIGHT BY SEALING ALL JOINTS AND JUNCTIONS BETWEEN THE AIR BARRIER IN THE WALL AND WINDOW. THE REQUIREMENT ALSO APPLIES TO DOORS AND SKYLIGHTS

 # WINDOW SILL

THE INTERFACE BETWEEN WINDOW SILL AND WALL ASSEMBLY MUST BE MADE AIRTIGHT BY SEALING ALL JOINTS AND JUNCTIONS BETWEEN THE AIR BARRIER MATERIAL IN THE WALL AND THE WINDOW. THE REQUIREMENT ALSO APPLIES TO DOORS AND SKYLIGHTS

 # MECHANICAL FLUES AND CHIMNEYS

STEEL-LINED CHIMNEYS THAT PENETRATE THE BUILDING ENVELOPE MUST BE MADE AIRTIGHT BY BLOCKING THE VOID BETWEEN REQUIRED CLEARANCES FOR METAL CHIMNEYS AND SURROUNDING CONSTRUCTION WITH SHEET METAL AND SEALANT CAPABLE OF WITHSTANDING HIGH TEMPERATURES

 # PLUMBING STACKS

PLUMBING VENT STACK PIPES THAT PENETRATE THE BUILDING ENVELOPE MUST BE MADE AIRTIGHT BY EITHER SEALING THE AIR BARRIER MATERIAL TO THE VENT STACK PIPE WITH A COMPATIBLE MATERIAL OR SHEATHING TAPE, OR INSTALLING A RUBBER GASKET OR PREFABRICATED ROOF FLASHING AT THE PENETRATION OF THE PLANE OF AIRTIGHTNESS AND SEALING IT TO THE TOP PLATE

 # SKYLIGHTS

THE INTERFACE BETWEEN THE SKYLIGHT AND WALL ASSEMBLY MUST BE MADE AIRTIGHT BY SEALING ALL JOINTS AND JUNCTIONS BETWEEN THE AIR BARRIER MATERIAL IN THE WALL AND THE SKYLIGHT

 # WALL TO CEILING

ALL JOINTS AT THE TRANSITION BETWEEN THE ABOVE GRADE WALL AND CEILING MUST BE MADE AIRTIGHT BY SEALING ALL JOINTS AND JUNCTIONS BETWEEN THE STRUCTURAL COMPONENTS AND/OR COVERING THE STRUCTURAL COMPONENTS WITH AN AIR BARRIER MATERIAL

 # WALL VENTED DUCTS

DUCT PENETRATIONS THROUGH THE BUILDING ENVELOPE MUST HAVE AN AIRTIGHT SEAL

 # ELECTRICAL PENETRATION IN WALLS

ELECTRICAL PENETRATIONS IN WALLS, INCLUDING ELECTRICAL OUTLETS, WIRING, SWITCHES, AND RECESSED FIXTURES THROUGH THE PLANE OF AIRTIGHTNESS MUST BE AIRTIGHT. OPTIONS INCLUDE USING A COMPONENT THAT IS DESIGNED TO BE AIRTIGHT AND SEALING IT TO THE ADJACENT AIR BARRIER MATERIAL, OR BY COVERING THE COMPONENT WITH AN AIR BARRIER MATERIAL AND SEALING IT TO THE ADJACENT AIR BARRIER MATERIAL

SPECIFIC REQUIREMENTS

EFFECTIVE INSULATION OF CEILINGS, WALLS, AND FLOORS MEET THE REQUIREMENTS OF TABLE 9.36.2.6.A AND TABLE 9.36.2.6.B FOR THE CORRECT CLIMATE ZONE

THE THERMAL CHARACTERISTICS OF WINDOWS, DOOR AND SKYLIGHTS MEET THE REQUIREMENTS OF TABLE 9.36.2.7.A, B, AND C FOR THE CORRECT CLIMATE ZONE

EFFECTIVE INSULATION OF FOUNDATIONS MEET THE REQUIREMENTS OF TABLE 9.36.2.8.A OR B FOR THE CORRECT CLIMATE ZONE

DUCTS LOCATED OUTSIDE THE THERMAL ENCLOSURE ARE SEALED AND INSULATED TO THE EXTERIOR WALL INSULATION REQUIREMENTS

DAMPERS ARE INSTALLED AT AIR INLETS AND EXHAUSTS WHERE REQUIRED

PIPING FOR HEATING OR COOLING SYSTEMS IS LOCATED WITHIN THE THERMAL ENCLOSURE OR ARE FULLY INSULATED

HVAC EQUIPMENT IS LOCATED WITHIN THERMAL ENCLOSURE OR DESIGNATED TO BE INSTALLED OUTSIDE OF THERMAL ENCLOSURE

TEMPERATURE CONTROLS ARE INSTALLED ON HEATING AND COOLING EQUIPMENT

INDOOR POOLS ARE COVERED OR HAVE AN HRV/DEHUMIDIFIER

HVAC AND SWH EQUIPMENT MEET MINIMUM PERFORMANCE REQUIREMENTS DETERMINED IN TABLES 9.36.3.10. AND 9.36.4.2

SERVICE WATER HEATING PIPES ARE INSULATED AT THE INLET AND OUTLET OF STORAGE TANKS

SERVICE WATER HEATERS HAVE TEMPERATURE CONTROLS

THE AIR BARRIER DETAILS, AND LOCATIONS HAVE BEEN IDENTIFIED

TEMPERATURE CONTROLS AS PER SECTION 9.36.3.6

TEMPERATURE CONTROLS ARE GENERALLY REQUIRED FOR HEATING AND COOLING EQUIPMENT. THE ACCURACY OF THE CONTROL MUST BE BETTER THAN PLUS OR MINUS 0.5 DEGREES CELSIUS

RIM JOIST SPACE (6.35MM FIBRE-CEMENT BOARD SIDING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 2.78 (R-15.8) 2X10 STUDS @ 12" O.C. W/R-20 BATT INSULATION IN CAVITY	
CONTINUOUS ELEMENTS:	
- 1.5" LUMBER RIM BOARD	0.325
- 1/2" PLYWOOD SHEATHING	0.11
- AIR BARRIER/SHEATHING MEMBRANE	-
- 3/8" CAPILLARY BREAK SPACE	0.15
- 6.35MM (1/4") FIBRE-CEMENT CLADDING	0.023
- EXTERIOR AIR FILM	0.03
	RSI 0.638 (R-3.62)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{12.5}{1.19}+\frac{87.5}{3.52}} = 2.82$ RSI	RSI 2.82 (R-15.99)
TOTAL EFFECTIVE INSULATION VALUE	RSI 3.458 (R-19.61)

RIM JOIST SPACE (HOLLOW BACKED VINYL SIDING)

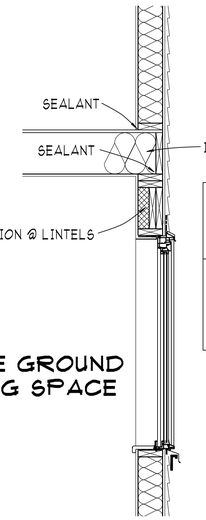
MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 2.78 (R-15.8) 2X10 STUDS @ 12" O.C. W/R-20 BATT INSULATION IN CAVITY	
CONTINUOUS ELEMENTS:	
- 1.5" LUMBER RIM BOARD	0.325
- 1/2" PLYWOOD SHEATHING	0.11
- SHEATHING MEMBRANE	-
- HOLLOW BACKED VINYL SIDING	0.11
- EXTERIOR AIR FILM	0.03
	RSI 0.575 (R-3.26)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{12.5}{1.19}+\frac{87.5}{3.52}} = 2.82$ RSI	RSI 2.82 (R-15.99)
TOTAL EFFECTIVE INSULATION VALUE	RSI 3.395 (R-19.25)

ABOVE GRADE WALL ASSEMBLY (6.35MM FIBRE-CEMENT BOARD SIDING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 2.78 (R-15.8) 2X6 STUDS @ 16" O.C.	
ASSEMBLY DESCRIPTION: - 1/2" GYPSUM BOARD - 6 MIL POLY VAPOUR BARRIER - 2X6 STUDS @ 16" O.C. - R-19 (R-20 COMPRESSED) BATT FIBREGLASS INSULATION IN CAVITIES - 1/2" PLYWOOD SHEATHING - AIR BARRIER/SHEATHING MEMBRANE - 3/8" CAPILLARY BREAK SPACE - 6.35MM (1/4") FIBRE-CEMENT CLADDING	
CONTINUOUS ELEMENTS:	
- INTERIOR AIR FILM	0.12
- 1/2" GYPSUM WALL BOARD	0.08
- 6 MIL POLY VAPOUR BARRIER	-
- 1/2" PLYWOOD SHEATHING	0.11
- AIR BARRIER/SHEATHING MEMBRANE	-
- 3/8" CAPILLARY BREAK SPACE	0.15
- 6.35MM (1/4") FIBRE-CEMENT CLADDING	0.023
- EXTERIOR AIR FILM	0.03
	RSI 0.513 (R-2.90)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{23}{1.19}+\frac{77}{3.34}} = 2.36$ RSI	RSI 2.36 (R-13.38)
TOTAL EFFECTIVE INSULATION VALUE	RSI 2.873 (R-16.28)

ABOVE GRADE WALL ASSEMBLY (HOLLOW BACKED VINYL SIDING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 2.78 (R-15.8) 2X6 STUDS @ 16" O.C.	
ASSEMBLY DESCRIPTION: - 1/2" GYPSUM BOARD - 6 MIL POLY VAPOUR BARRIER - 2X6 STUDS @ 16" O.C. - R-19 (R-20 COMPRESSED) BATT FIBREGLASS INSULATION IN CAVITIES - 1/2" PLYWOOD SHEATHING - SHEATHING MEMBRANE - HOLLOW BACKED VINYL SIDING	
CONTINUOUS ELEMENTS:	
- INTERIOR AIR FILM	0.12
- 1/2" GYPSUM WALL BOARD	0.08
- 6 MIL POLY VAPOUR BARRIER	-
- 1/2" PLYWOOD SHEATHING	0.11
- SHEATHING MEMBRANE	-
- HOLLOW BACKED VINYL SIDING	0.11
- EXTERIOR AIR FILM	0.03
	RSI 0.45 (R-2.55)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{23}{1.19}+\frac{77}{3.34}} = 2.36$ RSI	RSI 2.36 (R-13.38)
TOTAL EFFECTIVE INSULATION VALUE	RSI 2.81 (R-15.93)



THE THERMAL BRIDGING EFFECT OF CLOSELY SPACED, REPETITIVE STRUCTURAL MEMBERS LIKE STUDS & JOISTS, AND OF ANCILLARY MEMBERS LIKE LINTELS, SILLS AND PLATES, MUST BE ACCOUNTED FOR WHEN CALCULATING THE THERMAL RESISTANCE OF BUILDING ENVELOPE ASSEMBLIES.

FENESTRATION (WINDOWS) AND DOORS TO HAVE AN OVERALL THERMAL TRANSMITTANCE (U-VALUE) NOT GREATER THAN THE VALUES LISTED IN TABLE 9.36.2.7.A (BCBC LATEST REVISION) FOR THE APPLICABLE HEATING DEGREE-DAY CATEGORY. CLIMATE ZONE 4 & 5 MAXIMUM U-VALUE TO BE 1.80

ABOVE GROUND LIVING SPACE

EXTERIOR

CLIMATE ZONE 4 ENERGY EFFICIENCY OPAQUE ABOVE GRADE WALL ASSEMBLY DETAIL

SCALE: 3/4" = 1'-0"

RIM JOIST SPACE W/2 BEARING BLOCKS (6.35MM FIBRE-CEMENT BOARD SIDING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 2.78 (R-15.8) 2X10 STUDS @ 12" O.C. W/R-14 BATT INSULATION IN CAVITY	
CONTINUOUS ELEMENTS:	
- 2 - 1.1/2" BEARING BLOCKS (3")	0.65
- 1.5" LUMBER RIM BOARD	0.325
- 1/2" PLYWOOD SHEATHING	0.11
- AIR BARRIER/SHEATHING MEMBRANE	-
- 3/8" CAPILLARY BREAK SPACE	0.15
- 6.35MM (1/4") FIBRE-CEMENT CLADDING	0.023
- EXTERIOR AIR FILM	0.03
	RSI 1.288 (R-7.30)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{12.5}{1.19}+\frac{87.5}{2.46}} = 2.17$ RSI	RSI 2.17 (R-12.30)
TOTAL EFFECTIVE INSULATION VALUE	RSI 3.458 (R-19.60)

RIM JOIST SPACE W/2 BEARING BLOCKS (HOLLOW BACKED VINYL SIDING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 2.78 (R-15.8) 2X10 STUDS @ 12" O.C. W/R-14 BATT INSULATION IN CAVITY	
CONTINUOUS ELEMENTS:	
- 2 - 1.1/2" BEARING BLOCKS (3")	0.65
- 1.5" LUMBER RIM BOARD	0.325
- 1/2" PLYWOOD SHEATHING	0.11
- SHEATHING MEMBRANE	-
- HOLLOW BACKED VINYL SIDING	0.11
- EXTERIOR AIR FILM	0.03
	RSI 1.225 (R-6.95)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{12.5}{1.19}+\frac{87.5}{2.46}} = 2.17$ RSI	RSI 2.17 (R-12.30)
TOTAL EFFECTIVE INSULATION VALUE	RSI 3.395 (R-19.25)

THIS NOTE WILL BE MOVED TO THE FLOOR PLANS PAGE

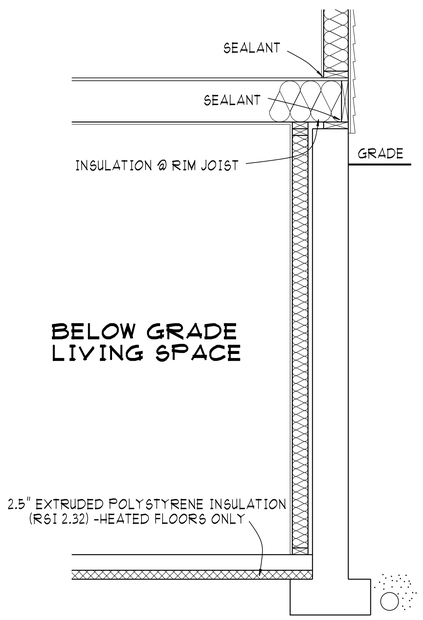
FENESTRATION (WINDOWS) AND DOORS TO HAVE AN OVERALL THERMAL TRANSMITTANCE (U-VALUE) NOT GREATER THAN THE VALUES LISTED IN TABLE 9.36.2.7.A (BCBC LATEST REVISION) FOR THE APPLICABLE HEATING DEGREE-DAY CATEGORY. CLIMATE ZONE 4 & 5 MAXIMUM U-VALUE TO BE 1.80	
DOOR TO UNCONDITIONED GARAGE FROM DWELLING	USI 2.6 (U-0.46)
ATTIC ACCESS HATCH	RSI 2.6 (R-14.8)
FRONT DOORS	USI 2.6 (U-0.46)
GLASS BLOCK	USI 2.9 (U-0.51)
OVERHEAD GARAGE DOOR (WHEN GARAGE CONDITIONED)	RSI 1.1 (R-6.245)

BELOW GRADE WALL ASSEMBLY

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 1.99 (R-11.3) 2X4 STUDS @ 24" O.C.	
ASSEMBLY DESCRIPTION: - 8" POURED-IN PLACE CONCRETE WALL - 2X4 STUDS @ 24" O.C. - R-14 BATT FIBREGLASS INSULATION - 1/2" GYPSUM WALL BOARD	
CONTINUOUS ELEMENTS:	
- INTERIOR AIR FILM	0.12
- 1/2" GYPSUM WALL BOARD	0.08
- POLYETHYLENE	-
- 8" POURED-IN PLACE CONCRETE WALL	-
- DAMPPROOFING	0.21
	RSI 0.41 (R-2.32)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{16}{.75}+\frac{84}{2.46}} = 1.80$ RSI	RSI 1.80 (R-10.20)
TOTAL EFFECTIVE INSULATION VALUE	RSI 2.21 (R-12.52)

BELOW GRADE WALL ASSEMBLY

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 1.99 (R-11.3) 2X4 STUDS @ 24" O.C.	
ASSEMBLY DESCRIPTION: - 8" POURED-IN PLACE CONCRETE WALL - 2" XPS INSULATION	
CONTINUOUS ELEMENTS:	
- INTERIOR AIR FILM	0.12
- 1/2" GYPSUM WALL BOARD	0.08
- 2" XPS INSULATION	1.68
- 8" POURED-IN PLACE CONCRETE WALL	-
- DAMPPROOFING	0.21
	RSI 2.09 (R-11.85)
TOTAL EFFECTIVE INSULATION VALUE	RSI 2.21 (R-12.52)



CLIMATE ZONE 4 ENERGY EFFICIENCY OPAQUE BELOW GRADE WALL ASSEMBLY DETAIL

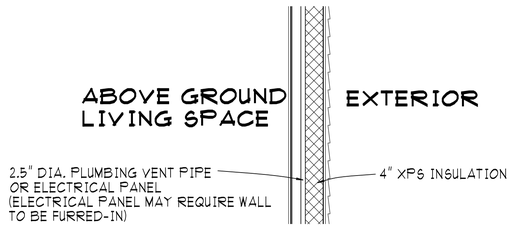
SCALE: 3/4" = 1'-0"

ABOVE GRADE WALL ASSEMBLY WITH PLUMBING VENT/ELECTRICAL PANEL (6.35MM FIBRE-CEMENT BOARD SIDING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 2.78 (R-15.8) 2X8 STUDS @ 16" O.C.	
ASSEMBLY DESCRIPTION: - 1/2" GYPSUM BOARD - 6 MIL POLY VAPOUR BARRIER - 2X8 STUDS @ 16" O.C. - 4" XPS INSULATION - 1/2" PLYWOOD SHEATHING - AIR BARRIER/SHEATHING MEMBRANE - 3/8" CAPILLARY BREAK SPACE - 6.35MM (1/4") FIBRE-CEMENT CLADDING	
CONTINUOUS ELEMENTS:	
- INTERIOR AIR FILM	0.12
- 1/2" GYPSUM WALL BOARD	0.08
- 6 MIL POLY VAPOUR BARRIER	-
- 1/2" PLYWOOD SHEATHING	0.11
- AIR BARRIER/SHEATHING MEMBRANE	-
- 3/8" CAPILLARY BREAK SPACE	0.15
- 6.35MM (1/4") FIBRE-CEMENT CLADDING	0.023
- EXTERIOR AIR FILM	0.03
	RSI 0.513 (R-2.91)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{23}{1.61}+\frac{77}{3.50}} = 2.75$ RSI	RSI 2.75 (R-15.59)
TOTAL EFFECTIVE INSULATION VALUE	RSI 3.263 (R-18.50)

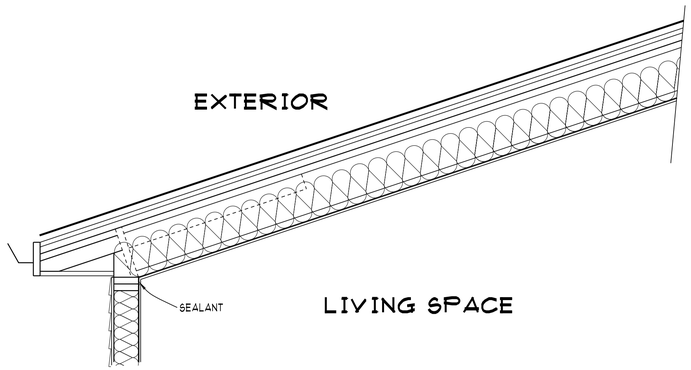
ABOVE GRADE WALL ASSEMBLY WITH PLUMBING VENT/ELECTRICAL PANEL (HOLLOW BACKED VINYL SIDING)

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 2.78 (R-15.8) 2X8 STUDS @ 16" O.C.	
ASSEMBLY DESCRIPTION: - 1/2" GYPSUM BOARD - 6 MIL POLY VAPOUR BARRIER - 2X8 STUDS @ 16" O.C. - 4" XPS INSULATION - 1/2" PLYWOOD SHEATHING - SHEATHING MEMBRANE - HOLLOW BACKED VINYL SIDING	
CONTINUOUS ELEMENTS:	
- INTERIOR AIR FILM	0.12
- 1/2" GYPSUM WALL BOARD	0.08
- 6 MIL POLY VAPOUR BARRIER	-
- 1/2" PLYWOOD SHEATHING	0.11
- SHEATHING MEMBRANE	-
- HOLLOW BACKED VINYL SIDING	0.11
- EXTERIOR AIR FILM	0.03
	RSI 0.45 (R-2.55)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{23}{1.61}+\frac{77}{3.50}} = 2.75$ RSI	RSI 2.75 (R-15.59)
TOTAL EFFECTIVE INSULATION VALUE	RSI 3.20 (R-18.14)



CLIMATE ZONE 4 ENERGY EFFICIENCY PLUMBING VENT/ ELECTRICAL PANEL WALL ASSEMBLY DETAIL

SCALE: 3/4" = 1'-0"



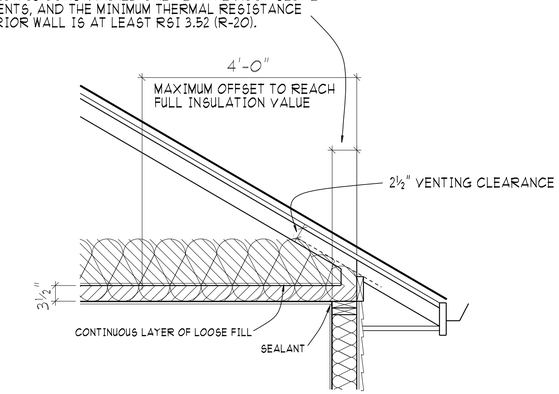
CLIMATE ZONE 4
ENERGY EFFICIENCY CEILINGS BELOW CATHEDRAL & FLAT ROOFS DETAIL

SCALE: 3/4" = 1'-0"

CEILINGS BELOW CATHEDRAL & FLAT ROOFS

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 4.67 (R-26.5) 2X12 ROOF JOISTS @ 24" O.C.	
ASSEMBLY DESCRIPTION: - 2.1/2" VENTED AIR SPACE - 2X12 ROOF JOISTS @ 24" O.C. - R-28 BATT FIBREGLASS INSULATION IN CAVITIES - 6 MIL POLY VAPOUR BARRIER - 5/8" GYPSUM BOARD CEILING	
CONTINUOUS ELEMENTS: - EXTERIOR AIR FILM - ROOFING (ASPHALT SHINGLE) - 1/2" PLYWOOD ROOF SHEATHING - AIR FILM - 5/8" GYPSUM BOARD - INTERIOR AIR FILM	 N/A N/A N/A 0.03 0.086 0.11 RSI 0.236 (R-1.34)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{10}{2.431} + \frac{90}{4.93}}$ = 4.47 RSI	RSI 4.47 (R-25.34)
TOTAL EFFECTIVE INSULATION VALUE	RSI 4.706 (R-26.68)

A REDUCTION IN THE THERMAL RESISTANCE OF THE ATTIC INSULATION AT THE PERIMETER IS PERMITTED, PROVIDED THE INSULATION IS CONSTRAINED ONLY BY THE ROOF SLOPE AND VENTING REQUIREMENTS, AND THE MINIMUM THERMAL RESISTANCE VALUE ABOVE THE EXTERIOR WALL IS AT LEAST RSI 3.52 (R-20).



CLIMATE ZONE 4 ENERGY EFFICIENCY OPAQUE CEILINGS BELOW ATTICS ASSEMBLY DETAIL

SCALE: 3/4" = 1'-0"

CEILING BELOW ATTICS - COMMON TRUSS

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 6.91 (R-39.2) COMMON TRUSS @ 24" O.C.	
ASSEMBLY DESCRIPTION: - 5/8" GYPSUM BOARD CEILING - 6 MIL POLY VAPOUR BARRIER - RAISED HEEL TRUSSES @ 24" O.C. W/3.1/2" BOTTOM CHORD - CAVITY SPACE FILLED WITH FIBREGLASS LOOSE FILL INSULATION - CONTINUOUS LAYER OF FIBREGLASS LOOSE FILL INSULATION OVER CAVITIES	
CONTINUOUS ELEMENTS: - EXTERIOR AIR FILM - ROOFING (ASPHALT SHINGLE) - 1/2" PLYWOOD ROOF SHEATHING - AIR FILM - 10.55" FIBREGLASS LOOSE FILL INSUL - 5/8" GYPSUM BOARD - INTERIOR AIR FILM	 N/A N/A N/A 0.03 5.25 0.086 0.11 RSI 5.486 (R-31.10)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{11}{.757} + \frac{89}{1.669}}$ = 1.475 RSI	RSI 1.475 (R-8.36)
TOTAL EFFECTIVE INSULATION VALUE	RSI 6.961 (R-39.46)

CEILING BELOW ATTICS - SCISSOR TRUSS

MINIMUM REQUIRED EFFECTIVE THERMAL RESISTANCE = RSI 6.91 (R-39.2) COMMON TRUSS @ 24" O.C.	
ASSEMBLY DESCRIPTION: - 5/8" GYPSUM BOARD CEILING - 6 MIL POLY VAPOUR BARRIER - RAISED HEEL TRUSSES @ 24" O.C. W/3.1/2" BOTTOM CHORD - CAVITY SPACE FILLED WITH 3.1/2" FIBREGLASS LOOSE FILL INSULATION - CONTINUOUS LAYER OF FIBREGLASS LOOSE FILL INSULATION OVER CAVITIES	
CONTINUOUS ELEMENTS: - EXTERIOR AIR FILM - ROOFING (ASPHALT SHINGLE) - 1/2" PLYWOOD ROOF SHEATHING - AIR FILM - 9.17" FIBREGLASS LOOSE FILL INSUL - 5/8" GYPSUM BOARD - INTERIOR AIR FILM	 N/A N/A N/A 0.03 4.37 0.086 0.11 RSI 4.606 (R-26.12)
CAVITY RSI (PARALLEL) $\frac{100}{\frac{11}{.757} + \frac{89}{2.625}}$ = 2.317 RSI	RSI 2.317 (R-13.14)
TOTAL EFFECTIVE INSULATION VALUE	RSI 6.923 (R-39.26)