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This course is based on the *Building Code Act*, S.O. 1992, C. 23 as amended to July 24, 2014 and the Ontario Building Code 2012 (O. Reg. 332/12).

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FORMAL COURSE OBJECTIVES

This course has some specific objectives in mind. See how closely they match your own.

Upon completion of this course, you will be able to:

- Find Code requirements that govern resource conservation
- Identify different compliance options for energy efficient design for Part 9 residential buildings and houses
- Recognize the transition dates for energy efficient designs
- Identify additional requirements that are not dependant on the submission date of the building permit application
- Recognize when Part 9 requirements are still applicable

COURSE FORMAT

Before you go on to accomplish these objectives, spend a few minutes acquainting yourself with the format of this course.

The course consists of 6 modules, ranging in length from 15 minutes to a few hours.

Each module deals with a particular topic and builds on information presented in previous modules. This logical sequence makes it easier to remember what you've learned, as you progress.

Each module outlines the learning objectives of the module, and has examples and exercises such that you can see how well you are doing.

You have already encountered one type of exercise that will occur frequently throughout the course – the group discussion. This is probably the most valuable part of the course, as you share your knowledge and experience with your group and learn from them.

A variety of materials will be used to help you learn, such as overheads, diagrams and individual or group exercises.

DEFINED WORDS, TERMS AND PHRASES

Words, terms and phrases with special meaning are defined in Division A, Clause 1.4.1.2.(1)(c) of the Building Code, and are shown within the body of the Code in *italics*. The definition always applies unless the word, term or phrase has a special purpose definition listed elsewhere.

NON-DEFINED WORDS, TERMS AND PHRASES

Consult Division A, Sentence 1.4.1.1.(1) of the Building Code. It provides direction for dealing with non-defined terms. Note any questions, comments, or concerns in the space provided.

ABBREVIATIONS AND SYMBOLS AND REFERENCED DOCUMENTS

The Building Code uses abbreviations and symbols throughout. Their meaning is found in Division A, Subsection 1.4.2.

For example, the abbreviation RSI means thermal resistance, International System of Units.

Abbreviations for organizations and associations (proper names) are found in Table 1.3.2.1. in Division B. For example, ASHRAE means American Society of Heating, Refrigerating and Air-Conditioning Engineers.

All documents referenced in the Code are found in Part 1, Division B, Table 1.3.1.2.

STOP

BASIC RULES FOR READING THE CODE

SCOPE AND APPLICATION OF CODE REQUIREMENTS

Individual requirements within the Code do not apply to every *building*. Guidance in the application of each of the 12 Parts of Division B is found in Division A, Subsection 1.1.2.

For this course, it is important to know that Part 12 of Division B applies to all buildings, however not all provisions included in Part 12 apply to Part 9 residential buildings and houses.

DEALING WITH 'AND'

The word '**and**' found at the end of the second last Clause of a Sentence with multiple Clauses means that the requirements of **every** Clause apply to the Sentence.

For example, Division B, Sentence 12.3.1.3.(2) reads:

The programmable thermostatic control device required in Sentence (1) shall,

- (a) allow the setting of different air temperatures for at least,
 - i) four time periods per day, **and***
 - ii) two different day-types per week,**
- (b) include a manual override, **and***
- (c) allow the setting of the air temperature to, . . .*

DEALING WITH 'OR'

The word '**or**' found at the end of the second last Clause of a Sentence with multiple Clauses means that the requirement of the Sentence is satisfied by **any** Clause as applied individually.

For example, Division B, Sentence 12.2.1.2.(2) reads:

Except as provided in Sentences (3) and (4), the energy efficiency of all buildings shall,

- (a) be designed to exceed by not less than 13% of the energy efficiency levels required by Sentence 12.2.1.1.(2), **or***
- (b) conform to Division 1 and Division 3 or 5 of MMAH Supplementary Standard SB-10, "Energy Efficiency Requirements".*

RULES OF THE BUILDING CODE

The Code is structured into a number of Rules that apply without exception.

For example, Division B, Sentence 12.3.1.5.(2) states:

A furnace serving a dwelling unit shall be equipped with an electronically commutated motor.

GENERAL RULES OF THE BUILDING CODE AND EXCEPTIONS

At other times, the user of the Building Code has to consider a general rule and exceptions that may be applicable.

Consider the application of electrical demand requirements for buildings within the scope of Part 9 given in Division B, Article 12.2.3.1.:

(1) Except as provided in Sentence (2), all buildings shall be designed to conform to the peak electric demand requirements set out in MMAH Supplementary Standard SB-10, "Energy Efficiency Requirements".

(2) This Article does not apply to,

(a) a building or part of a building of residential occupancy that is within the scope of Part 9 and is intended for occupancy on a continuing basis during the winter months,

(b) a farm building,

(c) a building that does not use electrical power or fossil fuel,

(d) a manufactured building described in Article 9.1.1.9., or

(e) a seasonal recreational building described in Section 9.36. or 9.38.

When the Code spells out a general rule and exceptions thereto, conformity with the Code is obtained by complying with EITHER the general rule OR the exception.

TABLES, TEXT AND FOOTNOTES

Whenever you are called upon to use a Table in the Code, you have to consider the text associated with the Table **and** the footnotes.

For example, Division B Table 9.25.5.2.

- Forms part of Sentence 9.25.5.2.(1).
- Note (1) to Table 9.25.5.2. tells us to refer to the MMAH Supplementary Standard SB-1 (found in Volume 2 of the Building Code) when determining the number of degree days for individual locations in Ontario.

SUPPLEMENTARY STANDARDS AND REFERENCED DOCUMENTS

The Supplementary Standards, published as Volume 2 of the Building Code Compendium form an integral part of the Building Code.

APPENDICES

The Appendices to the Building Code, published in Volume 2, have been prepared for convenience only. This material contains explanations that do **not** form part of the Building Code and are **not** intended to limit the ways by which compliance with Code requirements can be achieved.

STOP

LIST OF ABBREVIATIONS

The following abbreviations are used in this course:

Et	Thermal efficiency of the boiler
MNECB	Model National Energy Code for Buildings
ER	Energy rating
HDD	Heating degree-days
low-E	Low emissivity
RSI	Resistance System International, is a metric measure of the thermal resistance (or resistance to heat flow)
R-Value	The imperial measure of thermal resistance
Tavg	Average temperature
U-Value	Thermal conductance, is a measurement of the ability of a material to conduct heat

OBJECTIVES AND FUNCTIONAL STATEMENTS

Table 12 of Supplementary Standard SA-1 "Objectives and Functional Statements Attributed to the Acceptable Solutions" identifies all corresponding linked pairs of functional statement and objectives for each Part 12 provision.

OBJECTIVES

Most of the provisions of Part 12 are directly associated with the objective OR2 "Resource Conservation – Infrastructure Capacity" as defined in Division A, Table 2.2.1.1.

OR2 Resource Conservation – Infrastructure Capacity: *An objective of this Code is to limit the probability that, as a result of the design or construction of a building, the capacity of the infrastructure supporting the use, treatment or disposal of a resource will be exposed to an unacceptable risk of being exceeded.*

However, some of the provisions of Part 12 are associated directly with other objectives including:

- OS3.1 and OS3.7 "Safety – Safety in Use" for motion sensors to control lighting;
- OH1.1 and OH1.2 "Health – Indoor Conditions" for required insulation and air/vapour barrier;
- OS2.3 "Safety – Structural Safety" for required insulation and air/vapour barrier.

OR1.1 Resource Conservation – Water and Energy Conservation is not directly referenced in Part 12, but is referenced in Subsection 7.6.4, which is referenced by Part 12. OR1.1 is applicable for the provisions associated with water and energy conservation.

FUNCTIONAL STATEMENTS

Most of the provisions of Part 12 are linked to Functional Statement 131 “To limit excessive energy consumption” as listed within Division A, Table 3.2.1.1.

However, other functional statements also apply, including the following:

F10: “To facilitate the timely movement of persons to a safe place in an emergency” for motion sensors to control lighting

F30: “To minimize the risk of injury to persons as a result of tripping, slipping, falling, contact, drowning or collision” for motion sensors to control lighting

F51: “To maintain appropriate air and surface temperatures” for required insulation

F54: “To limit drafts” for air infiltration limitations

F55: “To resist the transfer of air through environmental separators” for air infiltration limitations

F63: “To limit moisture condensation” for required insulation

These functional statements are compatible with the provisions of Part 12 Resource Conservation and with the objectives, identify the areas of performance for Code provisions.

Every requirement under Part 12 has a functional statement/objective linked pair, however, there are some Code provisions where more than one linked pair of objectives/functional statements apply. Each of these linked pairs must be considered if an alternative solution is being considered.

EXAMPLE

What is the functional statement/objective linked pair corresponding to Sentence 12.2.1.1.(3)?

Division B, Sentence 12.2.1.1.(3)

Except as provided in Sentence (4), the energy efficiency of a building or part of a building of residential occupancy that is within the scope of Part 9 and is intended for occupancy on a continuing basis during the winter months shall,

(a) meet the performance level that is equal to a rating of 80 or more when evaluated in accordance with NRCan “EnerGuide for New Houses: Administrative and Technical Procedures”, or

(b) Conform to Chapters 1 and 2 of MMAH Supplementary Standard SB-12, “Energy Efficiency for Housing”.

Solution:

- Refer to Table 12 in the Supplementary Standard SA-1
- In column 1, locate the reference to ‘acceptable solution’ 12.2.1.1.(3)
- The corresponding Objectives and Functional Statements are identified in column 2
- One linked pair of Objectives and Functional Statements is linked to Clause 12.2.1.1.(3)(b) F131-OR1.2

Functional Statement: F131

Objective: OR1.2

STOP

COMPLETE THE NEXT EXERCISE

Exercise 1-2

For the following Code provisions list the corresponding linked pairs of Objectives and Functional Statements.

Code Provision	Functional Statements and Objectives
Motion Sensors 12.2.4.1.(2)(3)	
Windows and Sliding Glass Doors 12.3.1.2.(1)	
Peak Electric Demand 12.2.3.1.(1)	
Temperature Control in Dwelling Units 12.3.1.3.(1)	

STOP

SCOPE OF APPLICATION OF PART 12

Part 12 contains requirements for all types of building. The energy efficiency design requirements applicable to Part 9 residential buildings and houses shall comply with:

- Chapters 1 and 2 of MMAH Supplementary Standard SB-12, "Energy Efficiency for Housing".
- Carbon Dioxide Equivalents
- Peak Electric Demand
- Motion sensors to control lighting
- Windows and Sliding Glass Doors
- Temperature Control in Dwelling Units
- Hot Water Piping Insulation
- Residential Furnaces After December 31, 2014
- Energy Supply for Kitchens and Laundry Facilities After December 31, 2014
- Water Efficiency

As per Division B, Sentence 12.2.1.1.(4) and 12.2.1.2.(4) energy efficiency design does not apply to farm buildings, a building that does not use electrical power or fossil fuel, a manufactured building described in Article 9.1.1.9., or a seasonal recreational building described in Section 9.36. or 9.38.

ENERGY EFFICIENT DESIGN OPTIONS AND TRANSITION DATES

The provisions for energy efficiency design are described for two time periods. They are for applications for building permit submitted before **January 1, 2017**, and applications for building permit after **December 31, 2016**.

For each of the time periods, the energy efficiency design options are different for houses and residential buildings within the scope of Part 9.

STOP

PART 9 RESIDENTIAL BUILDINGS, BEFORE JANUARY 1, 2017

Houses and other buildings of residential occupancy within the scope of Part 9 can follow any one of the **two possible options** for energy efficient design.

Sentence 12.2.1.1.(3) sets out the minimum requirements relative to energy efficiency for Part 9 residential buildings intended for occupancy on a continuing basis during winter months. Any one of the following provisions can be applied:

Division B, Sentence 12.2.1.1.(3)

- (a) . . . meet the performance level that is equal to a rating of 80 or more when evaluated in accordance with NRCan, "EnerGuide for New Houses: Administrative and Technical Procedures",

OR

(b) conform to Chapters **1** and **2** of MMAH Supplementary Standard SB-12, "Energy Efficiency for Housing"

PART 9 RESIDENTIAL BUILDINGS, AFTER DECEMBER 31, 2016

All applications for building permit for Part 9 residential buildings submitted **after December 31, 2016** are required to be designed to exceed by not less than 15% the energy efficiency levels required by Sentence 12.2.1.1.(3) (NRCan, "EnerGuide for New Houses"). See Clause 12.2.1.2.(3)(a)

OR

Conform to Chapters **1** and **3** of MMAH Supplementary Standard SB-12, "Energy Efficiency for Housing". See Clause 12.2.1.2.(3)(b)

STOP

SUMMARY OF ENERGY EFFICIENCY DESIGN COMPLIANCE OPTIONS

The table below outlines the applicable energy efficiency design compliance options for houses and residential buildings under Part 9.

Summary of Energy Efficiency Design Compliance Options

Energy Efficiency Design Compliance Option Available for Part 9 Residential Buildings	Applicable up to Jan. 1, 2017	Applicable after Dec. 31, 2016	Code Reference
Rating of 80 or more in accordance with NRCan "EnerGuide for New Houses: Administrative and Technical Procedures"	√	--	12.2.1.1.(3)(a)
Exceed 15% of the values in NRCan "EnerGuide for New Houses: Administrative and Technical Procedures"	--	√	12.2.1.2.(3)a)
Supplementary Standard SB-12, Chapters 1 and 2	√	--	12.2.1.1.(3)(b)
Supplementary Standard SB-12, Chapters 1 and 3	--	√	12.2.1.2.(3)(b)

√ Applicable

-- Not applicable

EXAMPLE

A designer wants to design a Part 9 house applying the provisions of Subsection 12.2.1. What is the last day that the designer has to submit the application for permit?

Solution:

- Sentence 12.2.1.1.(1) sets out the time frames for design compliance options for Part 9 residential buildings

The last day the designer can apply for a building permit is December 31, 2016 in order to comply with Subsection 12.1.1.

COMPLETE THE NEXT TWO EXERCISES

Exercise 1-3

1. Can the provisions for Article 12.2.1.1. be used as a design compliance option for a Part 9 townhouse if the designer submits the application for building permit after January 1, 2017?

Code Ref: _____

Exercise 1-4

1. A house is being designed, and the building permit application will be submitted in 2016. Which of the following provisions does the designer have to satisfy to meet the minimum energy efficiency requirements?
 - a) Provisions of Clause 12.2.1.1.(3)(a)
 - b) Provisions of Clause 12.2.1.1.(3)(b)
 - c) Performance level of 80 or more when evaluate in accordance with NRCan, "EnerGuide for New Houses: Administrative and Technical Procedures"
 - d) Conform to Chapters 1 and 2 of Supplementary Standard SB-12
 - e) Any one of (a), (b), (c) or (d)

Code Ref: _____

STOP

INTRODUCTION

This module describes how NRCan “EnerGuide for New Houses: Administrative and Technical Procedures” may be used as an option to meet the minimum performance requirements for energy efficiency in Part 9 houses and residential buildings before January 1, 2017.

OBJECTIVES

Upon completion of this module, participants will be able to:

- Recognize the rating system for NRCan “EnerGuide for New Houses”
- Identify the factors that influence the performance level of “EnerGuide for New Houses” rating

READ TO THE NEXT STOP.

APPLICATION OF NRCAN ENERGUIDE TO PART 9 RESIDENTIAL BUILDINGS BEFORE JANUARY 1, 2017

Sentence 12.2.1.1.(3) sets out the minimum requirements for Part 9 houses and residential buildings relative to energy efficiency. Two different compliance options are offered so that a designer can choose either one option to meet the minimum energy efficiency requirements. As per Division B, Sentence 12.2.1.1.(3), either Clause (a) or (b) can be applied:

Division B, Sentence 12.2.1.1.(3)

Except as provided in Sentence (4), the energy efficiency of a building or part of a building of residential occupancy that is within the scope of Part 9 and is intended for occupancy on a continuing basis during the winter months shall,

- (a) meet the performance level that is equal to a rating of 80 or when evaluated in accordance with NRCan “EnerGuide for New Houses: Administrative and Technical Procedures”, or*
- (b) Conform to Chapters 1 and 2 of MMAH Supplementary Standard SB-12, “Energy Efficiency for Housing”.*

The following table outlines typical rating ranges:

EnerGuide Rating Chart	
Type of Building	Rating
New House build to building code standards	65 to 72
New house with some energy-efficiency improvements	73 to 79
Energy-efficient new house	80 to 90
House requiring little or no purchased energy	91 to 100

STOP

EXERCISE 3-1

1. A design for a 150 m², 3 storey house is currently being undertaken. The building permit application will be submitted in early 2016. The design will achieve a performance level equal to a rating of 80 if it was evaluated in accordance to NRCan "EnerGuide for New Houses: Administrative and Technical Procedures". Will the building meet the minimum energy efficiency design requirements?

Code Ref: _____

STOP

INTRODUCTION

This module describes how Supplementary Standard SB-12 may be used as an option to meet the minimum performance requirements for energy efficiency in Part 9 houses.

OBJECTIVES

Upon completion of this module, participants will be able to:

- Explain the two different design options to achieve energy efficiency.
- State how the design options apply to existing buildings.
- Identify the compliance packages for heating methods utilized in Zone 1 and Zone 2.
- Identify the insulation requirements for foundation walls.
- Identify the thermal characteristics of windows and doors.
- Explain where air barrier systems are required.
- Locate special requirements for air barrier system installation details.

STOP

APPLICATION OF SUPPLEMENTARY STANDARD SB-12 TO PART 9 RESIDENTIAL BUILDINGS BEFORE JANUARY 1, 2017

Sentence 12.2.1.1.(3) sets out the minimum requirements for Part 9 residential buildings relative to energy efficiency. Before January 1, 2017, there are **five compliance options** available so that a designer can choose any one option to meet the minimum energy efficiency requirements. As per Division B, Sentence 12.2.1.1.(3), either clause (a) or (b) can be applied:

Division B, Sentence 12.2.1.1.(3)

The energy efficiency of a building or part of a building of residential occupancy that is within the scope of Part 9 and is intended for occupancy on a continuing basis during the winter months shall,

TERMS AND ABBREVIATIONS

The abbreviations below relate to the content of this Module and apply to SB-12.

Abbreviations:

Abbreviation	Meaning
AFUE	Annual fuel utilization efficiency
EF	Energy factor
HRV	Heat recovery ventilator
ICF	Insulation concrete form

STOP

ENERGY EFFICIENCY FOR RESIDENTIAL OCCUPANCY

SB-12 provides provisions to achieve energy efficiency as an alternative to achieving a rating of 80 when evaluated with NRCan "EnerGuide for New Houses: Administrative and Technical Procedures".

Compliance with both Chapters 1 and 2 before 2017, and Chapters 2 and 3 after 2016, of the SB-12 standard will be deemed to meet the energy efficiency requirements in accordance with Sentences 12.2.1.1.(3) and 12.2.1.2.(3) of the OBC.

SB-12 is organized into 3 chapters with the following general content:

Chapter 1: General

Chapter 2: Acceptable Solutions for Energy Efficiency Compliance Before January 1, 2017

Chapter 3: Acceptable Solutions for Energy Efficiency Compliance After December 31, 2016

EXERCISE 4-1

Refer to Article 2.1.1.1 and answer the following questions.

1. What is the minimum annual fuel utilization efficiency of propane?

Code Ref: _____

2. What is the maximum percentage of gross area of glazing to gross area of peripheral walls permitted to exempt the application of Subsection 2.1.2?

Code Ref: _____

3. What types of glazing are exempt from the calculation of gross area of glazing?

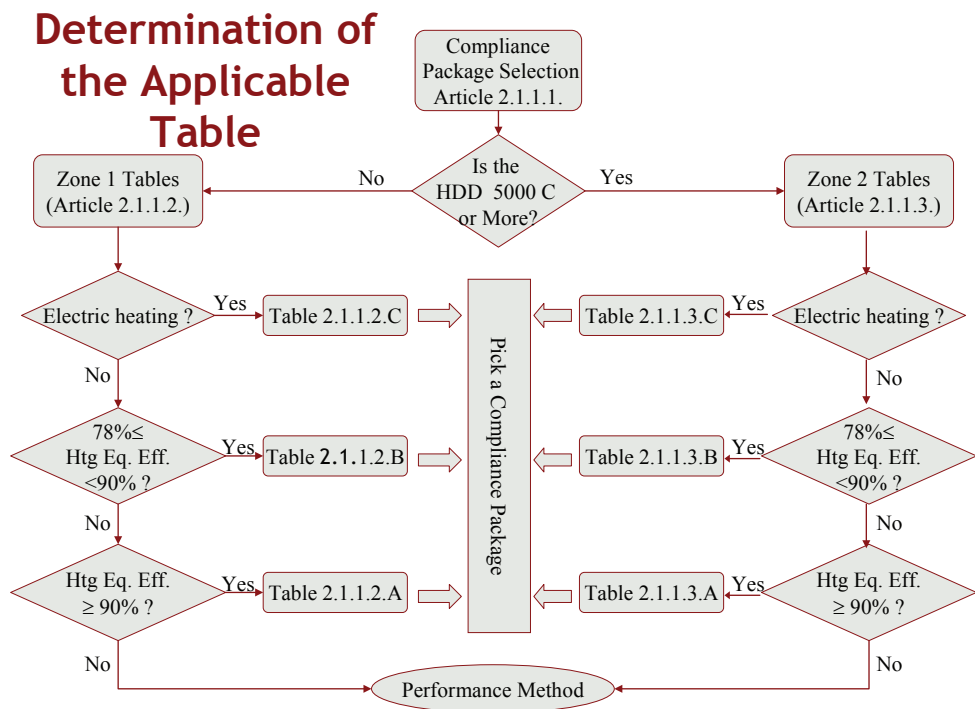
Code Ref: _____

4. What type of surface is exempt from the calculation of thermal resistance of building assemblies?

Code Ref: _____

COMPLIANCE PACKAGES

Compliance packages are a series of design options a designer can apply to their building based on specific performance values of building assemblies. Each compliance package outlines detailed requirements for the minimum thermal characteristics of building assemblies. A designer is free to choose which compliance package they desire but they must comply with all of the outlined values in order to achieve full compliance.



ENERGY EFFICIENCY FOR ZONE 1 AND ZONE 2 BUILDINGS

The application of the prescriptive compliance packages is dependent on the zone location of the building. To determine the applicable zone, it is first necessary to determine the heating degree days for the location.

As per Sentence 2.1.1.1.(1) a dwelling located in an area with less than 5000 degree days is considered to be Zone 1 and a dwelling located in an area with more than 5000 degree days is considered to be Zone 2.

Therefore it is up to the designer to identify which components will apply in each case and select and apply a compliance package that addresses all components.

When considering and applying these tables, refer to the footnotes for additional information and clarification. In particular, footnotes for compliance packages K, L and M in Tables 2.1.1.2.A and 2.1.1.3.A limit the application of these packages.

The footnotes of the various tables clarify that the values listed in the tables are the minimum RSI-Values for the thermal insulation component only. The footnotes also state that the U-Value found for skylights, windows and sliding glass doors are the overall coefficient of heat transfer.

Compliance package K applies to a building with both ICF basement walls and ICF above grade walls where the thermal insulation value is the sum of the insulation value on both sides of the wall.

Compliance package L applies to a building with ICF basement walls only where the thermal insulation value is the sum of the insulation value on both sides of the walls.

Compliance package M applies to a building with combined space heating and domestic hot water heating systems.

When applying the tables, a blank or "-" in the tables means that there is no specific requirement for this component. As an example, refer to the HRV requirement for compliance package A in table 2.1.1.2.A. For compliance package A, there is no requirement for a minimum efficiency on an HRV. Where there is an efficiency percentage indicated, it means that an HRV is required for the compliance package and that the HRV must have the specified minimum efficiency. If the designer does not provide an HRV or comply with its minimum values, the designer cannot utilize one of those compliance packages that specify an HRV. Note that only HRVs are mandatory if indicated in the compliance package. Other building features are not mandatory just because there is a corresponding value within a table.

Similarly, where space heating equipment efficiency ranges vary from 78% to less than 90%, the minimum thermal performance

of the building envelope and equipment must conform to Table 2.1.1.2.B for Zone 1 buildings or Table 2.1.1.3.B for Zone 2 buildings "Compliance Packages for Space Heating Equipment with AFUE \geq 78% and $<$ 90%". As for higher efficiency space heating equipment, minimum and maximum criteria for some building components is the same for both zones and for all compliance packages while other components differ depending on zone and/or compliance package.

Where electric space heating is utilized, the minimum thermal performance of the building envelope and equipment shall conform to Table 2.1.1.2.C. or Table 2.1.1.3.C. "Compliance Packages for Electric Space Heating". Many of the criteria are the same for both zones whereas the following differ between zones:

- Minimum RSI value for basement walls
- Minimum RSI value for below grade slab where the entire surface is more than 600 mm below grade
- Minimum efficiency of HRVs

STOP

Example

Which building components are consistent within all compliance packages for a Zone 1 building with space heating equipment with an AFUE of 84%?

Solution:

The values identified for

- ceiling with attic spaces,
- ceiling without attic space,
- exposed floor,
- edge of below grade slab \leq 600 mm below grade,
- heated slab or slab \leq 600 mm below grade and
- skylights

are all consistent regardless of compliance package in Zone 1 buildings.

COMPLETE THE NEXT EXERCISE

ELEMENTS ACTING AS A THERMAL BRIDGE

A thermal bridge is a material that connects the warm side of the building assembly to the cold side and that has a greater thermally conductivity compared to other adjacent materials.

Article 2.1.1.4. sets out provisions to reduce the effects of thermal bridging for insulated portions of a wall.

SB-12, 2.1.1.4.

*(1) Except for a foundation wall, the insulated portion of a wall that incorporates **wood** stud framing elements that have a thermal resistance of less than RSI 0.90 shall be insulated to restrict heat flow through the studs by a material providing a thermal resistance at least equal to 25% of the thermal resistance required for the insulated portion of the assembly in Articles 2.1.1.2., 2.1.1.3. and 2.1.1.10.*

Typical 2 x 4 construction would require a designer to utilize insulating sheathing however, 2 x 6 construction would not.

*(2) Except as provided in Sentence (3), the thermal resistance of the insulated portion of a building assembly in Articles 2.1.1.2. and 2.1.1.3. that incorporates **metal framing** elements, such as steel studs and steel joists, that act as thermal bridges to facilitate heat flow through the assembly, shall be 20% greater than the values shown in Tables 2.1.1.2.A, 2.1.1.2.B, 2.1.1.2.C and Tables 2.1.1.3.A, 2.1.1.3.B and 2.1.1.3.C, unless it can be shown that the heat flow is not greater than the heat flow through a wood frame assembly of the same thickness.*

OR

- Metal thermal bridges are insulated by a material having an RSI of 25% of the values set out in Articles 2.1.1.2. and 2.1.1.3. and 2.1.1.10. [SB-12, 2.1.1.4.(3)]

STOP

COMPLETE THE NEXT EXERCISE

The thermal resistance value in Sentence (1) for the total wall assembly may be reduced to not more than RSI 1.61 if,

(a) the thermal resistance of insulation for the exposed roof or ceiling required in Table 2.1.1.2.A. is increased by an amount equivalent to the reduction permitted in this Sentence,

AND

(b) for log walls, the logs have tongue-and-groove or splined joints.

Also, the minimum thermal resistance value of 2.1 m²C/W is **not required** for **milled** log walls:

SB-12, 2.1.1.5.(3)

*Where milled log walls are installed, the thermal resistance value in Sentence (1) for the total wall assembly does **not** apply if,*

(a) the mean thickness of each log is not less than 150 mm,

(b) the thermal resistance of insulation for the exposed roof or ceiling required in Table 2.1.1.2.A. is increased by RSI 0.53, and

(c) the logs have tongue-and-groove or splined joints.

STOP

THERMAL PERFORMANCE OF WINDOWS, SKYLIGHTS AND SLIDING GLASS DOORS

Table 2.1.1.8. "Energy Ratings (ER) for Windows, Skylights and Sliding Glass Doors" includes the maximum U-Values and minimum energy rating thermal properties for windows, skylights and sliding doors.

Windows, skylights and sliding glass doors are required to meet the required overall coefficient of heat transfer in Tables 2.1.1.2.A, 2.1.1.2.B and 2.1.1.2.C and Tables 2.1.1.3.A, 2.1.1.3.B and 2.1.1.3.C **or** the corresponding energy rating in Table 2.1.1.8.

When dealing with a **residential occupancy**, the energy rating and the overall coefficient of the heat transfer required for windows and sliding glass doors are required to be done in accordance with Sentence 2.1.1.8.(2)

SB-12, Sentence 2.1.1.8.(2)

The energy rating and the overall coefficient of the heat transfer required for windows and sliding glass doors in a residential occupancy shall be determined in conformance with

*(a) CAN/CSA-A440.2, "Fenestration Energy Performance" **or***

(b) NFRC 100, "Procedure for Determining Fenestration Product U-Factors" and NFRC 200, "Procedure for Determining Fenestration Product Solar Heat Coefficient and Visible Transmittance at Normal Incidence".

Sentence 2.1.1.8.(3), sets out the requirements for basement windows that incorporate loadbearing structural frames.

SB-12, Sentence 2.1.1.8.(3)

A basement window that incorporates a loadbearing structural frame shall be double glazed with a low-E coating.

EXAMPLE

A new house with natural gas heating is being designed in a Zone 1 (less than 5000 heating degree days). The designer wants to use compliance package F. What is the minimum energy rating of a fixed window?

Solution:

ADDITIONS TO EXISTING BUILDINGS

Article 2.1.1.10. outlines the requirements for additions to existing buildings.

SB-12, Sentence 2.1.1.10.(1)

... an addition to an existing building shall comply with:

- (a) one of the applicable compliance packages in Article 2.1.1.2. or 2.1.1.3. in accordance with this Subsection, or*
- (b) the thermal performance requirements in Table 2.1.1.10.*

SB-12, Sentence 2.1.1.10.(2)

For the purpose of Sentence 2.1.1.1.(7) to (9) and Subsection 2.1.2., the addition may be considered independently or in combination with the existing building, regardless of the thermal characteristics of the existing building envelope.

SB-12, Sentence 2.1.1.10.(3)

A one-storey sunroom addition to an existing building shall be deemed to be in compliance with Article 2.1.1.2. and 2.1.1.3. and Subsection 2.1.2., provided that the overall coefficient of heat transfer of

- (a) doors, windows and walls has a maximum U-Value of
 - i) 1.6 if the building is located in Zone 1 with less than 5000 heating degree days.*
 - ii) 1.4 if the building is located in Zone 2 with 5000 heating degree days, or*
 - iii) 1.4 if the building uses electrical space heating, and**
- b) roofs and skylights has a maximum U-Value of 2.6.*

STOP

COMPLETE THE NEXT EXERCISE

SB-12, Sentence 2.1.2.1.(10):

Where the overall thermal performance of a building envelope is less than the envelope performance of the compliance package that is compared against it, the reduction in the performance level of the building envelope shall not be more than 25%.

Furthermore, the dwelling must have the following characteristics:

- a) Have identical dimensions and orientation as the proposed design, except where the glazing to wall ratio exceeds 22%, the glazing area shall be reduced proportionally along each exposure until the limit is met. [2.1.2.1.(7)],
- b) If constructed of frame construction the spacing for wall studs shall be 406 mm o.c., 406 mm for exposed floor joists, roof joists and roof rafters and 610 mm for roof trusses, [2.1.2.1.(8)],
- c) Building envelope component properties described shall be modeled the same for both the proposed design and a design based on a permitted compliance package. [2.1.2.1.(9)].

EXERCISE 4-10

1. Which of the following software can be used to calculate the annual energy use of a proposed design?
 - a) HOT2000
 - b) HOT2000 version 9.34c
 - c) RESNET accredited Home Energy Rating System
 - d) b) and c)

Code Ref: _____

ENERGY STAR COMPLIANCE

Article 2.1.3.1. of SB-12 states that , "a building shall be deemed to be in compliance with the requirements of Subsection 2.1.1. provided that the building is in compliance with the technical requirements of NRCan, "Energy Star for New Homes: Technical Specifications – Ontario".

Eligible housing types for Energy Star energy efficiency requirements are new detached, semi-detached and townhouses, **however**

Motion sensors are permitted in an exit but only if the motion sensors control **supplementary** lighting that is provided over and above the minimum lighting levels set out in Article 9.9.12.2. (egress facilities), and Article 9.34.2.7. (public and service areas).

In addition to exits where motion sensors are not permitted, motion sensors are **not permitted to control emergency lighting**, as per Sentence 12.2.4.1.(3). Requirements for emergency lighting are described elsewhere in the Code, including Division B, Article 9.9.12.3.

CONTROLS

Additional features are required for motion sensors installed in specific locations, as set out in Sentence 12.2.4.1.(2).

Division B, Sentence 12.2.4.1.(2)

Where motion sensors are used to control minimum lighting in a public corridor or corridor providing access to exit for the public...

In these locations, the motion sensor must have the following additional features, as per Sentence 12.2.4.1.(2):

- Switch controllers equipped for fail-safe operation that will override the motion sensor in the event that the sensor malfunction does not detect movement,

AND

- Illumination timers must be set for a minimum 15-minute duration.

These features apply only to public corridors or a corridor providing access to exit for the public.

Division A, Article 1.4.1.2. defines a **public corridor** as “. . . a corridor that provides access to exit from more than one suite”.

Therefore, corridors providing access to exit for the public or corridors that serve more than one suite are required to meet Sentence 12.2.4.1.(2).

As described by Functional Statements F10 and F30, which are attributed to these provisions as per Table 12 of SA-1, these control features are to provide minimum illumination levels to facilitate the timely movement of occupants to a safe place in an evacuation and to minimize the risk of injuries as a result of tripping, slipping, etc.

EXAMPLE

The design of a new 2 storey house having a footprint area of 200 m² proposes the use of motion sensors for the normal lighting in the basement.

Are the minimum illumination levels for the basement permitted to be controlled with motions sensors?

Solution:

- Sentence 12.2.4.1.(1) generally permits the use of motion sensors in these areas.
- Emergency lighting is not permitted to be controlled by motion sensors.
- However, emergency lighting is not required in a basement in a house.

Therefore:

- The basement is permitted to make use of motion sensors to control the minimum lighting levels, as otherwise required by Division B, Table 9.34.2.7.

STOP

COMPLETE THE NEXT EXERCISE

EXERCISE 5-1

- For each of the areas listed below identify whether motion sensors are permitted to control minimum illumination levels (unless indicated otherwise).

Area	Permitted	Not Permitted	Code Reference
Example: Public corridor serving multiple residential suites			
Entrance vestibule in a dwelling unit			
Bedroom in a dwelling unit			
Exit stairwell in a multi-unit residential building			

STOP

WINDOWS AND SLIDING GLASS DOORS

The energy efficiency of windows and sliding glass doors is regulated by Article 12.3.1.2. of Part 12, Div. B and Article 2.1.1.8. of MMAH SB-12.

Sentence 12.3.1.2.(1) states that, “that the energy rating and overall coefficient of heat transfer required for windows and sliding glass doors shall be determined in conformance with,

- CAN/CSA-A440.2, “Fenestration Energy Performance”, or
- NFRC 100, “Procedure for Determining Fenestration Product U-Factors” and NFRC 200, “Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence”.

AND

Sentences 2.1.1.8.(1) and (2) and Table 2.1.1.8. of MMAH SB-12 requires windows, skylights and sliding glass doors to have an overall coefficient of heat transfer in Tables 2.1.1.2.A, 2.1.1.2.B and 2.1.1.2.C. and Tables 2.1.1.3.A., 2.1.1.3.B and 2.1.1.3.C



INTRODUCTION

This module focuses on how maximum flow rates of water supply fittings and flush cycles for plumbing fixtures contribute to water conservation in all buildings including houses.

OBJECTIVES

Upon completion of this module, participants will be able to:

- Apply the requirements of Subsection 7.6.4., as cross-referenced in Part 12.
- Identify the maximum flow rates for water fixtures.
- Identify the maximum flush cycles for new sanitary plumbing fixtures.
- Identify the maximum flush cycles for sanitary fixtures that replace existing fixtures.

READ TO THE NEXT STOP

APPLICATION OF WATER EFFICIENCY

Sentence 12.4.1.1(1) references Subsection 7.6.4. for water efficiency and the requirements for new water supply fittings and plumbing fixtures in all buildings including houses:

Division B, Sentence 12.4.1.1.(1)

All buildings shall conform to the water efficiency requirements of Subsection 7.6.4.

The water efficiency requirements in Subsection 7.6.4 support the objective OR1 “Resource Conservation – Water and Energy Conservation”. Water efficiency requirements apply to water supply fittings and plumbing fixtures.

Where new fixtures are being installed as a result of **renovations**, such fixtures may not have to comply with the requirements of Subsection 7.6.4. if the chief building official is satisfied that compliance with

In addition to the requirements of CAN/CSA-B45.0, Table 7.6.4.2.A. "Maximum Water Consumption per Flush Cycle for Sanitary Fixtures" lists the maximum flush cycles for the following sanitary fixtures:

- Water closet (tank type)
- Water closet (direct flush)
- Urinal (tank type)
- Urinal (direct flush)

A flush cycle is a volume of water [litres] used to complete one full flush for sanitary fixtures (urinals and water closets).

MAXIMUM FLUSH CYCLES FOR SANITARY FIXTURES THAT REPLACE EXISTING FIXTURES

Flush cycles for **replacement** sanitary fixtures are permitted to be higher than flush cycles for sanitary fixtures installed in new buildings.

Sentence 7.6.4.2.(4) permits higher flush cycles in existing buildings where the Chief Building Official is satisfied that compliance with the requirements is impracticable because of maintenance or operational difficulties.

EXAMPLE

How much water is permitted to be used for a flush cycle for a toilet (with a tank) in a new townhouse?

Solution:

- The building is new, therefore Table 7.6.4.2.A. "Maximum Water Consumption per Flush Cycle for Sanitary Fixtures" is applicable.
- The toilet is a tank type.
- The maximum flush cycle is 6.0 Litres.

STOP

COMPLETE THE NEXT TWO EXERCISES

EXCEPTIONS TO WATER EFFICIENCY REQUIREMENTS

New faucets, shower heads, water closets, and urinals installed in **heritage buildings** do **not** need to meet the requirements for maximum flow rates [Table 7.6.4.1.] nor the maximum flush cycles [Tables 7.6.4.2.A and 7.6.4.2.B].

Division A, Article 1.4.1.2. defines a heritage building as a building:

(a) that is designated under the Ontario Heritage Act,

OR

(b) that is certified to be of significant architectural or historical value by a recognized, non-profit public organization whose primary object is the preservation of structures of architectural or historical significance and the certification has been accepted by the chief building official.

STOP

CLOSING COMMENTS

As soon as you have finished this course, please complete the anonymous online survey to provide feedback on your course experience. Your comments and survey ratings related to the course and workbook are important; they will assist George Brown College to improve the learning experience for future students. The survey can be found here: <http://ce.georgebrown.ca/buildingcodesurvey/>

MODULE 1

EXERCISE 1-1

From the definition of “building”, identify examples of building types that may not need to be designed in conformance with Part 12 Resource Conservation.

Designated structures

Tents

Decks, Etc.

Exercise 1-2

For the following Code provisions list the corresponding linked pairs of Objectives and Functional Statements.

Code Provision	Functional Statements and Objectives
Motion Sensors 12.2.4.1.(2)	F30-OS3.1 and F10-OS3.7
Windows and Sliding Glass Doors 12.3.1.2.(1)	F131-OR2
Peak Electric Demand 12.2.3.1.(1)	F131-OR1, OR1.2 and F131-OR2.1
Temperature Control in Dwelling Units 12.3.1.3.(1)	F131-OR1.2

Exercise 1-3

1. Can the provisions for Article 12.2.1.1. be used as a design compliance option for a Part 9 townhouse if the designer submits the application for building permit after January 1, 2017?

No. Article 12.2.1.1. can only be used for a permit application made before January 1, 2017.

Code Ref: 12.2.1.1.

EXERCISE 4-6

A new 200 m² house will be built in Ajax. The house will use natural gas space heating equipment and Compliance Package A. If steel stud framing elements are proposed in lieu of wood stud framing elements [in accordance with Sentence 2.1.1.4.(2)], what is the minimum RSI value of the following building elements:

Building Element	Minimum RSI Value (m ² C/W)
Basement floor located at 650 mm below grade:	1.056
Ceiling with attic space:	10.572
Exterior wall:	5.076

Code Ref: Table 2.1.1.2.A. and Sentence 2.1.1.4.(2)

EXERCISE 4-7

1. A new house will be constructed in Ingersoll. The designer wants to apply the provisions of Subsection 2.1.1 of SB-12 as a compliance option to meet the energy efficiency requirements. The house has a walk-out basement located within 500 mm of the exterior ground level. The slab will contain heating cables throughout. Which portion of the slab will require insulation?

All of the slab

Code Ref: SB-12, 2.1.1.6.(6) and (7)

EXERCISE 4-8

1. A new 200 m² 2 storey house with natural gas furnace with an AFUE of 90% is being designed in Mississauga. The designer wants to use compliance package D. Determine the overall coefficient of heat transfer and energy rating for the following glazing:
 - a) Sliding glass doors

1.8

Code Ref: Table 2.1.1.2. A.

MODULE 6

EXERCISE 6-1

A new home will have showers in two separate bathrooms. Each shower will have a single shower head. The shower heads were each tested at 550 kPa for 5 minutes. The total flow out of each fitting was 45 Litres. Are these shower heads permitted to be installed in the new home?

- a) Yes. Flow rate is less than the maximum permitted flow rate.
- b) No. Flow rate cannot be determined.
- c) No. Flow rate is greater than the maximum permitted flow rate.
- d) No. Flow was tested at a different pressure.

$$\text{Flow rate} = \text{L/min} = 45\text{L}/5\text{min} = 9 \text{ L/min}$$

Table 7.6.4.1. permits a maximum flow rate of 7.6 L/min for shower heads.

Code Ref: Sentence 12.4.1.1.(1) and Sentence 7.6.4.1.(1) and Table 7.6.4.1.

EXERCISE 6-2

What is the maximum flush cycle for a urinal (tank type) that will be installed in a new home?

- a) 5.68 Litres
- b) 1.9 Litres
- c) 6 Litres
- d) 13.25 Litres

Code Ref: Table 7.6.4.2.A.