INSTRUCTIONS - READ ME FIRST

BEFORE THE COURSE STARTS, WORK ON YOUR OWN AND COMPLETE ALL OF THE EXERCISES. If you come unprepared, you will have a difficult time to keep up with the pace of instruction.

The House - 2012 overview course is structured differently than the detailed technical courses. Only selected modules will be addressed during the in-classroom portion of the course. Since the quantity of material contained in Part 9 of Division B of the Building Code is so extensive, the remaining modules must be studied on your own prior to writing the House - 2012 Qualification Examination and before attending the course.

The time you can expect to devote to self-study of the modules that will NOT be taken up in class is approximately 40 hours. Similarly, the time you should budget for preparation of the in-class component is also approximately 40 hours. Consequently participants can expect to take up to 80 hours of their own time to complete the House - 2012 overview course.

In class, the following modules will be facilitator-led.

Module 01	Introduction
Module 02	Basics of Structural Design Requirements
Module 06	Stairs, Ramps, Handrails and Guards
Module 08	Fire Protection
Module 09	Sound Control
Module 11	Dampproofing, Waterproofing and Soil Gas Control
Module 13	Footings and Foundations
Module 19	Chimneys
Module 20	Fireplaces
Module 21	Wood Frame Construction
Module 23	Heat Transfer, Air Leakage and Condensation Control and Resource Conservation

In order to assist you in establishing which portions of Part 9 you may wish to concentrate on, a LIMITED number of questions have been included as a Self-Administered Quiz that can be found at the end of this module.

INTRODUCTION

The House - 2012 overview course will prepare you to write the Ministry's examination program associated with the "House" Category of Qualification identified in Row 1 of Table 3.5.2.1. of Division C.

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DIVISION B, PART 9 - HOUSE - 2012
SELF-ADMINISTERED QUIZ

Start time: _____

MODULE 3 - DESIGN OF AREAS AND SPACES

1. A dwelling unit that contains sleeping accommodations for not more than 2 persons (occupant load) contains:

   a) one bedroom

   b) one bedroom or bedroom space in combination with other spaces

   c) two bedrooms

   d) two bedrooms or bedroom spaces in combination with other spaces

Reference: _____

2. In a kitchen that is 7 m² in a dwelling unit that is designed to accommodate more than 2 persons, a minimum ceiling height of 2 300 mm must be provided over an area of not less than:

   a) 2.78 m²

   b) 3.15 m²

   c) 4.20 m²

   d) 5.25 m²

References:_____

3. Consider the 7 m² kitchen in Question 2 above. The minimum ceiling height beyond the minimum area that requires a 2 300 mm ceiling height is:

   a) 1 950 mm

   b) 2 100 mm

   c) 2 300 mm

   d) unregulated

References: _____

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MODULE 18 - ABOVE GRADE MASONRY

30. As a general rule, the provisions found in Section 9.20. apply to unreinforced walls that are;
    a) up to 11 m high
    b) not more than 3 storeys high
    c) designed by an architect or an engineer
    d) unlimited in height.

Reference: _____

31. Loadbearing elements in a two storey building of masonry construction are required to have earthquake reinforcement described in Subsection 9.20.15. if the seismic spectral acceleration;
    a) Sa(0.2) is not greater than 0.35
    b) Sa(0.2) is greater than 0.35
    c) Sa(0.2) is not greater than 0.55
    d) Sa(0.2) is greater than 0.55

References: _____

32. A 2 100 mm opening in an exterior masonry wall and supporting 100 mm face brick with no floor load is permitted to be supported by a steel angle lintel comprised of;
    a) L-90 × 90 × 6
    b) L-125 × 90 × 8
    c) L-125 × 125 × 8
    d) L-102 × 89 × 7.9

References: _____

33. The depth of chases located in 190 mm thick masonry walls are limited to;
    a) 1/3 of the thickness of the wall
    b) 100 mm
    c) 75 mm
    d) are not permitted.

References: _____

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38. Consider a masonry wall requiring earthquake reinforcement under Article 9.20.1.2. If it is determined that the total amount of reinforcing steel is to be 750 mm², what is the minimum amount of horizontal steel in this case?

    a) 250 mm²

    b) 250 mm² or 500 mm² with the remainder installed vertically

    c) 200 mm²

    d) 200 mm² or 550 mm² with the remainder installed vertically

Reference: _____

39. A 4.76 mm by 40 mm carbon steel strip used to tie intersecting walls is required to have corrosion-resistance which is in accordance with;

    a) ASTM A153/A153M and a Class B2 coating

    b) ASTM A153/A153M and a coating as per ASTM A153

    c) ASTM A123/A123M and a coating of 610 g/m²

    d) ASTM A123/A123M and a coating of 305 g/m²

References: _____

40. The thickness of concrete in flat insulating concrete form walls not in contact with the ground must be constant for the entire height of the wall and not less than:

    a) 100 mm

    b) 120 mm

    c) 140 mm

    d) 160 mm

Reference: _____

MODULE 22 - SHEET STEEL STUD WALL FRAMING

41. What is the maximum wall height for an interior non-loadbearing wall built of 32 × 64 steel studs at 610 mm o.c.?

    a) 2.7 m max.

    b) 3.5 m max.

    c) 4.0 m max.

    d) 4.9 m max.

References: _____

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42. What is the minimum metal thickness of steel studs exclusive of any coatings in an interior non-loadbearing wall with no required fire-resistance rating?

    a) 0.46 mm

    b) 0.53 mm

    c) 0.69 mm

    d) 0.85 mm

Reference: _____

43. What would be the stud size, thickness and spacing for a non-loadbearing exterior wall 3 600 mm high?

    a) 30 × 91 × 0.53 @ 300 mm o.c. max.

    b) 30 × 91 × 0.85 @ 305 mm o.c. max.

    c) 30 × 91 × 0.85 @ 400 mm o.c. max.

    d) 30 × 91 × 1.00 @ 400 mm o.c. max.

References: _____

MODULE 24 - ROOFING

44. The minimum roof slope for low slope application of asphalt shingles is:

    a) 1 in 2

    b) 1 in 3

    c) 1 in 4

    d) 1 in 6

References: _____

45. Eave protection under asphalt shingles applied on slopes of 1 in 3 is to extend up the roof slope a minimum distance of:

    a) 300 mm

    b) 900 mm

    c) 1200 mm

    d) 900 mm and at least 300 mm past the inside face of the exterior wall

References: _____

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DIVISION B, PART 9 - HOUSE - 2012
SELF-ADMINISTERED QUIZ
ANSWER SET

MODULE 3 - DESIGN OF AREAS AND SPACES

1. A dwelling unit that contains sleeping accommodations for not more than 2 persons (occupant load) contains:

   b) one bedroom or bedroom space in combination with other spaces

Reference: Clause 9.9.1.3.(1)(a)

2. In a kitchen that is 7 m² in a dwelling unit designed to accommodate more than 2 persons, the minimum ceiling height of 2 300 mm must be provided over an area of not less than:

   b) 3.15 m²

References: Sentence 9.5.6.1.(1)and Row 1 Column 2 of Table 9.5.3.1., forming part of sentences 9.5.3.1.(1) and (2), 75% of 4.2 m²

3. Consider the 7 m² kitchen in Question 2 above. The minimum ceiling height beyond the minimum area that requires a 2 300 mm ceiling height is:

   b) 2 100 mm

Reference: Sentence 9.5.3.1.(1) and Row 1, Column 2 of Table 9.5.3.1.

MODULE 4 - DOORS

4. In a House, which room requires a door to be installed:

   d) room containing a water closet

Reference: Sentence 9.5.9.2.(1)

5. An exit doorway serving more than one dwelling unit that has a pair of doors and both are active leaves, they shall be:

   a) 1210 mm wide

Reference: Clause 9.9.6.3.(2)(c)

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6. Mirrored glass doors conforming to CAN/CGSB-82.6-M, "Doors, Mirrored Glass, Sliding or Folding, Wardrobe" and mirrored glass doors reinforced with a film backing that meet the impact resistance requirements specified in CAN/CGSB-12.5-M, "Mirrors, Silvered" may be used:

d) on any door to a reach-in closet

References: Sentences 9.6.1.2.(2) and (3),

MODULE 5 - WINDOWS, DOORS AND SKYLIGHTS

7. Windows may be omitted from a basement recreation room or an unfinished basement when the space is provided with electric lighting

References: Sentence 9.7.2.3.(1) and Row 1 Column 3 of Table 9.7.2.3.

8. The manufacturing standards of glass for windows are found in:

d) Article 9.6.1.2.

9. The double hung windows of the Mitec House have a pane area of approximately 0.39 m^2. A consideration of Sentence 9.6.1.3.(1) indicates that if the Mitec House was to be constructed in Goderich, the minimum thickness of the factory-sealed IG units would be:

a) 2.5 mm thick

References: Sentence 9.6.1.3.(1) → A-9.6.1.3.(1) and Table A-9.6.1.3.B.

To obtain Climatic Information for Building Design in Ontario, Sentences 1.1.2.1.(1) and 9.4.1.1.(3) → Supplementary Standard SB-1, Table 1.2 Column 16, Goderich has 1/50 Hourly Wind Pressures of 0.55 kPa

MODULE 7 - MEANS OF EGRESS

10. Consider our two-storey MITEC House. The number of required exits is:

a) 1 exit door

Reference: Sentence 9.9.8.2.(1) → Clause 9.9.9.1.(1)(b)

11. An exit door serving our two-storey MITEC House:

c) may swing in the direction of exit travel or inward

Reference: Sentence 9.9.6.5.(1)

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MODULE 18 - ABOVE GRADE MASONRY

30. As a general rule, the provisions found in Section 9.20. apply to unreinforced walls that are;

    a) up to 11 m high

Reference: Subclause 9.20.1.1.(1)(a)(i)

31. Loadbearing elements in a two storey building of masonry construction are required to have earthquake reinforcement described in Subsection 9.20.15. if the seismic spectral response acceleration;

    d) Sa(0.2) is greater than 0.55

References: Sentence 9.20.1.1.(1) → 9.20.1.2.(1)

32. A 2 100 mm opening in an exterior masonry wall and supporting 100 mm face brick with no floor load is permitted to be supported by a steel angle lintel comprised of;

    d) L-102 × 89 × 7.9

References: Sentence 9.20.5.2.(2) and Row 4, Column 2 of Table 9.20.5.2.A.

33. The depth of chases located in 190 mm thick masonry walls are limited to;

    b) 100 mm

References: Sentence 9.20.7.1.(1) → 9.20.7.2.(2)

34. As a general rule, individual wire ties for multiple wythe masonry cavity walls are to be spaced at not more than;

    b) 900 mm apart horizontally & 400 mm apart vertically

Reference: Sentence 9.20.9.4.(7)

35. In determining the distance between points of lateral support for interior and exterior cavity walls, with wythes of equal thickness, the thickness of the cavity wall is based on;

    d) 2/3 the sum of the thicknesses of the wythes

Reference: Clause 9.20.10.1.(3)(a)

36. Corbelling for masonry veneer of rough stone is limited to;

    d) the average projection not being more than 1/3 the width of the supporting base

Reference: Sentence 9.20.12.3.(2)

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37. In masonry veneer over wood frame walls, weep holes are to be spaced not more than:

    d) 800 mm apart

Reference: Clause 9.20.13.8.(1)(b)

38. Consider a masonry wall requiring earthquake reinforcement under Article 9.20.1.2. If it is determined that the total amount of reinforcing steel is to be 750 mm², what is the minimum amount of horizontal steel in this case?

    b) 250 mm² or 500 mm² with the remainder installed vertically

Reference: Sentence 9.20.15.1.(1), 750 ÷3

39. A 4.76 mm by 40 mm carbon steel strip used to tie intersecting walls is required to have corrosion-resistance which is in accordance with;

    c) ASTM A123/A123M and a coating of 610 g/m²

References: Sentence 9.20.16.1.(1) and Rows 2 and 3 of Table 9.20.16.1.

40. The thickness of concrete in flat insulating concrete form walls not in contact with the ground must be constant for the entire height of the wall and not less than:

    c) 140 mm

Reference: Clause 9.20.17.1.(1)(a)

MODULE 22 - SHEET STEEL STUD WALL FRAMING

41. What is the maximum wall height for an interior non-loadbearing wall built of 32 × 64 steel studs at 610 mm o.c.?

    b) 3.5 m max.

References: Sentence 9.24.2.1.(1) and Row 2 Column 3 of Table 9.24.2.1.

42. What is the minimum metal thickness of steel studs exclusive of any coatings in an interior non-loadbearing wall with no required fire-resistance rating?

    a) 0.46 mm

Reference: Sentence 9.24.2.2.(1)

43. What would be the stud size, thickness and spacing for a non-loadbearing exterior wall 3 600 mm high?

    b) 30 × 91 × 0.85 @ 305 mm o.c. max.

References: Sentence 9.24.2.5.(1) → Row 3, Columns 1, 2 and 3 of Table 9.24.2.5.

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MODULE 24 - ROOFING

44. The minimum roof slope for low slope application of asphalt shingles is:

    d) 1 in 6

References: Sentence 9.26.3.1.(1) and Row 3, Column 2 of Table 9.26.3.1.

45. Eave protection under asphalt shingles applied on slopes of 1 in 3 is to extend up the roof slope a minimum distance of:

    d) 900 mm and at least 300 mm past the inside face of the exterior wall

References: Sentence 9.26.7.7.(1) → 9.26.5.1.(1)

46. Eave protection under asphalt shingles applied on slopes of 1 in 6 is to extend up the roof slope a minimum distance of:

    d) not required when the installation of shingles complies to Subsection 9.26.8.

Reference: Clause 9.26.5.1.(2)(c)

MODULE 25 - CLADDING

47. The minimum length of nails for the attachment of metal siding is:

    c) 38 mm

References: Sentence 9.27.5.4.(1) and Row 3, Column 2 of Table 9.27.5.4.

48. The minimum thickness of plywood cladding (face grain parallel to studs at 406 mm o.c.) applied directly to sheathing is:

    a) 6 mm

Reference: Sentence 9.27.8.2.(1)

49. The minimum length of nails for the attachment of vinyl siding is:

    c) 38 mm

References: Sentence 9.27.12.2.(1) → 9.27.5.4.(1) → Row 3, Column 2 of Table 9.27.5.4., same as metal siding

MODULE 26 - STUCCO

50. The minimum diameter of nails used for the attachment of stucco lath is;

    b) 3.2 mm

Reference: Sentence 9.28.3.2.(1)

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59. The minimum length and maximum spacing of nails used to fasten 7.9 mm thick wood strip flooring is;

c) 38 mm @ 200 mm

References: Sentence 9.30.3.3.(1) → Table 9.30.3.3., Row 1, Columns 2 and 3

60. Wood strip flooring may be installed in a kitchen provided that:

d) it will provide a similar degree of water resistance as that of a prescribed material

Reference: Sentence 9.30.1.1.(1)

MODULE 29 - PLUMBING

61. In a House with a water distribution system, hot and cold water must be provided to the following fixtures;

b) kitchen sink, wash basin, bathtub, shower, slop sink and laundry area

Reference: Sentence 9.31.3.2.(1)

62. In a House the maximum temperature for hot water supply to fixtures other than dishwashers and clothes washers is;

a) 49°C

References: Sentence 9.31.4.3.(2) → 7.6.5.1.(1)

63. In Kapuskasing, service water heaters installed in Houses must be secured to the structure to resist overturning and displacement during an earthquake.

b) False

References: Sentence 9.31.6.2.(3) & 9.4.1.1.(3) → SB-1, Table 1.2, Column 17

MODULE 30 - ELECTRICAL

64. A 3 way switch is required at the top and bottom of a stair from the first to second level in a side-split House if the stairs have;

c) 4 or more risers

Reference: Sentence 9.34.2.3.(2)

65. The unfinished basement of a House has an area of 100 m². How many lighting fixtures are required?

d) 4

Reference: Sentence 9.34.2.4.(1)

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- □ designed in accordance with Part 4 using the loads and limits on deflection and vibration specified in Part 9 or Part 4.
  [Subclauses 9.4.1.1.(1)(c)(i) and (ii)]

2. the specified live load on the floor must not exceed 2.4 kPa.
   [Sentence 9.4.1.1.(2)]

3. The climatic date for structural design against snow and wind loads and seismic hazard is determined from MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".
   [Sentence 9.4.1.1.(3)]

WOOD FRAMING SYSTEMS FOR HOUSES

For the construction of Houses, you are likely to deal with platform framing systems most of the time and occasionally with post and beam and plank framing or log construction systems.

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NOTA BENE: Minimum live loads are also listed in Table 4.1.5.3., "Specified Uniformly Distributed Live Loads on an Area of Floor or Roof".

EXERCISE # 1 - STRUCTURAL DESIGN REQUIREMENTS AND APPLICATION LIMITATIONS FOR HOUSES

This exercise is based on Subsections 9.4.1. to 9.4.3. and 4.1.5. and MMAH Supplementary Standard SB-1. When prompted, support your answers with references.

1. As evidenced in Drawing M2:1, in a post and beam construction system, most repetitive structural members are spaced more than 610 mm apart. Consequently, they would need to be designed in conformance with:

   a) post and beam system is not permitted for the construction of Houses because the repetitive framing members are spaced more than 610 mm o.c.

   b) good engineering practice such as provided in CWC's "Engineering Guide for Wood Frame Construction"

   c) Part 4 of the Code using the loads, deflection and vibration limits specified in Part 9 or 4

   d) Part 4 of the Code using the loads, deflection and vibration limits specified in Part 9 or 4 or good engineering practice such as provided in CWC's "Engineering Guide for Wood Frame Construction"

References: _____

2. Consider a House measuring 8 m by 12 m, to be constructed in Kapuskasing. The specified design snow load for roof framing is:

   a) 2.8 kPa

   b) 0.3 kPa

   c) 1.84 kPa

   d) 1.56 kPa

References: _____

3. When the House in question # 2 is to be constructed in Hamilton, below escarpment and east of Highway 403 the specified design snow load for roof framing is:

   a) 0.9 kPa

   b) 0.4 kPa

   c) 0.895 kPa

   d) 1.0 kPa

References: _____

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7. Consider Subclauses 9.4.1.1.(1)(c)(i) and (ii) and complete the following Table by inserting the minimum uniformly distributed live load (UDL) for the specified area of floor in a House.

	Use of area of floor	minimum UDL	Div. B reference
1	Attic accessible by a stairway		
2	Attic (dry wall ceiling) with access hatch conforming to Subsection 9.19.2. of Division B and having limited accessibility		
3	Exterior balcony that serves a single dwelling unit		
4	Bedroom areas in Houses		
5	Floor areas other than bedrooms in Houses		
6	Stairs within a dwelling unit		

(1)Provided that the total load is not less than the sum of the dead load plus the live load of the ceiling.

(2)Whichever is greater.

8. Consider a patio deck, without a roof, to be constructed in Ottawa (City Hall). For determining the spans of the floor joists and beams and the loading on the columns, the design live load is:

   a) 1.4 kPa

   b) 1.9 kPa

   c) 1.72 kPa if the deck is more than 4.3 m wide

   d) 1.48 kPa when the deck is 4.3 m wide or less

References: _____

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CONCRETE FOR A SECTION 9.39. REINFORCED CONCRETE SLAB

Concrete for a reinforced concrete slab constructed under the authority of section 9.39. must conform to Section 9.3., "Materials, Systems and Equipment".
[Sentence 9.39.1.2.(1)]

REINFORCING STEEL FOR A SECTION 9.39. REINFORCED CONCRETE SLAB

Reinforcing steel for use in a reinforced concrete slab constructed under the authority of Section 9.39. must be Grade 400 complying to CSA G30.18, "Carbon Steel Bars for Concrete Reinforcement".
[Sentence 9.39.1.3.(1)]

DESIGN ASSUMPTIONS FOR A SECTION 9.39. REINFORCED CONCRETE SLAB

The design assumptions for a prescribed reinforced concrete slab are found in Section A 9.39.

CONSTRUCTION OF A SECTION 9.39. REINFORCED CONCRETE SLAB

The concrete must be deposited against the form work in accordance with CSA-A23.1, "Concrete Materials and Methods of Concrete Construction".
[Sentence 9.39.1.4.(1), see Subsection 1.3.1. for appropriate edition]

The slab must not be less than 125 mm thick.
[Sentence 9.39.1.4.(2)]

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EXERCISE # 3 - SECTION 9.39. PRESCRIBED REINFORCED CONCRETE SLABS FOR HOUSES

To complete this exercise you will need to consult Sections 9.39. and A-9.39. Standard procedures apply and support your answers with Code references when prompted.

1. The maximum clear span between supporting walls of a prescribed reinforced concrete slab is:
   a) 2.5 m
   b) 2.5 m along the shortest dimension of the slab
   c) 2.5 m along the longest dimension of the slab
   d) always determined in accordance with Part 4, "Structural Design"

Reference: _____

2. The reinforcing steel in a prescribed reinforced concrete slab must conform to:
   a) Grade 400 steel
   b) Grade 400 steel conforming to CSA-A23.1-04, "Concrete Materials and Methods of Concrete Construction"
   c) Grade 400 steel conforming to CSA-G30.18-M92, "Carbon Steel Bars for Concrete Reinforcement"
   d) the design under Part 4, "Structural Design"

References: _____

3. The minimum thickness of a prescribed reinforced concrete slab is:
   a) 75 mm
   b) 125 mm
   c) 200 mm
   d) 600 mm

Reference: _____

4. When the prescribed reinforced concrete slab is exposed to the weather, the clear concrete cover from the top of the upper layer of reinforcing steel and the top of the slab is not less than:
   a) 30 mm
   b) 75 mm
   c) 60 mm
   d) 60 mm plus a 12 mm placement tolerance

Reference: _____

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DWELLING UNIT WITH MORE THAN 1 BEDROOM OR SLEEPING AREA				
ROOM / SPACE	**Minimum Area**	**Div. B Code reference**	**Minimum Ceiling Height**	**Div. B Code reference**
Living Room separate or combined			(1)	
Dining Room - combined			(1)	
Dining Room - separate			(1)	
Kitchen separate or combined			(1)	
Master bedroom - separate no built in cabinets			(2)	
Master bedroom - separate built-in cabinets			(2)	
Other bedroom - separate no built in cabinets			(2)	
Other bedroom - separate built-in cabinets			(2)	
Bedroom combined			(2)	
Bathrooms and water-closet rooms must be separate				
Hallway / main entrance	minimum width only	9.5.10.1.(1)		
Laundry facilities, above grade [see 9.31.4.2.(1)]				
Laundry facilities, below grade [see 9.31.4.2.(1)]				
Basement Space				

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9. Consult Sentences 9.5.1.4.(1) to (3) and Article A-9.5.1.4. and describe the opening between combination rooms when a bedroom is involved.

References: _____

10. Despite Sentence 9.5.2.1.(2) which exempts Houses from having to comply with the provisions of Section 3.8., "Barrier-Free Design" Clauses 9.5.2.3.(1)(a) and (b) inform us that when wall studs of wood or sheet steel enclose the main bathroom in a dwelling unit, the wall framing must be reinforced to permit the future installation of grab bars on a wall adjacent to:

    - a water closet in the location required by Clause 3.8.3.8.(1)(d)

      and

    - a shower or bathtub in the location required by Clause 3.8.3.13.(1)(f) for showers and Clause 3.8.3.13.(4)(c) for bathtubs.

    The stud wall reinforcement must allow the installation of grab bars to resist a load of:

    a) at least 1.3 kN applied vertically and horizontally simultaneously

    b) at least 1.3 kN applied horizontally only

    c) at least 1.3 kN applied vertically only

    d) at least 1.3 kN applied vertically or horizontally

References: _____

11. Doorway openings within dwelling units are designed to accommodate the doors sizes for which type of doors?

    a) sliding doors

    b) swing-type and folding doors

    c) sliding up

    d) swing-type

Reference: _____

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EXTERIOR DOORS

Part 12, "Resource Conservation" applies to Houses.
[Division A, Sentence 1.1.2.1.(1)]

For a permit that is applied for before January 1, 2017 the energy efficiency provisions of a House intended for occupancy on a continuing basis during the winter months must:

- 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"
  [Sentence 12.2.1.1.(1) and Clause 12.2.1.1.(3)(a)]

  or

- conform to Chapters 1 and 2 of MMAH Supplementary Standard SB-12.
  [Sentence 12.2.1.1.(1) and Clause 12.2.1.1.(3)(b)]

In the House - 2012 course, we will not deal with the evaluation in accordance with NRCan, "EnerGuide for new Houses: Administrative and Technical Procedures". However, a House with a label indicating a rating of 80 or more demonstrates that the requirement of Clause 12.2.1.1.(3)(a) has been complied with.

All references to NRCan, "EnerGuide for New Houses: Administrative and Technical Procedures" are to the 2005 edition with all amendments, revisions and supplements effective to May 31, 2006.
[SB-12 Sentence 1.4.1.1.(2)]

As with any other Division B provision, the plans are reviewed by the Plans Examiner and the construction is verified by the Building Inspector. When a Registered Code Agency (RCA) is involved, the RCA or Persons authorized by the RCA would perform the plans examination and inspection activities.

The provisions of SB-12 will be dealt with systematically as we proceed through the remainder of this course.

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Where an exterior air barrier is penetrated by an exterior door, the air barrier system must be sealed to the door frame with:

- □ compatible flexible flashing material, [Clause 9.25.3.3.(12)(a)]

  or

- □ caulking, [Clause 9.25.3.3.(12)(b)]

  or

- □ spray foam insulation. [Clause 9.25.3.3.(12)(c)]

EXERCISE # 3 - CONTINUITY OF AIR BARRIER SYSTEM

1. True or false? Where an air barrier system is penetrated by an exterior door, such air barrier system must be sealed to maintain the integrity of the air barrier system.

   a) True

   b) False

Code reference: _____

2. When an exterior air barrier system is penetrated by an exterior door, such air barrier system could be sealed to the door frame with:

   a) caulking

   b) compatible tape

   c) flashing material that conforms to Article 9.27.3.7.

   d) air barrier material that is lapped not less than 100 mm and clamped

Code reference: _____

STOP

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METHODS OF ACHIEVING ENERGY EFFICIENCY COMPLIANCE UNDER PART 12 AND SB-12

WINDOWS AND RESOURCE CONSERVATION PROVISIONS

Part 12 regulates the mandatory and enabling energy efficiency requirements of Houses.

For a permit that is applied for before January 1, 2017 the energy efficiency provisions of a House intended for occupancy on a continuing basis during the winter months must:

- 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"
  [Sentence 12.2.1.1.(1) and Clause 12.2.1.1.(3)(a)]

  or

- conform to Chapters 1 and 2 of Supplementary Standard SB-12.
  [Sentence 12.2.1.1.(1) and Clause 12.2.1.1.(3)(b)]

Compliance with Chapters 2 and 3 of SB-12 is deemed to meet the energy efficiency requirements in accordance with Sentence 12.2.1.1.(3)
[SB-12, Sentence 1.1.1.2.(1)]

In the House - 2012 course, we will not deal with the evaluation in accordance with NRCan, "EnerGuide for new Houses: Administrative and Technical Procedures". However, a House with a label indicating a rating of 80 or more demonstrates that the requirement of Clause 12.2.1.1.(3)(a) has been complied with.

All references to NRCan, "EnerGuide for New Houses: Administrative and Technical Procedures" are to the 2005 edition with all amendments, revisions and supplements effective to May 31, 2006.
[SB-12 Sentence 1.4.1.1.(2)]

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3. If the House in Question # 2 had an electric forced-air furnace, its windows would require a thermal conductance, U-value of:

   a) not more than 2.0 W/m²·K

   b) not less than 35 as an energy rating for operable windows

   c) not more than 1.6 W/m²·K

   d) not less than 1.6 W/m²·K

SB-12 references: _____

4. The MITEC House has a natural gas forced-air furnace with a 90% annual fuel utilization efficiency. If it was constructed in Ottawa, its windows would require a thermal conductance, U-value of:

   a) not more than 1.6 W/m²·K

   b) not less than 1.6 W/m²·K

   c) not more than 25 as an energy rating for operable windows

   d) not less than 25 as an energy rating for fixed windows

SB-12 references: _____

5. If the House in Question # 4 had an electric forced-air furnace, its windows would require a thermal conductance, U-value of:

   a) not more than 2.0 W/m²·K

   b) not less than 35 as an energy rating for operable windows

   c) not more than 1.6 W/m²·K

   d) not less than 1.6 W/m²·K

SB-12 references: _____

6. The windows of the MITEC House in question # 4 (Ottawa without an HRV) could have a thermal conductance of 1.8 W/m²·K, as determined from CAN/CSA-A440.2, "Fenestration Energy Performance", when the natural gas forced-air heating system has an annual fuel utilization efficiency of:

   a) not less than 90%

   b) not more than 90%

   c) not less than 94%

   d) not more than 94%

SB-12 reference: _____

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11. Under all circumstances and anywhere in Ontario, the skylight of the MITEC House would require a thermal conductance, U-value of:

    a) not more than 2.8 W/m²·K

    b) not less than 2.6 W/m²·K

    c) not more than 17 as an energy rating for operable skylights

    d) not less than 27 as an energy rating for fixed skylights

SB-12 references: _____

STOP

CONTRIBUTION OF ENCLOSED UNHEATED SPACE

Where an **enclosed unheated space** such as a porch, verandah or vestibule is separated from a heated space by glazing, the unheated enclosure may be considered to provide thermal resistance of RSI 0.16.
[SB-12, Sentence 2.1.1.1.(15)]

AREA OF WINDOWS AND GLAZING V. GROSS AREA OF EXTERIOR WALLS

As a general rule, where the gross area of windows, sidelights, skylights, glazing in doors and sliding glass doors to the gross area of peripheral walls (the sum of the area of all exterior walls) measured from grade to the top of the upper most ceiling is not more than 17%, the House must comply with a compliance package selected from 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.
[SB-12, Sentence 2.1.1.1.(7)]

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2. The two-storey House depicted on drawing M5:2 will be constructed in Timmins. The natural gas furnace has an annual fuel utilization efficiency of 94% and the designer has selected Compliance Package D.

TIMMINS HOUSE DOOR - WINDOW SCHEDULE		
Opening number	Opening Type	Dimensions in metres
1	Sliding glass door	2 × 2
2	Window	1.75 × 1.5
3	Window	1.75 × 1.5
4	Window	3 × 1.5
5	Insulated steel door	1 × 2
6	Window	3 × 1.5
7	Window	3 × 1.5
8	Window	1 × 1
9	Window	2.5 × 1.5

a) What is the ratio of the gross area of windows (glazing) to gross area of peripheral walls?

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b) What is the required overall coefficient of heat transfer for the windows and sliding glass door for the two-storey House?

AIR INFILTRATION AND THE CONTINUITY OF THE AIR BARRIER SYSTEM AT WINDOWS

Penetration of the air barrier system by a must be sealed to maintain the integrity of the air barrier system.
[Sentence 9.25.3.3.(10)]

Where an interior air barrier is penetrated by a window or other fenestration, the air barrier system must be sealed to the window frame with:

- □ compatible tape,
  [Clause 9.25.3.3.(11)(a)]

  or

- □ spray foam insulation.
  [Clause 9.25.3.3.(11)(b)]

Where an exterior air barrier is penetrated by a window or other fenestration, the air barrier system must be sealed to the window frame with:

- □ compatible flexible flashing material,
  [Clause 9.25.3.3.(12)(a)]

  or

- □ caulking,
  [Clause 9.25.3.3.(12)(b)]

  or

- □ spray foam insulation.
  [Clause 9.25.3.3.(12)(c)]

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Stair, service in a House, means a stair that serves areas used only as service rooms or service spaces.
[Table 9.8.4.2., Note (1)]

NOTE: The House - 2012 course does not deal with live/work units.

Stair, public means a stair that is not described as a service stair or a private stair.
[Table 9.8.4.2., Note (3)]

Staircase, means a flight of steps leading from one floor or storey to another above or below. The term includes landings, newel posts, handrails and balustrades.

Stairway, Enclosed means a stairway enclosed by, and separated from, hallways and living units by means of walls or partitions and made accessible to such hallways or living units by means of a door or doors.

Stairway, Interior means a stairway within the exterior walls building.

Stairway, Open means a stairway which is not separated by walls and partitions from other areas in the building including hallways.

Stringer means the inclined structural member which supports the treads and risers of a stair.

Tread means the horizontal part of a step on which a person walks, as opposed to the run which is a measurement to frame the stair.

Winder means a step, generally triangular in plan, used at a change in direction of a stair.

STAIR, RAMPS, LANDINGS, HANDRAILS AND GUARDS IN GARAGES

Stairs, ramps, landings, handrails and guards in a garage that serves a single dwelling unit must conform to the requirements for stairs, ramps, landings, handrails and guards with a dwelling unit.
[Sentence 9.8.1.2.(1)]

STAIR DIMENSIONS

The provisions of the Code have been paraphrased. In the space provided, note any comment, question or concern which will be reviewed by the facilitator during class.

STAIR WIDTH

At least one stair between each floor level within a dwelling unit must have a width of not less than 860 mm.
[Sentence 9.8.2.1.(2)]

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and

- 10 mm between the tallest and the shortest risers in a flight.
  [Clause 9.8.4.4.(1)(b)]

As an exception to the general rule, in a stair that is not a required exit stair in a House, the top or bottom riser may adjoin a walking surface such as a garage floor, driveway or sidewalk that is sloping, provided that the height of the riser across the stair **does not vary by more than** 1 vertical unit to 12 horizontal units.
[Sentence 9.8.4.4.(2)]

As a general rule, treads must have a uniform run and tread depth in any one flight.
[Sentence 9.8.4.3.(3)]

As exceptions to the general rule, tread depth in any one flight can have a tolerance of:

- 5 mm between adjacent treads,
  [Clause 9.8.4.3.(3)(a)]

  or

- 10 mm between the deepest and the shallowest treads in a flight.
  [Clause 9.8.4.3.(3)(b)]

  and

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- the slope of treads must not exceed 1 vertical unit in 50.
  [Sentence 9.8.4.1.(5)

Where angled treads or winders are incorporated into a stair, the treads in all sets of angled treads or winders within a flight must turn in the same direction.
[Sentence 9.8.4.3.(4)]

DIMENSIONS FOR RISERS

As a general rule, the rise, run and tread depths of rectangular of rectangular treads must conform to Table 9.8.4.1.
[Sentence 9.8.4.1.(1)]

NOTE: Table 9.8.4.1.has not been reproduced. Please consult Table 9.8.4.1. and Subsection A-9.8.4. in your copy of the building code.

DIMENSIONS FOR RECTANGULAR RUNS AND TREADS

For rectangular treads:

- the run, which is measured as the horizontal nosing-to-nosing distance, and the tread depth must conform to Table 9.8.4.1.
  [Sentence 9.8.4.2.(1)

  and

- the depth of the rectangular tread cannot be less than its run nor more than its run plus (+) 25 mm.
  [Sentence 9.8.4.2.(2)]

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- where stairs or ramps having a greater width than the minimum required by the Code, are of different widths and adjoin a single landing, the width of the landing **must not be less than the width of the narrower** stair or ramp.
  [Clause 9.8.6.3.(3)(b)]

Where a door swings towards a stair, the full arc of the swing must be over the landing.
[Sentence 9.8.6.3.(4)]

The slope of landings must not exceed 1 in 50.
[Sentence 9.8.6.3.(5)]

Where a doorway or a stairway opens on the side of a ramp it shall do so on a landing, and
[Sentence 9.8.6.3.(6)]

- the landing must extend for at least 300 mm on each side of the said doorway or stairway, and
  [Sentence 9.8.6.3.(6)]
- the landing need not project beyond the doorway or stairway on a side abutting an end wall.
  [Sentence 9.8.6.3.(6)]

HEIGHT OVER LANDINGS

The clear height over landings must not be less than:

- 1 950 mm for ramps serving a single dwelling unit,
  [Clause 9.8.6.4.(1)(a)]

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As another exception to the general rule, only one handrail is required on exterior stairs having more than 3 risers when such exterior stairs serve a single dwelling unit.
[Sentence 9.8.7.1.(4)]

CONTINUITY OF HANDRAILS

As a general rule, at least one required handrail must be continuous throughout the length of the stair or ramp, including landings, except where the handrail is interrupted by:

- □ doorways,
  [Clause 9.8.7.2.(1)(a) and Article A-9.8.7.2.]

  or

- □ newel posts at changes in direction.
  [Clause 9.8.7.2.(1)(b) and Article A-9.8.7.2.]

As an exception to the general rule, for stairs and ramps serving a single dwelling unit, at least one handrail must be continuous throughout the length of the stair or ramp, except where the handrail is interrupted by:

- □ doorways,
  [Clause 9.8.7.2.(2)(a) and Article A-9.8.7.2.]

  or

- □ landings,
  [Clause 9.8.7.2.(2)(b) and Article A-9.8.7.2.]

  or

- □ newel posts at changes in direction.
  [Clause 9.8.7.2.(2)(c) and Article A-9.8.7.2.]

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and

- □ for handrails other than those serving a single dwelling units, a uniformly distributed load of 0.7 kN/m.
  [Clause 9.8.7.7.(1)(b)]

Where a handrail serving a single dwelling unit is attached to wood studs or blocking, the attachment is deemed to comply where:

- □ the attachment points are spaced not more than 1.2 m apart,
  [Clause 9.8.7.7.(2)(a) and Article A-9.8.7.7.]

  and

- □ the first attachment point at each end of the handrail is not more than 300 mm from the end of the handrail,
  [Clause 9.8.7.7.(1)(b) and Article A-9.8.7.7.]

  and

- □ the fasteners consist of no fewer than two wood screws that will penetrate not less than 32 mm into solid wood.
  [Clause 9.8.7.7.(2)(c) and Article A-9.8.7.7.]

REQUIRED GUARDS

As a general rule, every surface to which access is provided for other than maintenance purposes, including but not limited to flights of steps and ramps, exterior landings, porches, balconies, mezzanines, galleries and raised walkways, must be protected by a guard on each side that is not protected by a wall for the length of the said surface where:

- □ there is a difference in elevation of more than 600 mm between the walking surface and the adjacent surface,
  [Clause 9.8.8.1.(1)(a) and Article A-9.8.8.1., see sketches on page A-102]

  or

- □ the adjacent surface within 1.2 m from the walking surface has a slope of more than 1 vertical unit to 2 horizontal units.
  [Clause 9.8.8.1.(1)(b) and Article A-9.8.8.1., see sketches on page A-122]

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NOTE: The sketches on page A-102 illustrate the provisions for guards, not the provisions for handrails.

As an exception to the general rule, when an interior stair has more than two risers or an interior ramp rises more than 400 mm, the sides of the stair or ramp and the landing or floor level around the stairwell or ramp must be protected by a guard on each side that is not protected by a wall. [Sentence 9.8.8.1.(3)]

Doors in buildings of residential occupancy, where the finished floor on one side of the door is more than 600 mm above the floor or other surface or ground level on the other side of the door, must be protected:

- by a guard in accordance with this Subsection, [Clause 9.8.8.1.(4)(a)]

  or

- a mechanism capable of controlling the free swinging or sliding of the door so as to limit any clear unobstructed opening to not more than 100 mm. [Clause 9.8.8.1.(4)(b)]

Openable windows in buildings of residential occupancy must be protected:

- by a guard in accordance with this Subsection, [Clause 9.8.8.1.(5)(a)]

  or

- a mechanism capable of controlling the free swinging or sliding of the openable part of the window so as to limit any clear unobstructed opening to a size that will prevent the passage of a sphere having a diameter more than 100 mm. [Clause 9.8.8.1.(5)(b)]

Windows need not be protected in accordance with the above, where:

- the window serves a dwelling unit that is not located above another suite, [Clause 9.8.8.1.(6)(a)]

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or

- □ the only opening greater than 100 mm is a horizontal opening at the top of the window, [Clause 9.8.8.1.(6)(b)]

or

- □ the top surface of the window sill is located more than 480 mm above the finished floor on one side of the window, [Clause 9.8.8.1.(6)(c)]

or

- □ the window is located in a room or space with the finished floor described in Clause (c) is located less than 1800 mm above the floor or ground on the other side of the window. [Clause 9.8.8.1.(6)(d)]

Glazing installed over stairs, ramps and landings that extend to less than 1 070 mm above the surface of the treads, ramp or landing must be:

- □ protected by guards in accordance with this Subsection, [Clause 9.8.8.1.(7)(a)]

or

- □ non-openable and designed to withstand the specified lateral loads for guards as provided in Article. [Clause 9.8.8.1.(7)(b)]

In dwelling units, glazing installed over stairs, ramps and landings that extend to less than 900 mm above the surface of the treads, ramp or landing must be:

- □ protected by guards in accordance with this Subsection, [Clause 9.8.8.1.(8)(a)]

or

- □ non-openable and designed to withstand the specified lateral loads for guards as provided in Article. [Clause 9.8.8.1.(8)(b)]

Glazing installed in public areas that extends to less than 1000 mm from the floor and is located above the second storey in buildings of residential occupancy must be:

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OPENINGS IN GUARDS

In Houses, openings through a guard, required by Article 9.8.8.1., must be of a size that will prevent the passage of a spherical object having a diameter of 100 mm unless it can be shown that the location and size of openings that exceed the 100 mm limit do not represent a hazard. [Sentences 9.8.8.5.(1) and A-9.8.8.5.(1)]

In Houses, unless it can be shown that the location and size of openings through guards do not represent a hazard, openings through a guard, that is not required by Article 9.8.8.1., must be of a size that will:

- prevent the passage of a spherical object having a diameter of 100 mm, [Clause 9.8.8.5.(3)(a)]

  or

- permit the passage of a spherical object having a diameter of 200 mm. [Clause 9.8.8.5.(3)(b)]

HEIGHT OF WINDOW SILLS ABOVE FLOORS / GROUND

The primary intent of Sentence 9.8.8.1.(5) is to minimize the likelihood that, as a result of the design or construction of a building, small children will be exposed to an unacceptable risk of injury due to hazards caused by falling from openable windows.

The requirement applies only to buildings of residential occupancy and generally located on the second floor or higher of a dwelling unit that is located above another suite of any occupancy where the windows are essentially free-swinging or free-sliding.

Free swinging or free-sliding means that once a window that has been cracked open it can be opened further by simply pushing on it.

The 100 mm opening limit is consistent with openings in guards provisions under Article 9.8.8.5. The 480 mm height off the floor recognizes that furniture is often placed under windows and small children are often good climbers. Let's paraphrase the provisions of Article 9.7.1.6.

As a general rule, openable windows in buildings of residential occupancy must be protected by:

- a guard conforming to Subsection 9.8.8.
  - 9.8.8.2., "Loads on Guards",

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- 9.8.8.3., "Height of Guards",
- 9.8.8.5., "Openings in Guards",
- 9.8.8.6., "Design to Prevent Climbing", and
- 9.8.8.7., "Glass in Guards",
  [Clause 9.8.8.1.(5)(a)]

or

□ a mechanism capable of controlling the free swinging or sliding of the openable part of the window so as to limit any clear unobstructed opening to not more than 100 mm measured either vertically or horizontally.
[Clause 9.8.8.1.(5)(b)]

As an exception to the general rule, openable windows serving Houses **need not** be protected by a guard or a mechanism controlling the size of the opening when:

□ a dwelling unit is not located above another dwelling unit in the House,
[Clause 9.8.8.1.(6)(a)]

As further exceptions to the general rule, when a dwelling unit is located above another dwelling unit in a House, an openable window in either dwelling unit **need not** be protected by a guard or a mechanism controlling the size of the opening where:

□ the only opening greater than 100 mm is a horizontal opening at the top of the window,
[Clause 9.8.8.1.(6)(b)]

or

□ the top surface of the sill of the openable window is located more than 480 mm above the finished floor on one side of the openable window,
[Clause 9.8.8.1.(6)(c)]

or

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- □ the difference in elevation between the finished floor in the room or space with the openable window and a floor or the ground on the other side of the openable window is less than 1 800 mm.
  [Clause 9.8.8.1.(6)(d)]

DESIGN TO PREVENT THE CLIMBING OF A GUARD

Unless it can be shown that the location and size of openings through guards do not represent a hazard, guards required by Article 9.8.8.1., must be designed so that no member, attachment or opening will facilitate climbing.
[Sentence 9.8.8.6.(1)]

GLASS IN GUARDS

Glass in guards must be:

- □ safety glass of the laminated or tempered type conforming to CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass",
  [Clause 9.8.8.7.(1)(a)]

  or

- □ wired glass conforming to CAN/CGSB-12.11-M, "Wired Safety Glass".
  [Clause 9.8.8.7.(1)(b)]

EXERCISE # 1 - MINIMUM DIMENSIONS OF THE COMPONENT PARTS OF STAIRS AND CLEARANCES IN STAIRCASE

1. Examine Drawings M6:1 INTERIOR STAIR DETAIL and M6:2 HANDRAIL STAIR DETAIL and complete the Table by writing in the required dimension and the corresponding Code reference. In addition to what you already reviewed, you will need to Consult Subsection 9.8.9., "Construction".

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EXERCISE # 5 - OPENINGS IN GUARDS AND DESIGN TO PREVENT CLIMBING OF GUARDS FOR HOUSES

The sizes of openings in guards are regulated under Article 9.8.8.5. In dealing with the questions that follow, standard procedures apply. Consult the Appendix notes A-9.8.8.5.(1), (2) and (3).

1. In the MITEC House, the openings through the required guard, serving the stairwell opening at the second floor, must be of a size which will prevent the passage of a spherical object having a diameter of:

   a) less than 100 mm

   b) 100 mm

   c) more than 100 mm

   d) any size if it can be shown that the location and size of the openings do not represent a hazard

Reference: _____

2. Consider a dwelling unit where a guard is installed while it is not required by Article 9.8.8.1. The openings through the said guard, which is not required by Article 9.8.8.1., must be of a size that will:

   a) prevent the passage of a spherical object having a diameter of 100 mm

   b) permit the passage of a spherical object having a diameter of 200 mm

   c) prevent the passage of a spherical object having a diameter of 100 mm and permit the passage of a spherical object having a diameter of 200 mm

   d) prevent the passage of a spherical object having a diameter of 100 mm or permit the passage of a spherical object having a diameter of 200 mm

Reference: _____

3. In the MITEC House, the openings through the required guard serving the stairwell opening at the second floor are of a size that will prevent the passage of a spherical object having a diameter of 100 mm. In the situation at hand, the infill pickets are dowelled into the top and bottom rail as shown detail IC-2 of SB-7. In your own words explain why such an arrangement satisfies the requirements of Sentence 9.8.8.6.(1).

_____

_____

_____

_____

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and

- □ slip-resistant,
  [Clause 9.8.9.6.(1)(b)]

  and

- □ smooth, even, and free from open defects.
  [Clause 9.8.9.6.(1)(c)]

As an exception to the general rule, treads and landings of interior and exterior stairs and ramps, other than those within dwelling units, must:

- □ have a slip-resistant finish,
  [Sentence 9.8.9.6.(5)]

  or

- □ be provided with slip-resistant strips that extend not more than 1 mm above the tread surface.
  [Sentence 9.8.9.6.(5)]

The finish for ramps, treads and landings of interior stairs in dwelling units, including those from an attached garage serving a single dwelling unit, are deemed to comply with the provisions of Sentence 9.8.9.6.(1) when such treads, landings or ramps are finished with:

- □ hardwood,
  [Clause 9.8.9.6.(2)(a)]

  or

- □ vertical grain softwood,
  [Clause 9.8.9.6.(2)(b)]

  or

- □ resilient flooring,
  [Clause 9.8.9.6.(2)(c)]

  or

- □ low-pile carpet,
  [Clause 9.8.9.6.(2)(d)]

  or

- □ mat finish ceramic tile,
  [Clause 9.8.9.6.(2)(e)]

  or

- □ concrete,
  [Clause 9.8.9.6.(2)(f)]

  or

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or

□ an exterior ramp, [Clause 9.9.2.1.(1)(c)]

or

□ an exterior stairway, [Clause 9.9.2.1.(1)(d)]

or

□ an interior passageway, [Clause 9.9.2.1.(1)(g)]

or

□ an interior ramp, [Clause 9.9.2.1.(1)(h)]

or

□ an interior stairway. [Clause 9.9.2.1.(1)(i)]

PURPOSE OF EXIT IN A HOUSE WITH TWO DWELLING UNITS

5. An exit from a House with two dwelling units is designed for no purpose other than exiting but may also serve as an access.
[Sentence 9.9.2.2.(1)]

WINDOWS AS A MEANS OF EGRESS IN A HOUSE WITH TWO DWELLING UNITS

NOTE: Despite Sentence 9.9.2.3.(1), see Article 9.9.10.1. and Sentence 9.9.9.1.(2).

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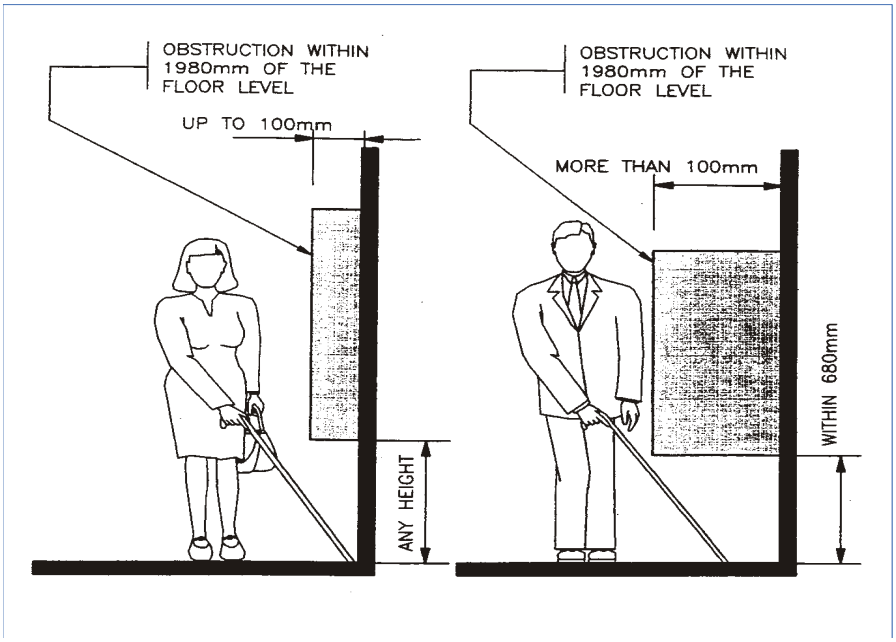
OBSTRUCTIONS IN A PUBLIC CORRIDOR OR SHARED EXIT PASSAGEWAY IN A HOUSE WITH TWO DWELLING UNITS

21. As a general rule, in a House with two dwelling units, obstructions located 1 980 mm or less above the floor must not project horizontally more than 100 mm into a public corridor or shared exit passageway in a manner that would create a hazard for persons with low or no vision travelling adjacent to walls.
[Sentence 9.9.5.3.(1)]

    a) As an exception to the general rule, the horizontal projection is permitted to exceed 100 mm where the horizontal projection extends to less than 680 mm above the floor.
    [Sentence 9.9.5.3.(2)]

    b) The requirements of Article 9.9.5.3., "Obstructions in Public Corridors and shared exit passageways are illustrated in Drawing M7:3 on the next page.



M7:3 - CONTROL OF OBSTRUCTIONS FOR PERSONS WITH NO OR LOW VISION IN PUBLIC CORRIDORS AND SHARED EXIT PASSAGEWAYS, ARTICLE 9.9.5.3.

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- □ 7 m above adjacent ground level.
  [Subclause 9.9.9.1.(2)(b)(ii)]

39.(c) As a second exception to the general rule, within a dwelling unit the travel limit from a floor level to an egress or exit door is permitted to exceed 1 storey provided that the floor level which is more than 1 storey removed from the said egress door (to a public corridor, enclosed exit stair or exterior passageway) or exit door (that is not more than 1 500 mm above adjacent ground level) has direct access to a balcony.
[Sentence 9.9.9.1.(3)]

TWO SEPARATE EXITS FOR A DWELLING UNIT IN A HOUSE WITH TWO DWELLING UNITS

40. Not including when a dead-end public corridor conforming to the provisions of Article 9.9.7.3. is provided, in a House with two dwelling units, where an egress door from a dwelling unit opens onto a public corridor or a shared exterior passageway it must be possible to go in opposite directions to two separate exits from the said egress door.
[Sentence 9.9.9.2.(1)]

40.(a) As one exception to the general rule, where an egress door from a dwelling unit opens onto a public corridor or a shared exterior passageway it is not necessary to be able to go in opposite directions to two separate exits from the said egress door when the dwelling unit has a second and separate means of egress.
[Sentence 9.9.9.2.(1)]

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SIGNAGE IN A HOUSE WITH TWO DWELLING UNITS

43. In a House with two dwelling units, the requirements of Subsection 9.9.11., "Signs" apply to a shared exit facility.
[Sentence 9.9.11.1.(1)]

A SHARED EXIT IN A HOUSE WITH TWO DWELLING UNITS

43.(a) In a House with two dwelling units an exit, in a shared means of egress, must be clearly visible **and if** it is not clearly visible, its location must be clearly indicated.
[Sentence 9.9.11.2.(1)]

43.(b) In a House with two dwelling units, a shared exit door must have an exit sign over or adjacent to it, when such shared exit door serves a:

- three storey building,
[Clause 9.9.11.3.(1)(a)]

or

- room or floor area that has a fire escape as part of a required means of egress.
[Clause 9.9.11.3.(1)(c)]

NOTE: Clause 9.9.11.3.(1)(a) does not talk about a building that is three storeys in building height so the provisions of the Clause would apply to a two storey House with a basement. Compare to Sentence 9.9.11.4.(1) that applies to buildings 3 storeys in building height.

43.(c) Every exit sign must be visible on approach to the exit and:

- when externally illuminated consist of a green prictogram and a white or lightly tinted graphic symbol meeting the colour specifications referred to in ISO 3864-1 "Graphical Symbols - Safety Colours and Safety Signs - Part 1 Design Principals for Safety Signs and Safety Markings".
[Clauses 9.9.11.3.(2)(a)and(b)]

and

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- □ conform to the dimensions indicated in ISO 7010, "Graphical Symbols - Safety Colours and Safety Signs - Safety Signs in Workplaces and Public Areas", for the following symbols
  - E001 emergency exit left,
  - E002 emergency exit right,
  - E005 90-degree directional arrow, and
  - E006 45-degree directional arrow
    [Clause 9.9.11.3.(2)(c)]

  and

- □ externally illuminated exit signs shall be illuminated at all times by a light fixture supplied by an electrical circuit.
  [Sentence 9.9.11.3.(4)]

43.(d) Every exit sign conforming to Clauses 9.9.11.3.(2)(b) and (c) with an arrow or other indicator pointing at the direction of egress shall be provided where no exit is visible from,

- □ a public corridor,
  [Clause 9.9.11.3.(6)(a)]

  or

- □ a corridor used by the public,
  [Clause 9.9.11.3.(6)(b)]

  or

- □ a principal route serving an open floor area having an occupant load of more than 150.
  [Clause 9.9.11.3.(6)(c)]

43.(e) Externally illuminated exit signs shall be illuminated at all times by a light fixture supplied by an electrical circuit. [Sentence 9.9.11.3.(4)]

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43.(f) Internally illuminated exit signs shall be continuously illuminated and,

- □ where illumination of the sign is powered by an electrical circuit, be constructed in conformance with CSA 22.2 No. 141, "Emergency Lighting Equipment", [Clause 9.9.11.3.(3)(a)]

or

- □ where illumination of the sign is not powered by an electrical circuit, be constructed in conformance with CAN/ULC-S572, "Photoluminescent and Self-Luminous Signs and Path Marking Systems", [Subclause 9.9.11.3.(3)(b)(i)]

and

- □ shall be labeled in accordance with the time duration for which they have been tested and listed. [Subclause 9.9.11.3.(3)(b)(ii)]

43.(g) The circuitry serving lighting for externally and internally illuminated exit signs shall,

- □ serve no equipment other than emergency lighting in the area where the exit signs are installed, [Clause 9.9.11.3.(5)(a)]

and

- □ be connected to an emergency power supply as described in Sentences 9.9.12.3.(2),(3) and (7). [Clause 9.9.11.3.(5)(b)]

SIGNS FOR STAIRS AND RAMPS AT EXIT LEVEL

44. In buildings that are 3 storeys in building height, any part of an exit ramp or stairway that continues up or down past the lowest exit level shall be clearly marked to indicate that it does not lead to an exit where the portion below the exit level may be mistaken as the direction of exit travel. [Sentence 9.9.11.4.(1)]

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47.(a) In a House with two dwelling units, the minimum value of the illumination required by Sentence 9.9.12.2.(2) shall be not less than 10 lx.

EMERGENCY LIGHTING IN A SHARED EGRESS FACILITY IN A HOUSE WITH TWO DWELLING UNITS

48. In a House with two dwelling units, emergency lighting must be provided in:

- □ shared exits,
  [Clause 9.9.12.3.(1)(a)]

and

- □ shared underground walkways,
  [Clause 9.9.12.3.(1)(d)]

and

- □ public corridors.
  [Clause 9.9.12.3.(1)(e)]

48.(a) In a House with two dwelling units, required emergency lighting must be powered by an emergency power supply (e.g., batteries, generators, power inverters etc.) that is separate from the electrical supply provided for the building.
[Sentence 9.9.12.3.(2)]

48.(b) In a House with two dwelling units, required emergency lighting must be designed:

- □ to power up automatically when the regular electric lighting in the affected area is interrupted,

and

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- □ cannot be tested in accordance with CAN/ULC-S102 without the use of supporting material that is not representative of the intended installation, [Clause 3.1.12.1.(2)(b)]

  or

- □ is thermoplastic.

[Clause 3.1.12.1.(2)(c)]

or

- □ Supplementary Standard SB-2 "Fire Performance Ratings" [Sentence 9.10.3.2.(1)]

b) In Part 9, unless the flame-spread rating is referred to as a "surface *flame-spread rating*", the rating applies to any surface of the element being considered that would be exposed by cutting through the element [cross-sectional flame-spread rating] as well as the exposed surface of the element [surface flame-spread rating]. [Sentence 9.10.3.2.(2)]

NOTE: The surface burning characteristics of building materials and assemblies are flame-spread rating and smoke developed classification. Take note that Part 9 of the Code DOES NOT regulate the Smoke Developed Classification of materials and assemblies of Houses.

Listed Flame-Spread Ratings can be found in a ULC publication called "List of Equipment and Materials - Building Materials". In this course, we will not deal with the ULC publication. On your own, you may obtain the document from Underwriters' Laboratories of Canada and consult Guide Number 40 U8, "Classification of Materials as to Surface Burning Characteristics.

Underwriters Laboratories Inc. and Intertek, the latter making use of the Warnock Hersey trademark, are also accredited by the Standards Council of Canada to list the Flame-Spread Rating of materials and assemblies of materials for use in the construction of buildings in Ontario.

In this Module, you will determine the maximum allowable flame-spread rating of interior surfaces in Houses and the generic flame-spread rating of common building materials. We will not deal with listed flame-spread rating of materials and assemblies of materials.

Supplementary Standard SB-2, in Section 3, assigns flame-spread ratings for surface materials related to CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and

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Assemblies" and CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies".

11. FIRE EXPOSURE TO DETERMINE THE FIRE RESISTANCE RATING OF ASSEMBLIES

a) Where a floor or a ceiling assembly requires a fire-resistance rating such assemblies are to be rated for exposure to fire on the underside.
[Sentence 9.10.3.3.(1)]

b) Where the exterior wall requires a fire-resistance rating such assemblies are to be rated for exposure to fire from inside the building.
[Sentence 9.10.3.3.(2)]

c) All firewalls and interior vertical fire separations which are required to have a fire-resistance rating [e.g., walls between dwelling units in a semi-detached, townhouse or row house party walls between two dwelling units or walls between dwelling units and a shared means of egress in a House with two dwelling units] must be rated for exposure to fire on each side.
[Sentence 9.10.3.3.(3)]

d) If a suspended ceiling construction has lay-in tiles that contribute to the fire-resistance rating of the overall assembly, those tiles must be provided with hold-down clips or other methods to prevent them from lifting in the event of a fire.
[Sentence 9.10.3.4.(1)]

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b) In Houses, mezzanines (open) ARE COUNTED as storeys in calculating building height if the aggregate (total) area of all the mezzanine floors (open with no visual obstruction that are more than 1 070 mm above their floors) is more than 40% of the area of the room or the storey in which they are located.
[Sentence 9.10.4.1.(2)]

c) In Houses, if there is more than one level of mezzanine within a storey, each level mezzanine floor additional to the first must be counted as a storey contributing to building height.
[Sentence 9.10.4.2.(1)]

15. ROOF-TOP ENCLOSURES NOT CONSIDERED AS STOREYS

In Houses, roof-top enclosures for elevator machinery, stairways and service rooms are NOT counted as storeys in calculating building height provided that the said roof-top enclosure is not used for any purpose other than for service to the building.
[Sentence 9.10.4.4.(1)]

EXERCISE # 2 - DETERMINATION OF RATINGS AND BUILDING SIZE FOR HOUSES

This exercise is based on Subsections 9.10.3., "Ratings" and 9.10.4., "Building Size Determination". When requested, provide code references. Established procedures apply.

1. The referenced standard for the determination of a listed flame-spread rating for structural lumber of Houses is:
   a) CAN/ULC-S102-M
   b) CAN/ULC-S102.2
   c) CAN/ULC-S102
   d) ULC-S102.3-M

References: _____

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References: _____

3. Consider the storage garage of the MITEC HOUSE it is detached from the dwelling unit it serves but attached to another storage garage on the adjacent property, the party wall between each section of the storage garage must be constructed as a fire separation with a fire-resistance of not less than:

   a) 30 minutes

   b) 45 minutes

   c) 1 hour

   d) 2 hours and constructed as a firewall

Reference: _____

STOP

PREVENTION OF FIRE SPREAD AT EXTERIOR WALS AND BETWEEN STOREYS OF HOUSES

The requirements of Subsection 9.10.12., "Prevention of Fire Spread at Exterior Walls and Between Storeys" have been paraphrased. In the space provided note any comment, question or concern.

43. LOCATION OF SKYLIGHTS I HOUSES WITH TWO DWELLING UNITS

Where the wall of a dwelling unit is exposed to a fire hazard from the roof of the other dwelling unit that is not sprinklered, the roof must not contain skylights within 5 m, measured horizontally, from the windows in the exposed wall.

_____

_____

_____

44. OPENING IN EXTERIOR WALL OF ONE DWELLING UNIT IN PROXIMITY OF OPENING IN OTHER DWELLING UNIT

a) Openings in exterior walls of one dwelling unit, other than openings in exterior walls of exits that are regulated by Article 9.9.4.5., must not be less than 1.2 m from openings in the exterior walls of the other dwelling unit where the exterior walls of the House intersect at an angle of less than 135°
[Sentence 9.10.12.3.(1)]

_____

_____

_____

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the area of generic wired glass that is not structurally supported by mullions does not exceed 7.5 m^2.
[Sentence 9.10.13.5.(3)]

50. STEEL DOOR FRAMES IN A CLOSURE

Where a steel door frame is used as part of a closure in a fire separation, such steel frame and its anchorage system must comply with CAN/ULC-S105, "Fire Door Frames Meeting the Performance Required by CAN/ULC-S104."
[Sentence 9.10.13.6.(1) see Subsection 1.3.1.]

51. GENERIC GLASS BLOCK AS A CLOSURE

Glass block which has not been tested in accordance with CAN4-S106-M, "Fire Tests of Window and Glass Block Assemblies", is permitted to be used as a closure in a fire separation required to have a fire-resistance rating of not more than 1 hour.
[Sentence 9.10.13.7.(1)]

52. MAXIMUM SIZE OF OPENINGS IN INTERIOR FIRE SEPARATIONS

Regardless of the fact that an opening in a fire separation is protected with a closure with the required fire-protection rating, the maximum size of an opening in an interior fire separation must not exceed:

- □ 11 m^2 in area with no dimension greater than 3.7 m if a fire compartment on either side of the fire separation is not sprinklered,
  [Sentence 9.10.13.8.(1)],

or

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60. UO IN EBF UNDER SUBSECTION 9.10.14.

a) As a general rule, the maximum aggregate area of UO in an EBF must:

□ conform to Table 9.10.14.4., "Maximum Aggregate Area of Unprotected Openings in Exterior Walls",
[Clause 9.10.14.4.(1)(a)]

or

□ conform to Subsection 3.2.3., "Spatial Separation and Exposure Protection",
[Clause 9.10.14.4.(1)(b)]

or

□ where the limiting distance is less than 1.2 m, be equal to or less than LD^2.
[Subclause 9.10.14.4.(1)(c)(i)]

b) As exceptions to the general rule:

i) when the LD is 1.2 m or more, the maximum aggregate area of UO calculated under Sentence 9.10.14.4.(1) may be doubled [increased by up to twice the area initially calculated] where the said unprotected openings are glazed with:

□ wired glass in fixed steel frames complying with Article 9.10.13.5.
[Clause 9.10.14.4.(3)(a)]

or

□ glass blocks complying with Article 9.10.13.7.
[Clause 9.10.14.4.(3)(b)]

ii) when the LD is 1.2 m or more, the maximum aggregate area of UO calculated under Sentence 9.10.14.4.(1) may be doubled [increased by up to twice the area initially calculated] provided that **all rooms**, including closets and bathrooms that could otherwise be exempt from sprinklers under the sprinkler standards referenced in Article 3.2.5.13., **that are adjacent to the EBF** and **have UO**, are sprinklered
[Sentence 9.10.14.4.(4)]

iii) the maximum aggregate area of UO in an EBF of a storage garage need not be calculated under Sentence 9.10.14.4.(1) where:

□ all storeys of the storage garage are constructed as open-air storeys,
[Clause 9.10.14.4.(5)(a)]

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9. When the minimum required LD is doubled under the provisions of Sentence 9.10.14.3.(1), the aggregate area of UO:

   a) cannot be increased from what was originally calculated under Sentence 9.10.14.4.(1) and Table 9.10.14.4.

   b) can be increased provided the LD is not irregular or skewed

   c) the LD need not be doubled when the UO are glazed with wired glass in fixed steel frames conforming to Article 9.10.13.5. or glass block conforming to Article 9.10.13.7.

   d) the building must be sprinklered

STOP

63. SPATIAL SEPARATIONS BETWEEN HOUSES UNDER SUBSECTION 9.10.15.

The provisions of Subsection 9.10.15., "Spatial Separations Between Houses", apply to Houses where:

- □ a dwelling unit is not located above another dwelling unit,
  [Clause 9.10.15.1.(1)(a)]

  and

- □ the spatial separation is not designed under Subsection 9.10.14.
  [Clause 9.10.15.1.(1)(b)]

64. AREA AND LOCATION OF EBF UNDER 9.10.15.

a) The area of an EBF must be:

   - □ taken as the exterior wall area facing one direction on any side of a building,
     [Clause 9.10.15.2.(1)(a)]

     and calculated as

   - □ the total area measured from the finished ground level to the uppermost ceiling,
     [Subclause 9.10.15.2.(1)(b)(i)]

     or

   - □ the area of each fire compartment where the building is divided into fire compartments by fire separations with a fire-resistance rating not less than 45 minutes,
     [Suclause 9.10.15.2.(1)(b)(ii)]

     or

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or

b) an opening of not more than 130 cm^2 in an EBF is not considered as an UO.
[Sentence 9.10.15.3.(1) → 9.10.15.4.(5)]

or

c) exposed heavy timber and steel columns in an EBF need not comply with Sentence 9.10.15.5.(1) when the LD is not less than 6 m [doubled from 3 m].
[Sentence 9.10.15.3.(1) → 9.10.15.5.(6)]

66. GLAZED OPENINGS IN EBF UNDER 9.10.15.

a) As a general rule, the maximum area of GO in an EBF must:

- conform to Table 9.10.15.4., "Maximum Area of Glazed Openings in Exterior Walls of Buildings Containing Only Dwelling Units",
[Clause 9.10.15.4.(1)(a)]

or

- conform to Subsection 3.2.3., as if the glazed openings were unprotected openings,
[Clause 9.10.15.4.(1)(b)]

or

- where the limiting distance is not less than 1.2m, be equal to or less than LD^2.
[Clause 9.10.15.4.(1)(c)]

b) As an exceptions to the general rule:

i) □ the limits on area of GO do not apply to an EBF of a dwelling unit facing a detached garage or detached accessory building provided that:

- the detached garage or detached accessory building serves only one dwelling unit,
[Clause 9.10.15.4.(3)(a)]

and

- the detached garage or detached accessory building is located on the same property as the dwelling unit it serves,
[Clause 9.10.15.4.(3)(b)]

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10. Consider staggered townhouse units where the limiting distance is 0. The Designer wants to make use of vinyl siding. In your own words, describe the installation.

    When vinyl siding is used as cladding in the EBF of a house with a limiting distance of less than 600 mm, the requirements of Clause 9.10.15.5.(2)(c) for noncombustible cladding may be satisfied with the installation of vinyl siding:

References: _____

STOP

68. FIRE BLOCKS

Fire blocks are elements of building assemblies that are installed at strategic locations to resist the passage of flames from one concealed space to another. While the term is not defined it is associated with the principle of compartmentation to prevent fire spread.

Thus, we can conclude that a fire block is:

> draft-tight barrier within or between construction assemblies that acts to retard the passage of smoke and flame.

Another purpose of fire blocks is to limit the size of concealed spaces such as stud cavities, crawl spaces, attic and ceiling spaces and spaces between the framing and the exterior building envelope by creating draft-tight compartments.

A review of Article 9.10.16.1. reveals that the requirement of a fire stop can be associated with the flame-spread rating of the exposed construction material within the concealed space. Before we deal with the determination of flame-spread rating, you should know that Table 3.1.1.A. of SB-2 indicates that lumber and most panel type boards have a generic flame-spread rating of 150.

The requirements of Subsection 9.10.16., "Fire Blocks" have been paraphrased. In the space provided note any comment, question or concern.

69. REQUIRED FIRE BLOCKS IN CONCEALED SPACES

a) Concealed spaces in interior walls must be separated by fire blocks from concealed spaces in:

   - □ exterior walls,

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and

- extends from below the bottom of the top plates in the lower storey to above the top of the bottom plate in the upper storey,
  [Clause 9.10.16.3.(3)(c)]

and

- completely fills the nominal gap of 25 mm between the headers and between the wall plates.
  [Clause 9.10.16.3.(3)(d)]

72. PENETRATION OF FIRE BLOCKS

Where fire blocks are pierced by pipes, ducts or other elements, the effectiveness of the fire stops must be maintained around such elements.
[Sentence 9.10.16.4.(1)]

EXERCISE # 10 - FIRE BLOCKS FOR HOUSES

Consult Subsection 9.10.16., "Fire Blocks". Standard procedures apply. As always, provide references when prompted.

1. Make a list of fire block materials that can be used in the construction of Houses.

Required fire stops in Houses of combustible construction must be constructed of not less than:

a)

b)

c)

d)

e)

References: _____

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2. Sentence 9.10.16.4.(1) of Division B informs us that where fire blocks are pierced by pipes, ducts or other elements, the effectiveness of the fire stops are to be maintained around such elements. In your opinion, how is the integrity of the fire stop maintained around such elements in Houses of combustible construction?

   Where fire blocks are pierced by pipes, ducts or other elements in Houses of combustible construction, the effectiveness of the fire stop shall be maintained around such elements by:

STOP

73. FLAME SPREAD LIMITS

THE NATURE OF FLAME-SPREAD RATING

During a fire, flames will spread along the exposed surfaces of different construction materials and interior finishes at different rates.

A flame-spread rating is determined by laboratory tests that calculate the rate at which flame travels along the test specimen, or the maximum distance that a controlled flame travels in a given period of time. The rating system is complex. Essentially, the results of the test compare the rate of flame travel along the surface of the material being tested against two standard materials which were both assigned an arbitrary benchmark flame-spread rating.

- untreated red oak is rated at 100

  and

- asbestos cement board is rated at 0

According to Clause 1.4.1.2.(1)(c) of Division A, flame-spread rating is:

an index or classification indicating the extent of the spread of flame on the surface of a material or an assembly of materials as determined in a standard fir test as described in the Code.

Flame-spread rating is used to control the use of construction materials as interior finishes. In the next exercise we will determine the permitted flame-spread limits of interior surfaces of Houses and the use of Supplementary Standard SB-2, "Fire Performance Ratings" to verify the generic flame-spread rating of common construction materials.

To obtain information about listed flame-spread rating of construction materials, consult ULC's List of Equipment and Materials, Building Materials under Guide 40 U8, "Classification of Materials as to Surface Burning Characteristics".

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Underwriters Laboratories Inc. and Intertek, the latter making use of the Warnock Hersey trademark, are also accredited by the Standards Council of Canada to list the flame-spread rating of materials, assemblies of materials and structural members for use in the construction of buildings in Ontario.

74. FLAME-SPREAD RATING OF INTERIOR SURFACES OF HOUSES

The requirements of Subsection 9.10.17., "Flame Spread Limits" have been paraphrased. In the space provided note any comment, question or concern.

a) As a general rule, the exposed surface of every interior wall and ceiling of a House, including skylights and glazing must have a flame-spread rating (FSR) of not more than 150.
[Sentence 9.10.17.1.(1)]

b) As exceptions to the general rule:

i) □ doors in Houses must have a FSR of not more than 200,
[Sentence 9.10.17.1.(2)]

ii) □ doors within dwelling units, other than vehicle garage doors, do not require a flame-spread rating,
[Sentence 9.10.17.1.(3)]

iii) □ vehicle (storage) garage door must have a surface FSR of not more than 200
[Sentence 9.10.17.1.(3) → 9.10.17.1.(2)]

and when they are factory-assembled and incorporate foamed plastic insulation

□ the foamed plastic insulation may have a cross-sectional FSR of not more than 500,
[Sentence 9.10.17.10.(2)]

and

□ the foamed plastic insulation must be covered on the interior with a metallic foil,
[Clause 9.10.17.10.(2)(a)]

□ the assembly (vehicle garage door) has a surface FSR of not more than 200,
[Clause 9.10.17.10.(2)(b)]

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7. Consider the installation of a factory-assembled door, that incorporates foamed plastic insulation, in the storage garage of a House; and, summarize the requirements of the Code for such a door.

   A factory-assembled door that incorporates foamed plastic insulation, when installed in the storage garage of a House, must possess the following characteristics:

References: _____

STOP

85. REQUIRED SMOKE ALARMS

The requirements of Subsection 9.10.19., "Smoke Alarms" have been paraphrased. In the space provided note any comment, question or concern.

a) A smoke alarm is a combined:

   - □ smoke detector and audible alarm device,

     that is designed

     - □ to sound an alarm within the dwelling unit in which it is located upon the detection of smoke within that dwelling unit.
       [Div. A, Clause 1.4.1.2.(1)(c)]

i) Smoke alarms conforming CAN/ULC-S531, "Smoke Alarms", must be installed in every dwelling unit.
[Sentence 9.10.19.1.(1), see Subsection 1.3.1.]

ii) Smoke alarms shall have a visual signaling component conforming to the requirements in 18.5.3.(Light, Color and Pulse Characteristics) of NFPA 72, "National Fire Alarm and Signaling Code".
[Sentence 9.10.19.1.(2)]

and

iii) The visual signaling component need not be integrated with the smoke alarm provided it is interconnected to it, be on battery backup, or have synchronized flash rates when installed in a dwelling unit.
[Sentence 9.10.19.1.(3)]

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iv) The luminous intensity of the visual signaling component installed in a sleeping room shall be minimum of 175 cd.
[Sentence 9.10.19.1.(4)]

86. SOUND PATTERNS OF SMOKE ALARMS

a) The sound patterns of smoke alarms must:

- □ meet the temporal patterns of alarm signals,
[Clause 9.10.19.2.(1)(a)]

or

- □ be a combination of temporal pattern and voice relay.[Clause 9.10.19.2.(1)(b)]

87. LOCATION OF SMOKE ALARMS

a) Within dwelling units, sufficient smoke alarms must be installed:
[Sentence 9.10.19.3.(1)]

- □ there is one on each storey, including basements
[Clause 9.10.19.3.(1)(a)]

and:

- □ on any storey of a dwelling unit containing sleeping rooms, a smoke alarm is installed,
[Clause 9.10.19.3.(1)(b)]
- □ in each sleeping room,
[Subclause 9.10.19.3.(1)(b)(i)]

and

- □ in a location between the sleeping rooms and the remainder of the storey, and if the sleeping rooms are served by a hallway, the smoke alarm must be located in the hallway.
[Subclause 9.10.19.3.(1)(b)(ii)]

b) A smoke alarm must be installed in conformance with CAN/ULC-S553, "Installation of Smoke Alarms".
[Sentence 9.10.19.3.(2)]

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91. SILENCING OF SMOKE ALARM'S ALARM SIGNAL

A manually operated device is permitted to be incorporated within the circuitry of a smoke alarm installed in a dwelling unit so that it will silence the signal emitted by the smoke alarm for a period of not more than 10 minutes, after which the smoke alarm will reset and again sound the alarm if the level of smoke in the vicinity is sufficient to reactuate the smoke alarm.
[Sentence 9.10.19.6.(1)]

EXERCISE # 13 - INSTALLATION OF SMOKE ALARMS IN DWELLING UNITS

Consult Subsection 9.10.19., "Smoke Alarms", follow the established procedure and deal with the questions that follow.

1. Consider Clause Article 9.10.19.3. Within the MITEC House there must be at least:
   a) 1 smoke alarm
   b) 5 smoke alarms
   c) 6 smoke alarms
   d) 3 smoke alarms

Reference: _____

2. Explain the rational for your choice of answer in question 1.

References: _____

3. Under which circumstance would the Code require a smoke alarm to be installed inside the bedrooms on the second floor level of the MITEC House?

Reference:

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4. When a smoke alarm is located outside a bedroom, the smoke alarm on such bedroom floor level must be within:
   a) 900 mm of the bedroom door measured following corridors and doorways
   b) in a location between the sleeping room and the remainder of the storey
   c) 15 m of the bedroom door measured following corridors and doorways
   d) in a dwelling unit the smoke alarm is not permitted to be located outside a bedroom.

Reference: _____

5. A required smoke alarm in a dwelling unit must be installed:
   a) at or near the ceiling
   b) at or near the ceiling and in accordance with the manufacturer's instructions
   c) in accordance with UL 2034,
   d) on any floor level provided it is audible within the bedrooms when the intervening doors are closed.

References: _____

6. As a general rule, Sentence 9.10.19.4.(1) requires smoke alarms in dwelling units to be installed by permanent connections to an electrical circuit and disconnect switches are not permitted between the overcurrent circuit device and the smoke alarm. Under which circumstances can smoke alarms in Houses be battery operated?

_____

_____

_____

_____

References: _____

7. Consider the MITEC House in Question № 1. Describe the interconnection requirement for each of the six required smoke alarms.

_____

_____

_____

_____

_____

Reference: _____

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b) Contribution of light steel frame

SB-2 reference: _____

c) Contribution of insulation

Rock fibre insulation in steel stud wall =

SB-2 reference: _____

d) Fire-resistance rating of assembly =

STOP

108. CONSIDERATIONS FOR VARIOUS TYPES OF ASSEMBLIES UNDER SB-2

Subsections 2.3.5. to 2.3.14. of SB-2 provide guidance on using the generic method to determine the fire-resistance rating of wood and steel framed wall, floor and roof assemblies. The guidance provided is summarized in the Table on page 114. In the space provided, note ay comment, concern or question.

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7. EXCAVATION TO UNDISTURBED SOIL

Excavation for foundations must extend to undisturbed soil.
[Sentence 9.12.2.1.(1)]

To be confirmed at the □ footing inspection, □ backfill inspection

8. MINIMUM DEPTH OF FOUNDATIONS - THE GENERAL RULE

a) As a general rule, for the construction of a House including exterior concrete steps with more than 2 risers, the minimum depth of foundations below finished ground level must conform to Table 9.12.2.2.
[Sentences 9.12.2.2.(1) and (3)]

To be confirmed at the □ footing inspection, □ backfill inspection.

b) Where a foundation is insulated in a manner that will reduce the heat flow to the soil beneath the footings, the foundation depth must conform to Column 4 or 5 of Table 9.12.2.2. as if the foundation contained no heated space.
[Sentence 9.12.2.2.(2) and Figure A-9.12.2.2.]

Depending on the configuration of the insulation, to be confirmed at the □ footing inspection, □ backfill inspection

9. EXCEPTIONS TO MINIMUM DEPTH OF FOUNDATIONS FOR HOUSES

a) As an exceptions to the general rule:

i) □ concrete steps with 1 and 2 risers are permitted to be laid on top of the ground.
[Sentence 9.12.2.2.(4)]

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EXERCISE # 6 - ANGLE OF REPOSE OF SOILS

According to Sentence 1.2.1.1.(1), of division C, where the foundations of a building are to be constructed below the level of the footings of an adjacent building and within the angle of repose of the soil, as drawn from the bottom of the footings, the foundations must be designed by a suitably qualified and experienced person.

The angle of repose is the steepest angle at which a pile of unconsolidated grains of soil (see definition of fine and coarse grained soils) will remain stable.

The angle of repose is determined by the frictional contact between the grains of soil. In general, for dry soils the angle of repose increases with increasing grain size and usually lies between 30° and 37° to the horizontal.

Slightly wet unconsolidated soils tend to exhibit a very high angle of repose because surface tension between the water and grains of soil tends to hold the grains in place.

In saturated soils the angle of repose is reduced to very small values and the soils tend to flow like a fluid.

If we were to deposit sand or gravel by pouring it from a single point above the ground, it would form a conical pile. As more and more granular material was deposited on the pile, the slope for a short period of time might appear to be steep, but eventually the soil particles would slip and slide down the slope.

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- □ no membrane or coating with a permeance less than 170 ng/(Pa.s.m^2) must be applied to the interior surface of the foundation wall above ground level between the insulation and the foundation wall.
  [Clause 9.13.2.6.(2)(b)]

c) Where insulation functions as both moisture protection for interior finishes and as a vapour barrier in accordance with Subsection 9.25.4. it must be applied over the entire interior surface of the foundation wall.
[Sentence 9.13.2.6.(3)]

9. PERMEANCE OF CONSTRUCTION MATERIALS

Permeance is the rate of water vapour transmission per unit area at a steady rate through a material. Just like fire-resistance rating and flame-spread rating which are determined by test in a laboratory, permeance is determined in accordance with ASTM E96/E96M, "Water Vapour Transmission of Materials".

Permeance is the number that is used to compare various construction materials in regard to moisture transmission resistance and is dependant on thickness much like the RSI-value of thermal insulation. Water vapour rate of permeance, for selected construction materials, are shown in Table A-9.25.5.1.(1), "Air and Vapour Permeance Values". See Volume 2 of the Building Code Compendium.

10. DAMPPROOFING OF FLOORS-ON-GROUND

a) As a general rule, when floors-on-ground are dampproofed, the dampproofing must be installed below the floor.
[Sentence 9.13.2.7.(1)]

11. REQUIRED WATERPROOFING OF FLOORS-ON-GROUND, EXTERIOR SURFACES OF FOUNDATION WALLS BELOW GROUND LEVEL AND ROOFS OF UNDERGROUND STRUCTURES

a) Where hydrostatic pressure occurs, waterproofing is required for the exterior surfaces of:

- □ floors-on-ground,
  [Clause 9.13.3.1.(1)(a)

  and

- □ below ground portions of foundation walls where the exterior finished ground level is at a higher elevation than the ground level inside the foundation walls,
  [Clause 9.13.3.1.(1)(b)]

b) Roofs of underground structures must be waterproofed to prevent the entry of water into the structure.
[Sentence 9.13.3.1.(2)]

12. STANDARDS FOR WATERPROOFING MATERIALS

The manufacturing standards of the materials that are permitted to be used for exterior waterproofing are listed in Clauses 9.13.3.2.(1)(a),(b),(c) and (d).
[Clauses 9.13.3.2.(1)(a) to (d), see Subsection1.3.1.]

13. STANDARD FOR THE APPLICATION OF ALL BITUMINOUS WATERPROOFING MATERIALS

The method of application of all bituminous waterproofing materials must conform to CAN/CGSB-37.3-M, "Application of Emulsified Asphalts for Dampproofing and Waterproofing".
[Sentences 9.13.3.3.(1) and Subsection 1.3.1.]

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16. WATERPROOFING SYSTEM FOR FLOOR-ON-GROUND

Basement floors-on-ground to be waterproofed must have a system of membrane waterproofing provided between 2 layers of concrete, with each layer of concrete to be not less than 75 mm thick, with the floor waterproofing membrane mopped to the foundation wall waterproofing membrane to form a complete seal.
[Sentence 9.13.3.6.(1)]

17. MEMBRANE FOR USE IN A WATERPROOFING SYSTEM

a) The membrane that is referenced in Articles 9.13.3.5. and 9.13.3.6., for use in a waterproofing system, is not specified in the Code but is incorporated by reference in CAN/CGSB-37.3-M89, "Application of Emulsified Asphalts for Dampproofing or Waterproofing. The following extracts from the CAN/CGSB-37.3-M89 standard have been prepared for purposes of the House - 2012 course.

18. APPLICATION OF EMULSIFIED ASPHALTS FOR DAMPPROOFING OR WATERPROOFING UNDER STANDARD CAN/CGSB-37.3-M89

1. Scope

1.1 This standard describes the recommended procedures to be employed in applying emulsified asphalts, covered by CAN/CGSB-37.1-M and CAN/CGSB-37.2-M, in dampproofing or waterproofing footings, floors, walls and structural slabs.

2. APPLICABLE PUBLICATIONS

2.1 The following publications are applicable to this standard:

2.1.1 37-GP-63M, "Cloth, Glass, Coated, for Membrane Waterproofing Systems and Built-Up Roofing",

37-GP-64M, "Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-Up Roofing".

4.3 Waterproofing Footings, Walls, Floors and Structural Slabs

4.3.1. Bituminous materials that conforms to CAN/CGSB-37.2-M are suitable for this purpose when used with reinforcing fabrics such as described in CGSB standards 37-GP-63M or 37-GP-64M.

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4. In your own words, describe the testing standard for the evaluation of a subfloor depressurization system, to determine the radon concentration in the building, including the basement.

   In a House containing only one dwelling unit, to determine the radon concentration, including the basement concentration measurements, a subfloor depressurization system, must be tested according to:

_____

_____

_____

SB-9 references: _____

5. A copy of the results of testing required under Sentences 3.2.(6) and (8) of Supplementary Standard SB-9, "Requirements for Soil Gas Control" must be forwarded to the:

   a) Registered Code Agency

   b) Chief Building Official

   c) Chief Building Official or the Inspector who has the same powers and duties as the chief building official in relation to plumbing, as the case may be

   d) the Chief Building Official or the Registered Code Agency having jurisdiction

SB-9 reference: _____

6. Complete the following statement. When testing determines that radon concentration exceeds 200 Bq/m³ in the normal occupancy area:

_____

_____

_____

SB-9 reference: _____

7. Complete the following statement. When a subfloor depressurization system is installed makeup air must be provided in accordance with:

_____

_____

_____

SB-9 references: _____

STOP

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10. DISPOSAL OF DRAINAGE FROM DRAIN TILE, DRAIN PIPE OR (HORIZONTAL) GRANULAR DRAINAGE LAYER BY A PUMP IN A SUMP PIT

a) Where gravity drainage is not practical, drainage from drain tile, drain pipe or (horizontal) granular drainage layer at the bottom of a foundation must discharge into a covered sump pit equipped with an automatic pump that will discharge the drainage water into a sewer, drainage ditch or dry well.
[Sentence 9.14.5.2.(1)]

b) The cover of the sump pit must be designed to resist removal by children.
[Sentence 9.14.5.2.(2)]

c) Sealed in accordance with Sentence 9.25.3.3.(16)

11. DRY WELL FOR THE DISPOSAL OF DRAINAGE FROM DRAIN TILE, DRAIN PIPE OR (HORIZONTAL) GRANULAR DRAINAGE LAYER

When drainage from drain tile, drain pipe or a (horizontal) granular drainage layer is drained by gravity or by way of an automatic pump in a sump pit into a dry well, the dry well must be located:

- in an area where the natural groundwater level is below the bottom of the dry well, [Sentence 9.14.5.3.(1)]

  and

- not less than 5 m from the foundation where the drainage comes from,

  and

- so that the bottom of the dry well drains away from the building.
  [Sentence 9.14.5.3.(2)]

12. SURFACE DRAINAGE

The building must be so located and the building site so graded so that surface water:

- will not accumulate at or near the building after any backfill has settled, [Sentences 9.14.6.1.(1) and 9.12.3.2.(1)]

  and

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- ☐ will not adversely affect adjacent properties.
  [Sentence 9.14.6.1.(1)]

13. SURFACE DRAINAGE AWAY FROM WELLS (WATER SUPPLY) AND SEWAGE SYSTEMS

Surface drainage must be directed away from the location of:

- ☐ a water supply well,

  or

- ☐ sewage system (leaching bed).
  [Sentence 9.14.6.2.(1)]

14. DRAINAGE OF SURFACE WATER IN WINDOW WELLS

Every window well must be drained to the footing level or other suitable location such as a sewer, drainage ditch or dry well.
[Sentence 9.14.6.3.(1)]

15. SURFACE DRAINAGE BY CATCH BASIN IN A DRIVEWAY

Where surface drainage water from a driveway is likely to accumulate in front of the overhead garage doors or enter in the garage, a catch basin must be installed to remove the surface drainage water.
[Sentence 9.14.6.4.(1)]

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2. EXCEPTION TO SECTION 9.15. FOR THE DESIGN OF FOOTINGS AND FOUNDATIONS

b) As exceptions to the general rule:

i) □ foundations for applications other than those described in paragraphs 1. a) i) and ii), must be designed in accordance with Section 9.4., "Structural Requirements". [Sentence 9.15.1.1.(2)]

ii) □ the size of footings must be designed in conformance with Section 4.2., "Foundations" where a foundation is erected on filled ground, peat, or sensitive clay. [Sentence 9.15.1.1.(3)]

and for the purposes of Sentence 9.15.1.1.(3)

□ sensitive clay is a fine-grained soil in which the grain size of the majority of the particles, as determined by laboratory analysis, is smaller than 0.002 mm and includes leda clay.
[Sentence 9.15.1.1.(4)]

iii) buildings to be erected on permafrost must have their foundation designed:

□ under the appropriate requirements of Part 4,

and

□ by a designer who is competent in this field.
[Sentence 9.15.1.2.(1)]

iv) where the superstructure of a detached building conforms with the deformation resistance test in CSA Z240.2.1, "Structural Requirements for Manufactured Homes", such foundations must be constructed in conformance with:

□ this Section
[Clause 9.15.1.3.(1)(a), see Subsection 1.3.1.]

or

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- CSA Z240.10.1., "Site Preparation, Foundation and Anchorage of Manufactured Homes".
  [Clause 9.15.1.3.(1)(b), see Subsection 1.3.1.]

3. CONCRETE FOR THE CONSTRUCTION OF HOUSES

Concrete for the construction of Houses must conform to Section 9.3., "Materials, Systems and Equipment".
[Sentence 9.15.2.1.(1)]

4. NOMINALLY UNREINFORCED CONCRETE

a) As a general rule, nominally unreinforced concrete for the construction of Houses must:

- be designed, mixed, placed, cured and tested in accordance with the requirements of "R" class concrete stated in Clause 8.13 of CSA A23.1, "Concrete Materials and Methods of Concrete Construction".
  [Sentences 9.3.1.1.(1), see Subsection 1.3.1.]

b) As an exception to the general rule, unreinforced and nominally reinforced concrete may be site-batched provided that it is:

- designed, mixed, placed and cured in accordance with Articles 9.3.1.2. to 9.3.1.9.
  [Sentence 9.3.1.1.(2)]

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- conform to CSA-A23.1, "Concrete Materials and Methods of Concrete Construction",

  and

- have a maximum aggregate size of 19 mm, [Clause 9.3.1.1.(4)(a), see Subsection 1.3.1.]

  and

- alternatively, reinforcing steel must:
  - conform to CSA-G30.18-M, "Carbon Steel Bars for Concrete Reinforcement", [Subclause 9.3.1.1.(4)(b)(i), see Subsection 1.3.1.]

    and

  - have a minimum specified yield strength of 400 MPa, [Subclause 9.3.1.1.(4)(b)(ii)]

    and

  - be lapped a minimum of:
    - 450 mm for 10M bars, [Subclause 9.3.1.1.(4)(b)(iii)

      and

    - 650 mm for 15M bars. [Subclause 9.3.1.1.(4)(b)(iii)]

Imperial Reinforcing Bars		**Metric Reinforcing Bars**		
bar size	**diam. in inches**	**bar size**	**diam. in mm**	**area in mm²**
#2	.250 - ¼			
#3	.375 - ⅜	10M	11.3	100
#4	.500 - ½			
#5	.625 - ⅝	15M	16.0	200
#6	.750 - ¾	20M	19.5	300
#7	.875 - ⅞			
#8	1.00 - 1	25M	25.2	500

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13. SITE-BATCHED CONCRETE MIXES

For nominally unreinforced site-batched concrete, the mixes described in Table 9.3.1.7., "Concrete Mixes" are considered acceptable **if** the ratio of water to cementing materials does not exceed:

- 0.45 for garage floors, carport floors and all exterior flatwork, [Clause 9.3.1.7.(1)(a)

  or

- 0.65 for interior floors other than those for garages and carports, [Clause 9.3.1.7.(1)(b)]

  or

- 0.70 for all other applications. [Clause 9.3.1.7.(1)(c)]

14. MAXIMUM SIZE OF AGGREGATES FOR SITE-MIXED CONCRETE

For nominally unreinforced site-batched concrete, the size of coarse aggregates must not exceed:

- in the case of foundation walls and piers, 1/5 of the distance between the sides of the vertical forms, [Clause 9.3.1.7.(2)(a)]

  or

- in the case of flatwork, 1/3 the thickness of the flatwork (footing, floor-on-ground or slab). [Clause 9.3.1.7.(2)(b)]

15. ADMIXTURES IN CONCRETE

When admixtures are added to a concrete mix, the admixture must, as the case may be, conform to:

- ASTM C260 / C260M, "Air Entraining Admixtures for Concrete"

  or

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5. Consider the site batched concrete mix in Question № 4. When the mixer can accommodate 3 Parts of Cement, 6 Parts of Fine Aggregates and 10.5 Parts of Coarse Aggregates per volume, maximum amount of water to cement cannot exceed:

   a) 19.6 L of water

   b) 39.2 L of water

   c) 58.8 L of water

   d) the amount of water that will give a slump in excess of 150 mm (5 7/8 in)

References: _____

STOP

18. UNIT MASONRY CONSTRUCTION FOR FOUNDATION WALLS AND PIERS OF HOUSES

According to Section 2.2 of CSA A165.1, "Concrete Block Masonry Units", a concrete block masonry unit is a hollow, semi-solid, or full solid masonry unit made from cementitious materials, water and aggregates, with or without other materials, and with dimensions and properties in accordance with this standard.

There are many types and shapes of concrete blocks but the three main configurations are hollow, semi-solid full solid.

- hollow concrete block, a unit that has a net cross-sectional area in any plane parallel to the bearing surface of less than 75% of the gross cross-sectional area measured in the same plane.
  [Section 2.2, CSA A165.1, "Concrete Block Masonry Units"]
- semi-solid concrete block, a unit that has a net cross-sectional area in all planes parallel to the bearing surface of at least 75% but less than 100% of the gross cross-sectional area measured in the same plane.
  [Section 2.2, CSA A165.1, "Concrete Block Masonry Units"]
- full solid concrete block, a unit that has a net cross-sectional area in all planes parallel to the bearing surface of 100% of the gross cross-sectional area measured in the same plane.
  [Section 2.2, CSA A165.1, "Concrete Block Masonry Unit"]

19. CONCRETE BLOCK SPECIFICATIONS

Concrete Blocks must be manufactured to comply with:

- CAN/CSA A165.1, "Concrete Block Masonry Units"

  and

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EXERCISE # 3 - FOOTINGS

Standard procedures apply. Consider Subsection 9.15.3., "Footings" and deal with the questions that follow and provide references when prompted to do so.

1. The minimum footing sizes of Table 9.15.3.4. are based on a maximum specified live load, on any floor supported by the footings, of:

   a) 1.4kPa

   b) 1.9 kPa

   c) 2.4 kPa

   d) 3.6 kPa

Reference: _____

2. According to Table 4.1.5.3., by way of Clauses 9.4.1.1.(1)(c), 9.23.4.1.(1)(a) and (b), the minimum specified uniformly distributed live load on any area of floor other than floors of bedrooms in Houses is:

   a) 1.4kPa

   b) 1.9 kPa

   c) 2.4 kPa

   d) 3.6 kPa

Reference: _____

3. According to Table 4.1.5.3., by way of Clauses 9.4.1.1.(1)(c), 9.23.4.1.(1)(a) and (b), the minimum specified uniformly distributed live load on floors of bedrooms in Houses is:

   a) 1.4 kPa

   b) 1.9 kPa

   c) 2.4 kPa

   d) 3.6 kPa

Reference: _____

4. Consider a one-storey detached House with vinyl siding and engineered wood joists that span 7.32 m on each side of a centre beam supported by columns. The footings supporting exterior walls will need to be a minimum width of:

   a) 250 mm

   b) 350 mm

   c) 375 mm

   d) 400 mm

References: _____

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5. Consider a two-storey detached House with brick veneer on both storeys and engineered wood joists that span 7.32 m on both sides of a basement beam and the floor joists of the second storey span 6 m from bearing partitions on the first floor. The footings supporting exterior walls will need to be a minimum width of:

   a) 480 mm

   b) 655 mm

   c) 960 mm

   d) 1440 mm

References: _____

6. For the one-storey detached House in Question № 4 the footing area for columns spaced 3 m o.c. will need a minimum of:

   a) 0.4 m^2

   b) 0.75 m^2

   c) 0.6 m^2

   d) 0.9 m^2

References: _____

7. Consider the MITEC House and calculate the minimum width of the strip footing supporting the exterior foundation wall.

   a) 250 mm

   b) 350 mm

   c) 380 mm

   d) 480 mm

References: _____

8. How does the required footing width in Question № 7 compare with what is proposed by Wall Section B?

_____

_____

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9. Consult the Basement Plan of the MITEC House. The area of floor being supported by the column that is closest to the furnace was calculated as 9 m^2. Evaluate the appropriateness of the area of the footing supporting the said column.

In Question № 7, we calculated the minimum width of the strip footing supporting the exterior walls of the MITEC House, at 480 mm. Consult Wall Section B. If the MITEC House was to be constructed on gravel, sand or silt where the elevation of the water table was 450 mm below the underside of footing elevation, the width of the footing supporting the exterior walls would need to be a minimum of:

a) 900 mm

b) 960 mm

c) 1 000 mm

d) as required by design under Part 4

References: _____

10. According to Row 2, Column 3 of Table 9.15.3.4., the minimum width of strip footings supporting interior walls of a two storey house is 350 mm. If the MITEC House was to be constructed on gravel, sand or silt where the elevation of the water table was 450 mm below the underside of footing elevation, the width of the footing supporting an interior load-bearing partition (without masonry) would need to be a minimum of:

a) 350 mm

b) 700 mm

c) 1 000 mm

d) as required by design under Part 4

References: _____

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11. In Question № 9, we calculated the minimum area of the footing closest to the furnace to be 0.46 m^2 or 677mm × 677mm and concluded that a 700 mm x 700 mm column footing was adequate. If the MITEC House was constructed on gravel, sand or silt where the elevation of the water table was 450 mm below the underside of footing elevation. The size of the column footing closest to the furnace would need to be a minimum of:

    a) 895 mm x 895 mm

    b) 960 mm x 960 mm

    c) 1 200 mm x 1 200 mm

    d) 1 400 mm x 1 400 mm

Reference: _____

12. In Question № 10, we calculated the minimum width of the strip footing supporting the exterior walls of the MITEC House to be 960 mm if said footings were to be constructed on gravel, sand or silt and the water table level was less than the width of the original footing below its underside elevation. Consider Wall Section B. The minimum thickness of the strip footing widened by Clause 9.15.3.4.(3)(a) will be:

    a) 100 mm

    b) 330 mm

    c) 480 mm

    d) 960 mm

Reference: _____

13. In Question № 11, we calculated the minimum width of strip footing supporting interior walls of the MITEC House to be 350 mm. The minimum thickness of the footing, supporting loadbearing interior walls comprised of 38 mm x 140 mm wood studs would be:

    a) 100 mm

    b) 105 mm

    c) 200 mm

    d) 350 mm

References: _____

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14. In Question № 12, we calculated the size of the footing closest to the furnace to be 960 mm x 960 mm when such footing was to be constructed on gravel, sand or silt and the water table level was less than the width of the original footing below its underside. Consider that the widened footing will support a steel column resting on a 100 mm x 100 mm x 6.35 mm thick steel plate, the minimum thickness of the enlarged footing area will be:

    a) 100 mm

    b) 430 mm

    c) 480 mm

    d) 960 mm

Reference: _____

15. True of false. The configuration of step footings is dependant on the type of soil.

    a) True

    b) False

Reference: _____

16. When step footing are used, they must have the following configuration:

    a) be designed under Part 4

    b) max. rise of 600 mm and max. run of 600 mm

    c) min. rise of 600 mm and max. run of 600 mm

    d) max. rise of 600 mm and min run of 600 mm

References: _____

STOP

32. FOUNDATION WALLS

Until now you have considered the requirements of the Code for backfill, dampproofing or waterproofing, drainage and soil gas control. We will now look at the foundation wall as a structural member whose purpose is also to support the pressure of the retained soil.

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c) The thickness and reinforcing of foundation walls, made of reinforced concrete block, and subject to lateral earth pressure, must conform to Table 9.15.4.2.B., "Reinforced Concrete Block Foundation Walls Laterally Supported at the Top" and Sentences 9.15.4.2.(5) to (8) where:

- □ the walls are laterally supported at the top.
  [Sentence 9.15.4.2.(4)(a)]

  and

- □ average stable oils are encountered,
  [Sentence 9.15.4.2.(4)(b)]

  and

- □ wind loads on the exposed portion of the foundation are not greater than 0.70 kPa.
  [Sentence 9.15.4.2.(4)(c)]

i) Continuous vertical reinforcement, in reinforced concrete block foundation walls, must:

- □ be provided at:
  - □ wall corners,

    and

  - □ wall ends,

    and

  - □ wall intersections,

    and

  - □ changes in wall height,

    and

  - □ the jambs of all openings,

    and

  - □ movement joints.
    [Clause 9.15.4.2.(5)(a)]

ii) □ extend from the top of the footing to the top of the foundation wall,
[Clause 9.15.4.2.(5)(b)]

1

iii) □ where the foundation wall is laterally supported at the top, be embedded not less than 50 mm into the footing, if the floor-on-ground does not provide lateral support at the base of the said foundation wall.
[Clause 9.15.4.2.(5)(c)]

d) For reinforced concrete block foundation walls, a continuous horizontal bond beam containing at least one 15M bar must be installed:
[Sentence 9.15.4.2.(6)]

□ along the top of the wall,
[Clause 9.15.4.2.(6)(a)]

and

□ at the sill and head of every opening greater than 1.2 m in width,
[Clause 9.15.4.2.(6)(b)]

and

□ at structurally connected floors.
[Clause 9.15.4.2.(6)(c)]

e) In reinforced concrete block foundation walls, all vertical reinforcement bars must be installed along the centre line of said masonry wall.
[Sentence 9.15.4.2.(7)]

f) In reinforced concrete block foundation walls, ladder or truss type lateral reinforcement not less than 3.8 mm in diameter must be installed in the bed joint of every second course of masonry.
[Sentence 9.15.4.2.(8)]

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12. **When** the foundation wall of the MITEC House is constructed as a prescribed flat ICF foundation wall, the minimum thickness of the flat ICF foundation wall is:

    a) 140 mm

    b) 190 mm

    c) 240 mm

    d) required to be designed under Part 4

References: _____

13. **When** the foundation wall of the MITEC House is constructed as a prescribed flat ICF foundation wall, the concrete:

    a) can be site-batched,

    b) must be site-batched

    c) must conform to CAN/CSA-A23.1, "Concrete Materials and Methods of Concrete Construction, with a maximum aggregate size of 19 mm and Part 4, Structural Design"

    d) must conform to CAN/CSA-A23.1, "Concrete Materials and Methods of Concrete Construction", with a maximum aggregate size of 19 mm or Part 4, "Structural Design"

References: _____

14. **When** the foundation wall of the MITEC House is constructed as a prescribed flat ICF foundation wall, the minimum vertical reinforcement for the wall in question № 12 is:

    a) 10M bars at 250 mm o.c.

    b) 10M bars at 380 mm o.c.

    c) 10M bars at 400 mm o.c.

    d) required to be designed under Part 4

Reference: _____

15. **When** the foundation wall of the MITEC House is constructed as a prescribed flat ICF foundation wall, the maximum **spacing of horizontal reinforcement** for the wall in question № 12 is:

    a) 1-10M bar not more than 300 mm from the top of the foundation wall

    b) 1-10M bar not more than 300 mm from the bottom of the foundation wall

    c) 1-10M bar placed not more than 300 mm from the bottom of the foundation wall and 10M bars spaced not more than 600 mm o.c.

    d) 1-10M bar placed not more than 300 mm from the top of the foundation wall and 10M bars spaced not more than 600 mm o.c.

Reference: _____

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16. **When** the foundation wall of the MITEC House is constructed as a prescribed flat ICF foundation wall, the reinforcing steel must conform to:

    a) Part 4

    b) CSA-A23.3-04, "Design of Concrete Structures"

    c) CAN/CSA-A23.1, "Concrete Materials and Methods of Concrete Construction", with a maximum aggregate size of 19 mm and Part 4, Structural Design"

    d) CSA G30.18 "Carbon Steel Bars for Concrete Reinforcement"

References: _____

STOP

43. SUPPORT OF FLOOR JOISTS ON MASONRY FOUNDATION WALLS

a) As a general rule, foundation walls of hollow unit masonry supporting floor joists, must:

- □ be capped with a course of solid masonry units not less than 50 mm thick, [Clause 9.15.5.1.(1)(a)]

  or

- □ be capped with a layer of concrete not less than 50 mm thick, [Clause 9.15.5.1.(1)(a)]

  or

- □ have the top course filled with mortar or concrete. [Clause 9.15.5.1.(1)(b)]

_____

_____

_____

i) As an exception to the general rule, in localities <u>where termites are not known to occur</u>, the capping required in Sentence 9.15.5.1.(1) may be omitted when: [Clause 9.15.5.1.(2)(a)]

- □ the floor joists are supported on a 38 mm x 89 mm wood plate, [Clause 9.15.5.1.(2)(b)]

  and

- □ the siding overlaps the face of the foundation wall by not less than 12 mm. [Clause 9.15.5.1.(2)(c)]

_____

_____

_____

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9. A 2 100 mm opening in an exterior masonry wall and supporting 100 mm brick with no other load is required to have a loose steel lintel comprising:

   a) L-90 mm × 90 mm × 6 mm

   b) L-125 mm × 90 mm × 8 mm

   c) L-125 mm × 125 mm × 8 mm

   d) L-102 mm × 89 mm × 7.9 mm

References: _____

10. A 2 100 mm opening in an exterior wood-framed wall and supporting 90 mm brick veneer with no other load is required to have a loose steel lintel comprising:

    a) L-89 mm × 89 mm × 6.4 mm

    b) L-125 mm × 90 mm × 8 mm

    c) L-125 mm × 125 mm × 8 mm

    d) L-100 mm × 90 mm × 8 mm

References: _____

11. A 1 800 mm opening in a 305 mm thick interior masonry wall and supporting 10 000 N of floor loading is required to have a steel lintel of comprising:

    a) L-150 mm × 100 mm × 10 mm

    b) 2Ls-127 × 89 × 7.9

    c) 2Ls-100 × 90 × 8

    d) L-100 × 90 × 8

References: _____

12. An exterior window opening is required to have a steel lintel to support 90 mm wide brick veneer. When the span of the lintel is 3 000 mm what is the minimum size of the steel lintel?

    a) L-90 × 75 × 6

    b) L-90 × 90 × 6

    c) L-100 × 90 × 6

    d) L-127 × 89 × 7.9

References: _____

STOP

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4. Any opening in an exterior non-loadbearing above-ground flat ICF wall must not occur within:

   a) 1 800 mm of corners

   b) 400 mm of corners

   c) 600 mm of corners

   d) 1 200 mm of corners

Reference: _____

5. In non-loadbearing flat ICF walls, an opening of 2.5 m in width must be reinforced with:

   a) 1-10M bar at the top of the opening

   b) 2-10 M bars at the top o f the opening

   c) 10M bars at not more than 400 mm o.c. horizontally

   d) 1-10M bar at the top and 1-10M bar at the bottom of the opening

Reference: _____

6. In loadbearing flat ICF walls, what is the maximum opening that can be utilized without a lintel?:

   a) 800 mm

   b) 900 mm

   c) 1 200 mm

   d) 1 000 mm

References: _____

7. The roof framing supported on the top of an ICF wall must be fixed to a top plate which is anchored to the said wall with anchor bolts:

   a) of not less than 12.7 mm in diameter

   b) of not less than 12.7 mm in diameter and not less than 100 mm long and spaced not more than 1 200 mm o.c.

   c) in accordance with Table 9.23.3.4.

   d) of not less than 12.7 mm in diameter and embedded not less than 100 mm into the concrete and spaced not more than 1 200 mm o.c.

References: _____

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8. In a loadbearing flat ICF wall, a lintel must also be reinforced for shear with stirrups at openings when the opening is:

   a) more than 900 mm in width

   b) more than 900 mm but not more than 1 200 mm in width

   c) more than 900 mm but less than 1 200 mm in width

   d) more than 1 200 mm in width

Reference: _____

9. The wood-trusses in question № 7, would need to be attached to the top plate with:

   a) 3-76 mm nails, toe-nailed at each truss

   b) 4-76 mm nails, toe nailed at each truss

   c) 4-82 mm nails, toe nailed at each truss

   d) 3-82 mm nails, toe-nailed at each truss

References: _____

10. Wood ledger boards supporting floor joists that span 4.2 m must be anchored to flat ICF walls with:

    a) secured joist hangers

    b) staggered 12.7 mm anchor bolts that are not more than 300 mm apart

    c) staggered 16 mm anchor bolts that are spaced not more than 400 mm apart

    d) staggered 12.7 mm anchor bolts that are not more than 275 mm apart

Reference: _____

STOP

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or

□ serves appliances that have a combined total output of more than 120 kW.
[Sentence 9.21.1.1.(2)]

b) As a general rule, Section 9.21. applies to flue pipes serving solid fuel-burning appliances.
[Clause 9.21.1.1.(1)(b)]

i) As an exception to general rule № 1. b), a flue pipe that serves an appliance other than a solid fuel-burning appliance must conform to Section 6.3., "Chimneys and Venting Equipment".
[Sentence 9.21.1.1.(2)]

2. STANDARD FOR THE MANUFACTURING AND INSTALLATION OF FACTORY-BUILT CHIMNEYS

Factory-built chimneys serving solid fuel-burning appliances must be manufactured and installed in accordance with CAN/ULC-S629-M, "650°C Factory-Built Chimneys".
[Sentences 9.21.1.2.(1) and A-9.21.1.2.(1), see Subsection 1.3.1.]

3. FLUE PIPES

i) As an exception to general rule № 3. a), flue pipes serving solid fuel-burning stoves, cooktops and space heaters must conform to CSA-B365, "Installation Code for Solid-Fuel Burning Appliances and Equipment"
[Sentence 9.21.1.3.(1)]

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2. A factory-built chimney serving a solid fuel-burning appliance must conform to:
   a) CAN/ULC-S629-M, "650°C Factory-Built Chimneys"
   b) CSA-B365, "Installation Code for Solid-Fuel-Burning Appliances and Equipment"
   c) NFPA 211, "Chimneys, Fireplaces, Vents and Solid-Fuel-Burning Appliances"
   d) CAN/ULC-S604, "Standard for Factory-Built Type A Chimneys"

Reference: _____

STOP

6. LIMITATIONS ON USE OF CHIMNEY FLUES IN HOUSES

a) A chimney flue that serves:
   - □ a fireplace,

     or

   - □ an incinerator,

     must not serve

     - □ any other appliance.
       [Sentence 9.21.2.1.(1)]

b) A chimney flue that serves a solid-fuel burning appliance must never be connected to a:
   - □ natural gas-fired appliance,

     and

   - □ propane-fired appliance.
     [Sentence 9.21.2.1.(2)]

c) A chimney flue that serves a solid fuel-burning appliance may be connected to an oil-burning appliance **if**:
   - □ the solid fuel-burning appliance is listed for such installation,

     and

   - □ the installation of both appliances meets their respective installation requirements.
     [Sentence 9.21.2.1.(3)]

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7. CONNECTING MORE THAN ONE APPLIANCE TO THE SAME CHIMNEY FLUE

a) When a fireplace, an incinerator, a gas-fired or propane-fired appliance is not involved, two or more fuel-burning appliances (oil and solid fuel) (solid fuel and solid fuel) may be connected to the same chimney flue **if**:

- adequate draft is maintained for each connected appliance, [Sentence 9.21.2.2.(1)]

and the connections are made as follows:

- where two or more solid fuel-burning appliances are connected to the same chimney flue, the said appliances must be located on the same storey, [Sentence 9.21.2.2.(2)]

and

- where a solid-fuel burning appliance is connected to the same chimney flue as an oil-burning appliance, the connection to the chimney flue for the solid-fuel burning appliance must be made below the connection for the oil-burning appliance. [Sentence 9.21.2.2.(3)]

8. MAXIMUM INCLINATION OF CHIMNEY FLUE

A chimney flue is permitted to be inclined up to 45 degrees from the vertical, or 45 degrees or more from the horizontal.
[Sentence 9.21.2.3.(1)]

9. SIZING THE CHIMNEY FLUE OF A SOLID-FUEL BURNING APPLIANCE

a) Not including fireplaces the size of a chimney flue, serving a solid-fuel burning appliance for a central heating system or a supplemental heating system in the case of a stove, range or space heater, must conform to CSA-B365, "Installation Code for Solid-Fuel Burning Appliances and Equipment".
[Sentence 9.21.2.4.(1) → 6.2.1.4.(1) and 9.33.1.2.(1), see Subsection 1.3.1.]

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19. FIREPLACE INSERTS AND HEARTH-MOUNTED STOVES

Fireplace inserts and hearth-mounted stoves are listed appliances that are installed within the firebox space of a masonry fireplace thereby substantially closing off the fireplace opening. It is to be noted that the masonry fireplace must conform to the requirements of the Code and that bricks and other masonry units must not be removed to accommodate the installation of the said insert stove or hearth-mounted stove.

20. MANUFACTURING STANDARD FOR LISTING FIREPLACE INSERTS AND HEARTH-MOUNTED STOVES

Fireplace inserts and hearth-mounted stoves vented through the throat of a fireplace must be listed as conforming to ULC S628, "Fireplace Inserts".
[Sentence 9.22.10.1.(1), see Subsection 1.3.1.]

21. INSTALLATION STANDARD FOR LISTED FIREPLACE INSERTS AND LISTED HEARTH-MOUNTED STOVES

The installation of listed fireplace inserts and listed hearth- mounted stoves vented through the throat of a fireplace must conform to CSA-B365, "Installation Code for Solid-Fuel Burning Appliances and Equipment".
[Sentence 9.22.10.2.(1)]

22. SMOKE CHAMBER SPECIFICATIONS FOR THE INSTALLATION OF LISTED FIREPLACE INSERTS AND LISTED HEARTH-MOUNTED STOVES

a) As a general rule, a listed fireplace insert or a listed hearth- mounted stove to be vented through the throat of an existing masonry fireplace may be installed **if**:

   - the walls of the smoke chamber adjacent to combustible construction have a minimum thickness of 190 mm of solid masonry.
     [Sentence 9.22.10.2.(2)]

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d) Flooring screws must be at least 3.2 mm in diameter.
[Sentence 9.23.3.5.(4)]

e) Where roof sheathing supports are spaced at more than 406 mm o.c. the maximum spacing of fasteners for roof sheathing must be 150 mm along edges and intermediate supports.
[Sentence 9.23.3.5.(5)]

EXERCISE #1 - SCOPE, GENERAL AND FASTENERS

To complete this exercise, you will need to consult Subsections 9.23.1 to 9.23.3. Provide code references when prompted.

1. The provisions of Section 9.23 apply only to the following structures (select the most correct answer):
   a) framing members spaced at not more than 600 mm o.c.
   b) live load cannot exceed 2.4 kPa
   c) post, beam and plank construction is proposed
   d) framing members spaced at not more than 610 mm o.c. and a maximum live load of not more than 2.4 kPa

References: _____

2. A wood column resting on a concrete pier which is in contact with the ground and extends 150 mm above finished ground is required to:
   a) be pressure treated against decay
   b) be separated from the concrete with not less than 0.05 mm polyethylene film
   c) be separated from the concrete with not less than 0.05 mm polyethylene film or Type S roll roofing or be pressure treated with a wood preservative
   d) protection from dampness is not required

Reference: _____

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- □ 38 mm thick and 19 mm thick members that are fastened together with a double row of nails not less than 63 mm long spaced not more than 450 mm apart in each row.
  [Clause 9.23.12.3.(2)(b)]

c) In loadbearing exterior walls and loadbearing interior walls made of 38 mm × 64 mm studs, the other dimension (height) of such lintels must not be less than 50 mm greater than the sizes indicated in Tables A-12 to A-16 for the maximum spans shown,
[Clause 9.23.12.3.(3)(a)]

and in any case

- □ the maximum span must not exceed 2.24 m.
  [Clause 9.23.12.3.(3)(b)]

EXERCISE # 5 - WALL STUDS, WALL PLATES AND FRAMING OVER OPENINGS.

To complete this exercise, you will need to consult Subsections 9.23.10. to 9.23.12. Provide code references when prompted.

1. What is the minimum stud size and maximum spacing for an interior loadbearing wall, 3 m high in unsupported height, carrying an attic not accessible by stairway plus one floor?
   a) 38 mm × 89 mm @ 406 mm o.c.
   b) 38 mm × 89 mm @ 610 mm o.c.
   c) 38 mm × 140 mm @ 406 mm o.c.
   d) 38 mm × 140 mm @ 610 mm o.c.

References: _____

2. What is the minimum stud size and maximum spacing for an interior loadbearing wall carrying a roof load plus 2 floors? The unsupported height of the said wall is 3.0 m.
   a) 38 mm × 89 mm @ 305 mm o.c.
   b) 38 mm × 89 mm @ 406 mm o.c.
   c) 38 mm × 89 mm @ 610 mm o.c.
   d) 38 mm × 140 mm @ 610 mm o.c.

References: _____

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3. What is the minimum stud size and maximum spacing for an exterior loadbearing wall carrying a roof load plus two floors? The unsupported height of the said wall is 3.0 m.

   a) 38 mm × 89 mm @ 305 mm o.c.

   b) 38 mm × 89 mm @ 406 mm o.c.

   c) 38 mm × 89 mm @ 610 mm o.c.

   d) 38 mm × 140 mm @ 610 mm o.c.

References: _____

4. Single studs are permitted on both sides of an opening if the opening is not more than 1 stud space in width, does not extend across a stud and there are not openings in adjacent stud spaces and the opening is located in:

   a) non-loadbearing exterior walls only

   b) loadbearing interior walls only

   c) loadbearing exterior walls only

   d) loadbearing and non-loadbearing interior and exterior walls

References: _____

5. As a general rule, a wall plate in a stud wall comprised of 38 mm × 64 mm studs is:

   a) 38 mm wide

   b) 38 mm × 64 mm on the flat

   c) 38 mm × 64 mm on edge

   d) 19 mm × 64 mm.

References: _____

6. A single top plate is permitted in a loadbearing wall;

   a) for interior walls only

   b) for exterior walls only

   c) if the supported members are not more than 50 mm from the stud

   d) if the concentrated loads from the supported members are not more than 50 mm from the supporting stud

Reference: _____

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3. Hip and valley rafters must be at least:
   a) the same size as the common rafters they support
   b) the next size bigger than the common rafters they support up to a maximum of 38 × 286
   c) 25 mm deeper than the common rafters they support
   d) 50 mm deeper than the common rafters they support

Reference: _____

4. Collar ties may be assumed to provide intermediate support to roof rafters if the roof slope is:
   a) 1 in 4 or greater
   b) 1 in 4 or less steep
   c) 1 in 3 or greater
   d) 1 in 3 or less steep

Reference: _____

5. Collar ties must be laterally braced at right angle with a 19 mm × 89 mm brace, if they span more than:
   a) 1 200 mm
   b) 1 830 mm
   c) 2 240 mm
   d) 2 400 mm

Reference: _____

6. Struts used to provide intermediate support for roof framing members must be inclined by:
   a) not less than 45° to the horizontal
   b) 45° to the vertical
   c) 45° to the horizontal
   d) not more than 45° from the horizontal

Reference: _____

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3. Waferboard or OSB subflooring must be installed with the direction of face orientation:
   a) perpendicular to the direction of the floor joists
   b) parallel to the direction of the floor joists
   c) at an angle of not less than 45° to the direction of the floor joists
   d) at an angle of 45° or more to the direction of the floor joists

Reference: _____

4. Where the finished flooring consists of other than matched wood strips or ceramic tiles, what is the minimum thickness of plywood subflooring applied over floor joists spaced at 610 mm o.c.?
   a) 12.5 mm
   b) 15.5 mm
   c) 15.9 mm
   d) 18.5 mm

References: _____

5. What is the minimum rating of construction sheathing subflooring applied over floor joists spaced at 610 mm o.c.? Subsection 9.30.2 does not require an underlay.
   a) 0-1
   b) 1F20
   c) 1F24
   d) R-1

References: _____

6. What is the minimum thickness of plywood subflooring applied over floor joists spaced at 610 mm o.c. when 19 mm thick hardwood strip flooring is applied over the subfloor?
   a) 12.5 mm
   b) 12.7 mm
   c) 15.9 mm
   d) 18.5 mm

References: _____

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7. What is the minimum thickness of plywood subflooring applied over floor joists spaced at 406 mm o.c. when 10 mm thick hardwood strip flooring is applied over the subfloor?

   a) 12.5 mm

   b) 12.7 mm

   c) 15.5 mm

   d) 15.9 mm

References: _____

8. What is the minimum thickness of R-1 grade waferboard subflooring applied over floor joists spaced at 406 mm o.c. and supporting a concrete topping and ceramic tiles applied with adhesive?

   a) 12.7 mm

   b) 15.5 mm

   c) 15.9 mm

   d) 19.0 mm

References: _____

9. Lumber subflooring is to be applied over floor joists, at an angle of:

   a) not more than 45° to the floor joists

   b) not less than 45° to the floor joists

   c) 45° only to the floor joists

   d) must always be perpendicular to the floor joists

Reference: _____

10. What is the minimum thickness of lumber subflooring applied to joists at 406 mm o.c.?

    a) 17.0 mm

    b) 18.5 mm

    c) 19.0 mm

    d) 25.4 mm

References: _____

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11. What is the maximum width of lumber subflooring applied to joists at 406 mm o.c.?

    a) any width provided that ir is uniform

    b) 286 mm

    c) 19.0 mm

    d) 184 mm

Reference: _____

STOP

72. REQUIRED ROOF SHEATHING

a) As a general rule, continuous lumber or continuous panel-type roof sheathing must be installed to support roofing.
[Sentence 9.23.15.1.(1)]

_____

_____

_____

i) As an exception to the general rule, roofing need not be supported by continuous lumber or continuous panel-type roof sheathing when so permitted by Section 9.26., "Roofing".

_____

_____

_____

73. MATERIAL STANDARDS FOR ROOF SHEATHING

Wood-based panels used for roof sheathing must comply to:

- □ "Douglas Fir Plywood" to CSA O121,
  [Clause 9.23.15.2.(1)(a), see Subsection 1.3.1.]

  or

- □ "Canadian Softwood Plywood" to CSA O151,
  [Clause 9.23.15.2.(1)(b), see Subsection 1.3.1.]

  or

- □ "Poplar Plywood" to CSA O153-M,
  [Clause 9.23.15.2.(1)(c), see Subsection 1.3.1.]

  or

- □ "Construction Sheathing" to CAN/CSA-O325,
  [Clause 9.23.15.2.(1)(d), see Subsection 1.3.1.]

  or

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- □ "OSB and Waferboard" to CSA-O437.0.
  [Clause 9.23.15.2.(1)(e), see Subsection 1.3.1.]

74. DIRECTION OF INSTALLATION OF ROOF SHEATHING

a) Plywood roof sheathing must be installed with the face (surface) grain at right angles to the roof framing members.
[Sentence 9.23.15.2.(1)]

b) **OSB**, conforming to CAN/CSA-O325, "Construction Sheathing", **OSB** of grades O-1 and O-2 conforming to CSA-O437.0, "OSB and Waferboard" must be installed with the direction of face orientation perpendicular to the direction of roof framing members.
[Sentence 9.23.15.3.(2), see Subsection 1.3.1.]

75. JOINTS IN PANEL-TYPE ROOF SHEATHING

a) Panel-type roof sheathing boards must be applied so that joints that are perpendicular to the roof ridge are staggered where the sheathing:

- □ is applied with the surface grain parallel to the ridge,
  [Clause 9.23.15.4.(1)(a)]

  and

- □ its thickness is such that edge support is required.
  [Clause 9.23.15.4.(1)(b)]

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78. THICKNESS OR RATING OF ROOF SHEATHING

a) The thickness or rating of roof sheathing used on a flat roof which will be used as a walking surface must comply with Table 9.23.14.5.A., "Thickness of Subflooring" or Table 9.23.14.5.B., "Rating for Subfloor when Applying CSA O325, as if it were subflooring. [Sentence 9.23.15.7.(1)]

b) When a roof is not used as a walking surface, the roof sheathing thickness or rating is determined from either Table 9.23.15.7.A., "Thickness of Roof Sheathing" or Table 9.23.15.7.B., "Rating for Roof Sheathing When Applying CSA O325". [Sentence 9.23.15.7.(2), see Subsection 1.3.1.]

c) Asphalt-coated or asphalt-impregnated fibreboard is permitted as roof sheathing when:

- □ it is at least 11.1 mm thick,

  and

- □ it conforms to CAN/ULC-S706, "Wood Fibre Thermal Insulation for Buildings",

  and

- □ it is installed over supports spaced at not more than 406 mm o.c., [Sentence 9.23.15.7.(3)]

  and

- □ all its edges are supported by blocking or framing, [Sentence 9.23.15.7.(3)]

  and the roofing consists of continuous sheets of:

- □ 0.33 mm thick galvanized steel, [Clause 9.23.15.7.(3)(a)]

  or

- □ 0.61 mm thick aluminum. [Clause 9.23.15.7.(3)(b)]

EXERCISE #8 - ROOF SHEATHING.

To complete this exercise, Consult Subsection 9.23.15., "Roof Sheathing". Provide references prompted.

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1. Panel-type roof sheathing to be placed with the face grain orientation:
   a) parallel to the framing with joints supported
   b) perpendicular to the framing
   c) at not more than 45° to the framing members
   d) at not less than 45° to the framing member.

References: _____

2. The expansion gap between sheets of panel-type roof sheathing must:
   a) not be less than 2.0 mm
   b) not be more than 2.0 mm
   c) not be less than 20 mm
   d) not be more than 20 mm

Reference: _____

3. Lumber roof sheathing must not be wider than;
   a) 89 mm
   b) 184 mm
   c) 235 mm
   d) 286 mm

Reference: _____

4. Plywood sheathing, on a flat roof that will be used as a patio with a waterproof vinyl roof and walking deck membrane system that complies with CAN/CGSB-37.54, "Polyvinyl Chloride Roofing and Waterproofing Membrane", when the roof joists are spaced at 406 mm o.c. must have a minimum thickness of:
   a) 15.9 mm with edges unsupported or supported
   b) 15.9 mm with edges supported
   c) 15.5 mm with edges supported
   d) 15.5 mm with edges unsupported or supported

References: _____

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5. A roof has a slope of 1:2. Waferboard roof sheathing (with edges supported), when the roof rafters are at 610 mm o.c., must have a minimum thickness of:

   a) 12.7 mm

   b) 9.5 mm

   c) 11.1 mm

   d) 12.5 mm

References: _____

6. A roof has a slope of 6:12. Lumber sheathing (with ends supported), when the roof rafters are spaced at 610 mm o.c., must have a minimum thickness of:

   a) 17 mm and a maximum width of 286 mm

   b) 17 mm and a minimum width of 184 mm

   c) 19 mm and a minimum width of 184 mm

   d) 19 mm and a maximum width of 286 mm

References: _____

7. A roof, with Code complying asphalt fibreboard sheathing, may support the following type of roofing.

   a) low slope asphalt shingles

   b) built-up roofing

   c) cedar shingles or shakes

   d) 0.33 mm thick galvanized steel sheets

Reference: _____

STOP

79. REQUIRED WALL SHEATHING

Exterior walls and gable ends are to be provided with wall sheathing if the exterior cladding requires:

- ☐ intermediate fastening between framing members,

  or

- ☐ solid backing.
  [Sentence 9.23.16.1.(1)]

_____

_____

_____

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80. THICKNESS, RATING AND MATERIAL STANDARDS FOR WALL SHEATHING

Required wall sheathing must conform to:

- □ Table 9.23.16.2.A., "Wall Sheathing Thickness and Specifications",

  or

- □ Table 9.23.16.2.B., Rating for Wall Sheathing When Applying CSA O325".
  [Sentence 9.23.16.2.(1), see Subsection 1.3.1.]

81. ATTACHMENT OF CLADDING TO WALL SHEATHING

a) The following sheathing materials CANNOT be used for the attachment of siding materials (cladding):

- □ gypsum sheathing,

  and

- □ rigid insulation,

  and

- □ fibreboard.
  [Sentence 9.23.16.3.(1)]

b) Nails used for fastening gypsum wall sheathing, rigid insulation sheathing and fibreboard wall sheathing to framing members must have a:

- □ shank diameter of not less than 3.2 mm,

  and

- □ minimum head diameter of 11 mm.
  [Sentence 9.23.16.3.(2)]

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b) At the header (top) and sill (bottom) of an opening for a fire damper, in a non-loadbearing steel stud wall fire separation with a fire-resistance rating, a runner must be provided (a horizontal member) and bent 90° at each end and extend 300 mm above or below the opening and fastened to the studs at the sides of the opening. [Sentence 9.24.3.7.(2)]

c) The opening for the installation of a fire damper in a non-loadbearing steel stud wall fire separation with a fire-resistance rating, must be lined with 12.7 mm thick gypsum board laid horizontally and fastened to the studs and web of runners. [Sentence 9.24.3.7.(3)]

EXERCISE # 1 - SHEET STEEL STUD WALL FRAMING

To complete this exercise consult Section 9.24., "Sheet Steel Stud Wall Framing". Standard procedures apply and provide code references when asked.

1. 15.9 mm thick gypsum wall board attached to steel studs in an unrated partition with a stud spacing of 406 mm o.c. must be fastened with screws spaced at:

   a) 200 mm o.c. max.

   b) 300 mm o.c. max.

   c) 400 mm o.c. max.

   d) 600 mm o.c. max.

References: _____

2. What is the maximum wall height for an interior non-loadbearing wall built of 30 mm × 63 mm steel studs spaced at 610 mm o.c.?

   a) 2.7 m max.

   b) 3.6 m max.

   c) 4.0 m max.

   d) 4.9 m max.

References: _____

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3. What would be the most economical (smallest size of stud with widest spacing) steel stud size and spacing for an interior non-loadbearing wall 3.5 m high?

   a) 30 mm × 63 mm @ 406 mm o.c.

   b) 30 mm × 63 mm @ 610 mm o.c.

   c) 30 mm × 91 mm @ 406 mm o.c.

   d) 30 mm × 91 mm @ 610 mm o.c.

References: _____

4. What is the minimum metal thickness of steel studs exclusive of any coatings in an interior non-loadbearing and unrated wall?

   a) 0.46 mm

   b) 0.53 mm

   c) 0.69 mm

   d) 0.85 mm

Reference: _____

5. What would be the stud size, thickness and spacing for a non-loadbearing exterior wall 3 500 mm high?

   a) 30 mm × 91 mm × 0.53 mm @ 305 mm o.c. max.

   b) 30 mm × 91 mm × 0.85 mm @ 305 mm o.c. max.

   c) 30 mm × 91 mm × 0.85 mm @ 406 mm o.c. max.

   d) 30 mm × 91 mm × 1.0 mm @ 406 mm o.c. max.

References: _____

6. Top and bottom runners for exterior walls are to be fastened to the structure at a maximum spacing of:

   a) 200 mm o.c. max.

   b) 305 mm o.c. max.

   c) 406 mm o.c. max.

   d) 610 mm o.c. max.

Reference: _____

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All walls, ceilings and floors separating conditioned space from unconditioned space, the exterior air or the ground must be,

a) provided with,

i) thermal insulation conforming to Subsection 9.25.2.,

and

ii) an air barrier system conforming to Subsection 9.25.3.,

and

iii) a vapour barrier conforming to Subsection 9.25.4.,
[Subclause 9.25.1.1.(2)(a)(i) to (iii)]

and

- constructed in such a way that the properties and relative position of all materials conform to Subsection 9.25.5. .
[Clause 9.25.1.1.(2)(b)]

b) Insulation and sealing of heating and ventilating ducts must conform to Sections 9.32 and 9.33.
[Sentence 9.25.1.1.(3)]

EXERCISE #1

For each of the following questions review the presented text and use the applicable Code references to select the correct answer using the multiple-choice method.

1. A summer cottage will be located in Bancroft, Ontario. It must be determined if the requirements of Section 9.25. apply. This determination is based on what condition?

a) Heating Degree Day value for location is less than 5 000

b) The building is intended for use on a continuing basis during the winter months

c) The design is being prepared and provided by an architect

d) The design will be reviewed by an engineer

Reference: _____

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2. For the home described in question #2, the long dimension of low permeable 12.5 mm thick wall sheathing will be applied perpendicular to the wall framing. What installation requirement will insure venting of the framing space and exemption from the requirements of Sentence 9.25.5.1.(1)?

   a) A 2 mm gap between installed sheets

   b) A 1/16 in gap between installed sheets

   c) A 2 mm overlap of installed sheets

   d) A 0.2 mm gap between installed sheets

Reference: _____

STOP

THERMAL INSULATION

2. Required Insulation

All walls, ceilings and floors separating heated space from unheated space, the exterior air or the exterior soil must be provided with thermal insulation in conformance with Section 12.2 to prevent moisture condensation on their room side during the winter and to ensure comfortable conditions for the occupants.
[Sentence 9.25.2.1.(1)]

_____

_____

_____

3. INSULATION MATERIAL STANDARDS

As a general rule, thermal insulation must conform to:

- □ CAN/CGSB-51.25-M, "Thermal Insulation, Phenolic, Faced",
  [Clause 9.25.2.2.(1)(a), see Subsection 1.3.1.]

  or

- □ CGSB-51-GP-27M, "Thermal Insulation, Polystyrene, Loose Fill",
  [Clause 9.25.2.2.(1)(b), see Subsection 1.3.1.]

  or

- □ CAN/ULC-S701, "Thermal Insulation, Polystyrene, Boards and Pipe Covering"
  [Clause 9.25.2.2.(1)(c), see Subsection 1.3.1.]

  or

- □ CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings"
  [Clause 9.25.2.2.(1)(d), see Subsection 1.3.1.]

  or

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EXERCISE #4 PROPERTIES AND POSITION OF MATERIALS IN BUILDING ENVELOPE

1. A home being constructed in Windsor, Ontario has been changed to include an addition of an indoor swimming pool. The wall assemblies of the swimming pook incorporate materials with a water permeance of less than 60 ng/(Pa×s×m^2). High moisture generation will occur and therefore the wall assemblies;?

   a) Are sufficient if all penetrations are sealed,

   b) Shall be designed according to Part 5

   c) Are insufficient and are required to be designed by a qualified person

   d) Must be thermally insulated to Table 2.1.1.2.A.

Reference: _____

30. Position of Low Permeance Materials

Sheet and panel-type materials described in Article 9.25.5.1. must be installed,

a) on the warm face of the assembly

b) at a location where the ratio between the total thermal resistance of all materials outboard of its innermost impermeable surface and the total thermal resistance of all materials inboard of that surface is not less than that required by Table 9.25.5.2., or

c) outboard of an air space that is vented to the outdoors.
[Clauses 9.25.5.2.(1)(a),(b) and (c)]

For walls the air space described in Clause 9.25.5.2.(1)(c) must be drained and ventilated and must be not less than 10 mm deep behind the cladding over the full height and width of the wall.

EXERCISE #5 POSITION OF LOW PERMEANCE MATERIALS

1. A home is being designed for year round residence in Atikokan and utilizes wall sheathing with an air leakage characteristic of 0.09 L/(s×m^2) at 75Pa and water vapour permeance of 50 ng/(Pa×s×m^2). What is the value of the Ratio of Outboard to Inboard Thermal Resistance given for this location and material condition?

   a) 0.20

   b) 0.30

   c) 0.40

   d) 0.35

References: _____

RESOURCE CONSERVATION

Part 12 and Supplementary Standard SB-12 contain the mandatory and enabling energy efficiency requirements of Houses.
[9.25.2.1.(1) → 12.2.1.1.(3)(b) → SB-12]

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Another exception to the general rule for a programmable thermostatic device permits a manual thermostatic control device if it:

- □ controls a heating or cooling system where the heating or cooling capacity is not more than 2 kW,

  or

- □ serves an individual room or space
  [Clauses 12.3.1.3.(3)(a) and (b)]

38. HOT WATER PIPE INSULATION

Hot water pipes that are vertically connected to a hot water storage tank must have heat traps on both inlet and outlet piping as close as practical to the tank, except where the tank,

- □ has an integral heat trap,

  or

- □ serves a recirculating system
  [Clauses 12.3.1.4.(1)(a) and (b)]

The first 2.5 m of hot water outlet piping of a hot water storage tank serving a non-recirculating system must be insulated to provide a thermal resistance of not less than RSI 0.62
[Sentence 12.3.1.4.(2)]

The inlet pipe of a hot water storage tank between the heat trap and the tank serving a non-recirculating system must be insulated to provide a thermal resistance of not less than RSI 0.62
[Sentence 12.3.1.4.(3)]

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39. RESIDENTIAL FURNACES AFTER DECEMBER 31, 2014

For construction for which a permit has been applied for after December 31, 2014, a furnace serving a dwelling unit must be equipped with a brushless direct current motor.
[Sentence 12.3.1.5.(2)]

40. ENERGY SUPPLY FOR KITCHEN AND LAUNDRY FACILITIES AFTER DECEMBER 31, 2014

For construction for which a permit has been applied for after December 31, 2014, in order to supply energy to cooking appliance and clothes dryers, every kitchen and laundry space must be provide with:

- □ an electrical outlet,

  or

- □ a natural gas outlet,

  or

- □ a propane line
  [Clauses 12.3.1.6.(2)(a), (b) and (c)]

41. ENERGY EFFICIENCY FOR FURNACES OF HOUSES

Space heating equipment must conform to:

- □ Article 2.1.1.2. if the House is located in Zone 1 with less than 5 000 heating degree days, [SB-12, Clause 2.1.1.1.(1)(a)]

  or

- □ Article 2.1.1.3. if the House is located in Zone 2 with 5 000 or more heating degree days. [SB-12, Clause 2.1.1.1.(1)(b)]

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The minimum annual fuel utilization efficiency (AFUE) of natural gas and propane furnaces serving Houses must not be less than 90%.
[SB-12, Sentence 2.1.1.1.(13) → Table 2.1.1.1.A.]

Energy efficiency requirements for oil fired furnaces and boilers that were referenced in previous editions of SB-12 (2006 building code compendium) have been removed from the Table 2.1.1.1.A.

Annual Fuel Utilization Efficiency (AFUE) means the ratio of annual output energy to annual input energy, which includes any non-heating- season pilot input loss and, for gas or oil-fired furnaces or boilers, does not include electric energy.
[CAN/CSA-B212-00, Clause 2.1 Definitions]

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- □ except as required in Clauses 2.1.1.2.(10(b) and 2.1.1.3.(8)(a), (b) and (c) and Sentence 2.1.1.2.(11), the minimum efficiency of the drain water heat recovery unit must not be less than 36% when it is tested in accordance with Sentence 2.1.1.11.(3)
  [SB-12, Sentences 2.1.1.11.(1) to (5)]

SAMPLE QUESTION

A House occupied year-round has a basement and a single storey with cathedral ceilings attached to roof joists. It is equipped with electric baseboard heaters and has two air circulation fans hanging from cathedral ceilings. What is the minimum thermal resistance of ceiling insulation if the House was constructed in Kapuskasing?

a) RSI 8.81

b) RSI 2.80

c) RSI 4.40

d) RSI 5.46

SB-12 References: _____

REASON FOR ANSWER

Because the House has electric space heating is located in Zone 2 with 5 000 or more heating degree days, use Table 2.1.1.3.C. Cathedral ceilings associated with roof joists is a style of construction that typically does not have an attic space so select Row 2, Ceiling Without Attic Space" and in Column 2, the RSI value is 5.46. The correct answer is d).

EXERCISE # 7 - LEVELS OF INSULATION FOR HOUSES

To complete this exercise you will have to combine the provisions of SB-12 with Subsection 9.25.2., "Thermal Insulation". Standard procedures apply. Support your choice of answers with Code references.

1. A year round residence is planned for Arnprior. A forced-air furnace with a AFUE of 90% will heat the home. The foundation walls are non-ICF. What is the minimum thermal resistance of insulation required to be installed in the above ground walls when the floor-on-ground is insulated to RSI 0.88?

   a) RSI 4.75

   b) RSI 3.52

   c) RSI 4.23

   d) RSI 2.11

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7. SLOPE OF ROOF SURFACES

a) As a general rule, the slopes on which roof covering may be applied must conform to Table 9.26.3.1., "Roofing Types and Slope Limits".
[Sentence 9.26.3.1.(1)]

ROOF SLOPE TERMINOLOGY

The slope of a roof is expressed as a ratio of a unit of rise to a unit of run. The units of measurement are usually in millimetres. The slope can be expressed as 1 to 3, 1:3 or as shown on the right-angle triangle in the roof illustration. In other words, for every 1 unit of rise you have 3 units of run.

When dealing with the slope of a roof, you are effectively dealing with triangles. In the illustrated gable-end roof, the span of the roof is equal to the width of the building. The run (base of triangle) is equal to 1/2 the span. The rise is measured vertically from the top of the top plate to the top of the ridge board.

If the building in the illustration was 7 200 mm in width, the run would be 7 200 ÷2 = 3 600 mm. We have 3 units of run per 1 unit of rise. So if we have a run of 3 600 mm÷3=a rise of 1 200 mm.

The 1:3 slope could be expressed as an angle by using the trigonometric function of the tangent the angle. The tangent is equal to opposite side divided by adjacent side. In this case, 1÷3=0.3333, and from natural trigonometric tables, the angle would be 18.43° or 18°-26'-05", a very accurate measurement but not very practical for a carpenter on the construction site.

Rather than slope some plans may indicate the pitch of a roof. The pitch is an expression of the rise of the roof over its span. In our illustration, the pitch is 1/6.

For you information and use, the values of the most common roof slopes have been listed as Imperial and Metric ratios. The equivalent angle in decimal notation and in degrees, minutes and seconds and the pitch values are also shown.

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- □ Part 5, "Environmental Separation".
  [Clause 9.27.1.1.(3)(b)]

d) Where asphalt shingles (see Module 24) are installed as cladding on wood-frame walls of Houses exposed to precipitation, such cladding assembly must comply to:

- □ Subsections 9.26.7. and 9.27.2. to 9.27.4.,
  [Clause 9.27.1.1.(4)(a)]

  or

- □ Part 5, "Environmental Separation".
  [Clause 9.27.1.1.(4)(b)]

e) Cladding materials and their installation must comply with Part 5, "Environmental Separation" when the cladding material:

- □ is other than the building materials described in 1. a) to d),

  or

- □ is installed on substrates other than those described in paragraphs 1. a) to d).
  [Sentence 9.27.1.1.(6)]

f) Where an exterior insulation finish system (EFIS) is installed as cladding it must comply with Subsections 9.25.5. for permeance, 9.27.2 to 9.27.4 for protection from precipitation and moisture and with Subsection 9.27.13, the standard CAN/ULC-S716.1, "Exterior Insulation and Finish Systems (EFIS)- Materials and Systems".
[Sentence 9.27.1.1.(5)]

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2. An exterior wall that is exposed to precipitation need not be protected in accordance with Section 9.27. or Part 5 where it can be shown that ingress of precipitation will not adversely the health or safety of the occupants of the building by way of:

   a) a report signed by the holder of a licence, certificate of practice or temporary licence under the *Architects Act*, R.S.O. 1990, c. A.26

   b) a report signed by the holder of a licence or temporary licence under the *Professional Engineers Act*, R.S.O. 1990, c. P.28

   c) an alternative solution

   d) an alternative solution that is deemed by the CBO or RCA, as the case may be, to achieve the level of performance that is required by Division B

References: _____

3. The exterior walls of Houses must be protected from the ingress of precipitation by:

   a) a first plane of protection

   b) a second plane of protection

   c) a first plane of protection or a second plane of protection

   d) a first plane of protection and a second plane of protection

Reference: _____

4. The function of the of the first plane of protection is to:

   a) provide a continuous barrier to air leakage

   b) prevent condensation in the exterior wall space

   c) intercept and effectively dissipate to the exterior any precipitation that gets past the second plane of protection

   d) minimize the passage of rain and snow into the exterior wall assembly

Reference: _____

5. When used as cladding, untreated wood must clear the ground by not less than:

   a) 50 mm

   b) 100 mm

   c) 150 mm

   d) 200 mm

Reference: _____

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6. True or False. The protection from precipitation provided by the first plane of protection must be maintained at all penetrations through exterior walls of Houses and at the interface with other wall assemblies.

   a) True

   b) False

References: _____

STOP

7. ELEMENTS OF THE SECOND PLANE OF PROTECTION FROM PRECIPITATION

a) To dissipate rainwater to the exterior, the second plane of protection must consist of:

   □ a drainage plane with appropriate inner boundary,

   and

   □ flashing.
   [Sentence 9.27.3.1.(1) and Article A-9.27.3.1., Drainage Plane]

_____

_____

_____

b) The inner boundary of the drainage plane must comply with Article:

   □ 9.27.3.2., "Sheathing Membrane Material Standard",

   and

   □ 9.27.3.3., "Required Sheathing Membrane and Installation",

   and

   □ 9.27.3.4., "Insulating Sheathing in Lieu of Sheathing Membrane",

   and

   □ 9.27.3.5., "Sheathing Membranes in Lieu of Sheathing",

   and

   □ 9.27.3.6., "Face Sealed Cladding"

   or

   □ 9.27.13., "Exterior Insulation Finish Systems".
   [Sentence 9.27.3.1.(2)(a) and (b)]

_____

_____

_____

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12. FACE SEALED CLADDING

a) As another exception to general rule № 9. a), the sheathing membrane may be omitted beneath the cladding when the joints in the cladding are formed to effectively prevent the passage of wind and rain.
[Sentence 9.27.3.6.(1) and Article A-9.27.3.6.]

b) When plywood, hardboard, OSB, waferboard or fibre cement provide the face sealed cladding to effectively prevent the passage of wind and rain, such panels must be applied so that:

- □ all edges are directly supported by framing,
  [Clause 9.27.3.6.(2)(a)]

  and the vertical joints between panels

  - □ are sealed and covered with batten,
    [Clause 9.27.3.6.(2)(b) and Subclause 9.27.3.6.(2)(b)(i)]

  or

  - □ are sealed and shiplapped,
    [Clause 9.27.3.6.(2)(b) and Subclause 9.27.3.6.(2)(b)(ii)]

  or

  - □ are sealed and otherwise matched to provide weathertight joints,
    [Clause 9.27.3.6.(2)(b) and Subclause 9.27.3.6.(2)(b)(iii)]

    and the horizontal joints between panels

    - □ sealed and shiplapped,
      [Clause 9.27.3.6.(2)(c) and Subclause 9.27.3.6.(2)(c)(i)]

      or

    - □ sealed and otherwise matched to provide weathertight joints.
      [Clause 9.27.3.6.(2)(c) and Subclause 9.27.3.6.(2)(c)(ii)]

c) Sheet metal siding panels are deemed to effectively prevent the passage of wind and rain by providing faced sealed cladding when the joints between the sheets are of the locked-seam type.
[Sentence 9.27.3.6.(3) and A-9.27.3.6.]

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EXERCISE # 2 - THE SECOND PLANE OF PROTECTION FROM PRECIPITATION

To complete this exercise, consult Articles 9.27.3.1. to 9.27.3.6. Support your choice of answer with Code references.

1. The function of the of the second plane of protection is to:
   a) provide a continuous barrier to air leakage
   b) prevent condensation in the exterior wall space
   c) intercept and effectively dissipate to the exterior any precipitation that gets past the first plane of protection
   d) minimize the passage of rain and snow into the exterior wall assembly

References: _____

2. True or False. The protection from precipitation provided by the second plane of protection must be maintained at all penetrations through exterior walls of Houses and at the interface with other wall assemblies.
   a) True
   b) False

References: _____

3. A sheathing membrane that forms part of the second plane of protection for an exterior wall must comply to:
   a) CAN/CGSB-51.32-M
   b) CAN/CGSB-51.33-M89
   c) CAN/CGSB51.34-M86(amended 1988)
   d) CGSB 37-GP-56M-1985

References: _____

4. True or false. Consider the second plane of protection for a House with brick veneer over wood frame. Wall sheathing panels conforming to Table 9.23.16.2.A. or 9.23.16.2.B., may be omitted provided that at least two layers of sheathing membrane conforming to CAN/CGSB-51.32-M, "Sheathing, Membrane, Breather Type" are used.
   a) True
   b) False

References: _____

EXERCISE # 4 ATTACHMENT OF CLADDING TO PROTECT EXTERIOR WALLS FROM PRECIPITATION

To complete this exercise, consult Subsection 9.27.5., "Attachment of Cladding". Support your choice of answer with Code references.

1. As a general rule, cladding must be fastened by nails or staples, as the case my be, to:
   a) framing members
   b) furring members
   c) blocking between framing members
   d) framing members, furring members or blocking between framing members

Reference: _____

2. Horizontally applied metal siding may only be fastened:
   a) through 14.3 mm thick lumber
   b) to framing or furring members or to blocking between studs
   c) through 12.5 mm thick plywood, OSB or waferboard
   d) through 14.3 mm thick lumber or 9.5 mm thick plywood, OSB or waferboard

Reference: _____

3. Blocking between framing members that is referenced in Sentence 9.27.5.1.(1) must not be less than:
   a) 89 mm × 9.5 mm
   b) than the size of the studs to which they are fastened
   c) 38 mm × 38 mm
   d) 38 mm × 89 mm

Reference: _____

4. Consider wood shingles when the sheathing is 6 mm thick plywood on studs @ 406 mm o.c. Such wood shingles may be attached by fasteners:
   a) to the wood studs
   b) through the plywood provided it is of the exterior type
   c) to furring that is not less than 38 mm × 9.5 mm
   d) to furring members that are not less than 89 mm × 9.5 mm

Reference: _____

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48. EXTERIOR INSULATION FINISH SYSTEM

a) Exterior Insulation Finish Systems (EFIS) must comply to :

- □ CAN/ULC-S716.1, "Exterior Insulation Finish Systems (EIFS)- Materials and Systems", [Clause 9.27.13.1.(1)(a)]

  and

- □ have a geometrically defined drainage cavity with a minimum cavity depth of 6 mm and an open area equal to not less than 13% of the area of a full-size EIFS panel. [Clause 9.27.13.1.(1)(b)]

b) Exterior Insulation Finish Systems not conforming to the above requirements must comply with the requirements of Article 5.10.3.1.
[Sentence 9.27.13.1.(2)]

c) Material used in EIFS wall systems must conform to CAN/ULC-S716.1
[Sentence 9.23.13.2.(1)]

d) The substrate on which EIFS is installed must be compatible with that system and comply with the structural requirements for sheathing materials as set out in Subsection 9.23.
[Sentence 9.27.13.2.(2)]

e) EIFS design shall comply with CAN/ULC-S716.3, "Exterior Insulation Finish Systems (EIFS) – Design Application."
[Sentence 9.27.13.3.(1)]

f) EIFS installation shall comply with CAN/ULC-S716.2, "Exterior Insulation Finish Systems (EIFS) – Installation of EIFS Components and Water Resistive Barrier".
[Sentence 9.27.13.3.(2)]

EXERCISE # 5 - VARIOUS CLADDING TO PROTECT EXTERIOR WALLS FROM PRECIPITATION

To complete this exercise, consult Subsections 9.27.6., "Lumber Siding" to 9.27.12., "Vinyl Siding". Support your choice of answer with Code references.

1. Bevel siding that is 200 mm in width must overlap the lower course by not less than:

   a) 9.5 mm

   b) 12 mm

   c) 12.5 mm

   d) 25 mm

References: _____

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2. The width of shingles and shakes used as cladding:
   a) must not be less than 65 mm
   b) must not be more than 350 mm
   c) must not be less than 65 mm or more than 350 mm
   d) must not be more than 65 mm or less than 350 mm

Reference: _____

3. Plywood panels used as cladding, when applied directly to studs spaced at 610 mm o.c. must not be less than:
   a) 8 mm thick when the face grain is parallel to studs
   b) 6 mm thick when the face grain is at right angle to studs
   c) 11 mm thick when the face grain is at right angle to the studs
   d) 8 mm thick when the face grain is at right angle to the studs

Reference: _____

4. When the studs are spaced at 610 mm o.c., the minimum thickness of Type 5 hardboard cladding applied over sheathing must not be less than:
   a) 6 mm thick at the groove
   b) 7.5 mm thick at the groove
   c) 9 mm thick at the groove
   d) 10.5 mm thick at the groove

References: _____

5. OSB and waferboard panels used as cladding must have all their vertical and horizontal edges supported and treated with:
   a) a primer or sealer
   b) suitable paint or sealer
   c) a primer
   d) a sealer

Reference: _____

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6. Prefinished galvanized steel siding for Houses must conform to:

   a) CAN/CGSB-93.4-92

   b) CAN/CGSB-93.3-M

   c) CAN-CGSB-93.2-M91

   d) CAN/CGSB-93.1-M85

References: _____

7. True or false. Vinyl siding may be fastened to 7.5 mm thick OSB or waferboard as provided by Clause 9.27.5.1.(3)(c) as if it were metal siding.

   a) True

   b) False

References: _____

Reason for decision: _____

_____

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13. PARTICLEBOARD, OSB OR WAFERBOARD INTERIOR FINISH (SUBSECTION 9.29.9.)

Material Standards and Minimum Thicknesses for Particleboard, OSB or Waferboard Interior Finish

a) Particleboard wall finish panels must comply with ANSI A208.1, "Particleboard". [Sentence 9.29.9.1.(1), see Subsection 1.3.1.]

b) OSB or waferboard panels used as interior finish must comply with:

- □ CSA O325, "Construction Sheathing", or
- □ CSA O437.0, "OSB and Waferboard".

[Clauses 9.29.9.1.(2)(a) and (b), see Subsection 1.3.1.]

c) As a general rule, the minium thickness for grade O-2 OSB that is used as an interior finish must comply with the minimum thickness shown for plywood in Table 9.29.6.1., "Thickness of Plywood Interior Finish".
[Sentence 9.29.9.2.(1)]

i) As exceptions to general rule № 13. c):

- □ the minimum thicknesses in Table 9.29.6.1. are permitted to have a manufacturing tolerance of -0.4 mm, and
  [Sentence 9.29.9.2.(2)]
- □ there is no minimum thickness when O-2 grade OSB is applied over continuous backing.
  [Sentence 9.29.9.2.(3)]

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d) The minimum thickness of grade O-1 OSB, grade R-1 waferboard and particleboard is:

- □ 6.35 mm on supports at 406 mm o.c. max.,
- □ 9.5 mm on supports at 610 mm o.c. max., and
- □ 6.35 mm on supports at 610 mm o.c. max. on walls with mid-height blocking between studs.
  [Clauses 9.29.9.2.(4)(a) to (c)]

e) OSB conforming to CSA O325, "Construction Sheathing" must meet the minimum panel mark of:

- □ W16 on supports not more than 406 mm o.c.,
- □ W24 on supports not more than 610 mm o.c., and
- □ W16 on supports at 610 mm o.c. on walls with mid-height blocking between studs.
  [Clauses 9.29.9.2.(5)(a) to (c), see Subsection 1.3.1.]

Nails for Particleboard, OSB or Waferboard Interior Finish

f) Nails for the attachment of particleboard, OSB or waferboard interior finish must be casing or finishing nails that are not less than 38 mm long and spaced at not more than 150 mm o.c. along edge supports and 300 mm o.c. along intermediate supports.
[Sentence 9.29.9.3.(1)]

Edge Support for Particleboard, OSB or Waferboard Interior Finish

g) All edges of particleboard, OSB or waferboard used as an interior finish must be supported by furring, blocking or framing.
[Sentence 9.29.9.4.(1)]

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2. What is the minimum length of casing or finishing nails to fasten plywood interior finish material?

   a) 20 mm

   b) 25 mm

   c) 38 mm

   d) 51 mm.

Reference: _____

3. What is the minimum thickness for hardboard interior finish panels placed directly on studs at 400 mm o.c.?

   a) 3 mm

   b) 6 mm

   c) 9 mm

   d) 11.1 mm

Reference: _____

4. What is the minimum shank diameter of casing nails or finishing nails used for fastening sheets of insulating fibreboard finish?

   a) 2.6 mm

   b) 2.0 mm

   c) 26 mm

   d) 20 mm

Reference: _____

5. The minimum nominal thickness of grade O-2 OSB interior panels on supports spaced at 406 mm o.c. with no horizontal blocking is:

   a) 4 mm

   b) 4.7 mm

   c) 6.35 mm

   d) 9.5 mm

References: _____

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6. The minimum thickness of particleboard placed on wall studs spaced at 406 mm o.c. with mid-height blocking between studs is:

   a) 4 mm

   b) 4.7 mm

   c) 6.35 mm

   d) 9.5 mm

Reference: _____

7. Wall tile finish on walls around bathtubs and showers must be applied to:

   a) Type X drywall backing

   b) asbestos-cement board backing

   c) exterior type plywood backing

   d) moisture resistant backing

Reference: _____

STOP

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Acceptable Materials and Minimum Thickness of Panel-Type Underlay for Flooring

e) Required panel-type underlay beneath finished flooring must not be less than 6 mm thick and conform to:

- ANSI A208.1, "Particleboard",
  [Clause 9.30.2.2.(1)(a), see Subsection 1.3.1.]
- CAN/CGSB-11.3-M, "Hardboard",
  [Clause 9.30.2.2.(1)(b), see Subsection 1.3.1.]
- CSA O115-M, "Hardwood and Decorative Plywood",
  [Clause 9.30.2.2.(1)(c), see Subsection 1.3.1.]
- CSA O121, "Douglas Fir Plywood",
  [Clause 9.30.2.2.(1)(d), see Subsection 1.3.1.]
- CSA O151, "Canadian Softwood Plywood",
  [Clause 9.30.2.2.(1)(e), see Subsection 1.3.1.]
- CSA O153-M, "Poplar Plywood", **or**
  [Clause 9.30.2.2.(1)(f), see Subsection 1.3.1.]
- CSA O437.0, "OSB and Waferboard".
  [Clause 9.30.2.2.(1)(g), see Subsection 1.3.1.]

Fastening of Panel-Type Underlay for Flooring

f) Panel-type underlay for flooring must be fastened to the subfloor at not more than 150 mm o.c. along the edges of the underlay panels and 200 mm o.c. both ways in other locations with one of the following types of fasteners:

- staples,
- annular grooved flooring nails, or
- spiral nails.
  [Sentence 9.30.2.3.(1)]

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d) If grab bars are provided in dwelling units, they must be designed and installed to resist a load of at least 1.3 kN applied vertically or horizontally.
[Sentence 9.31.2.3.(1), see Sentence 9.5.2.3.(1)]

2. WATER SUPPLY AND DISTRIBUTION (SUBSECTION 9.31.3.)

Every dwelling unit shall be supplied with a water distribution system where a drink water system is available. In a dwelling unit with a water distribution systems (see Clause 1.4.1.2.(1)(c) of Division A), piping for hot and cold water must be connected to every:

- □ kitchen sink,
- □ lavatory,
- □ bathtub or shower stall,
- □ shower,
- □ slop sink, and
- □ laundry area,
[Sentence 9.31.3.2.(1)]

and piping for cold water

- □ must be connected to every water closet.
[Sentence 9.31.3.2.(2)]

3. REQUIRED PLUMBING FACILITIES (SUBSECTION 9.31.4.)

a) In a dwelling unit with a water distribution system, the following fixtures must be provided;

- □ kitchen sink,
- □ lavatory,
- □ bathtub or shower,
- □ water closet or drainless composting toilet
[Sentence 9.31.4.1.(1)]

1

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<u>NOTA BENE:</u> When the question is meant to generate class discussions, no answer is suggested

MODULE ONE - INTRODUCTION AND INSTRUCTIONS

The answers to the self-administered quiz are contained at the end of Module One.

MODULE TWO - BASICS OF STRUCTURAL DESIGN REQUIREMENTS

EXERCISE # 1 - STRUCTURAL DESIGN REQUIREMENTS AND APPLICATION LIMITATIONS FOR HOUSES

1. d) Part 4 of the Code using the loads, deflection and vibration limits specified in Part 9 or 4 or good engineering practice such as provided in CWC's "Engineering Guide for Wood Frame Construction"

References: Clauses 9.4.1.1.(1)(b) and (c)

2. c) 1.84 kPa

References: Sentence 9.4.2.2.(1) and Columns 13 and 14 of Table 1.2 of SB-1

3. d) 1.0 kPa

References: Sentence 9.4.2.2.(1) (2) and Columns 13 and 14 of Table 1.2 of SB-1

4. d) 1.56 kPa

References: Sentence 9.4.2.2.(1) and Columns 13 and 14 of Table 1.2 of SB-1

5. d) 1.0 kPa

References: Sentence 9.4.2.2.(1) (2) and Columns 13 and 14 of Table 1.2 of SB-1

6. d) exceeds 6 m

Reference: Sentence 9.4.2.2.(3)

7.

Use of area of floor		minimum UDL	Div. B reference
1	Attic accessible by a stairway	1.4 kPa	Table 4.1.5.3.
2	Attic (dry wall ceiling) with access hatch conforming to Subsection 9.19.2. of Division B and having limited accessibility	0.35 kPa[1]	9.4.2.4.(1)
3	Exterior balcony that serves a single dwelling unit	1.9 kPa or[2] specified design snow load	9.4.2.3.(1)
4	Bedroom areas in Houses	1.4 kPa	Table 4.1.5.3.
5	Floor areas other than bedrooms in Houses	1.9 kPa	Table 4.1.5.3.
6	Stairs within a dwelling unit	1.9 kPa	Table 4.1.5.3.

8. b) 1.9 kPa

References: Sentences 9.4.2.2.(1) and 9.4.2.3.(1) and Columns 13 and 14 of Table 1.2 of SB-1

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9. c) 2.66 kPa if the deck is more than 4.3 m wide
d) 2.25 kPa when the deck is 4.3 m wide or less

References: Sentences 9.4.2.2.(1) and 9.4.2.3.(1) and Columns 13 and 14 of Table SB-1

EXERCISE # 2 - FOUNDATION CONDITIONS FOR HOUSES

1. d) clay and silt

References: Subclause 9.4.4.1.(1)(b)(i) → Table 9.4.4.1. → A-Table 9.4.4.1., "Classification of Soil"

2. c) in the face of the excavation at or near the bottom of the excavation

References: Subclause 9.4.4.1.(1)(b)(i) → Table 9.4.4.1. → A-Table 9.4.4.1., "Classification of Soil"

3. b) order a subsurface investigation and design of footings under Section 4.2.

Code references: 9.4.4.1.(1)(a) → Subclause 9.15.1.1.(1)(a)(i) → 9.4.4.1.(1)(b)(ii) → Section 4.2.

Act reference: Subsection 12(2) or Clause 18(1)(f)

4. d) file details of the material change with the CBO and obtain his/her authorization

Act reference: Subsections 8(12) and (13)

EXERCISE # 3 - SECTION 9.39. PRESCRIBED REINFORCED CONCRETE SLABS FOR HOUSES

1. b) 2.5 m along the shortest dimension of the slab

Reference: Clause 9.39.1.1.(1)(b)

2. c) Grade 400 steel conforming to CAN/CSA-G30.18, "Carbon Steel Bars for Concrete Reinforcement"

References: Sentence 9.39.1.3.(1) and Subsection 1.3.1.

3. b) 125 mm

Reference: Sentence 9.39.1.4.(2)

4. d) 60 mm plus a 12 mm placement tolerance

Reference: Section 9.39. → Paragraph 4. of Section A-9.39.

5. d) that will effectively shed water

Reference: Sentence 9.39.1.4.(5)

MODULE THREE - DESIGN OF AREAS AND SPACES

EXERCISE # 1 - MINIMUM AREA AND MINIMUM HEIGHT OF ROOMS AND SPACES IN DWELLING UNITS

1. b) do not apply to buildings of residential occupancy used or intended to be used as seasonal recreational buildings

References: Sentences 9.5.1.1.(1) and 9.36.2.1.(1)

2. d) as dwelling units on a continuing or year-round basis as the principal residence of the occupant

Reference: Sentence 9.5.1.1.(1)

3. The prescribed minimum areas of rooms and spaces in Section 9.5. may be reduced when it can be shown that the proposed size is made adequate by compensating construction such as built-in furniture.

Reference: Sentence 9.5.1.5.(1)

4. it serves only bedrooms and bathrooms at the end of the hallway furthest from the living area, and
a second exit is provided in the hallway near the end furthest from the living area, or
in each bedroom served by the 710 mm wide hallway

References: Clauses 9.5.10.1.(1)(a) and (b)

5. b) one bedroom or bedroom space in combination with other spaces

Reference: Clause 9.9.1.3.(1)(a)

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9. When a bedroom is involved, the opening between combination rooms:
   - must be the larger of 3 m^2 (32 ft^2) or 40% or more of the wall measured on the side of the dependent area, (that is the one that depends on the other area for natural light and natural ventilation
   - must have direct passage when the dependent area is a bedroom
   - must not have doors or windows in the opening.

References: Sentences 9.5.1.4.(1), (2) and (3)

10. d) at least 1.3 kN applied vertically or horizontally

References: Clauses 9.5.2.3.(1)(a) and (b) → Subclauses 3.8.3.8.(1)(d)(iv) and Clause 3.8.3.13.(1)(f) → Subclause 3.8.3.8.(1)(d)(iv), or Sentence 9.31.2.3.(1)

11. b) swing type and folding doors

References: Sentence 9.5.11.1.(1)

12. c) 810 mm x 1980 mm

References: Sentence 9.5.11.1.(1) and Table 9.5.11.1.

MODULE THREE A - GLASS

EXERCISE # 1- APPLICATION

1. b) apply to the protection of glass

References: Clause 9.6.1.1.(1)(b)

2. d) interior windows and interior doors and their skylights

Reference: Subclause 9.6.1.1.(1)(a)(i)

3. Mirrored doors may be used only at the entrance to clothes closets and conform to the requirements of CAN/CGSB-82.6-M, "Doors, Mirrored Glass, Sliding or Folding Wardrobe.

Reference: Sentence 9.6.1.2.(2)

4. Glass shall conform to CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass or CAN/CGSB-12.11-M, "Wired Safety Glass".

References: Clauses 9.6.1.2.(1)(a) and (g)

5. b) no limit

Reference: Sentence 9.6.1.3.(2), Table 9.6.1.3.

6. b) wired glass

References: Clause 9.6.1.4.(1)(b)

7. b) area of glass and distance glass from bottom of door

References: Sentences 9.6.1.4.(2)

8. When transpartent panels could be mistaken as a means of egress.

References: Sentences 9.6.1.4.(3)

9. d) D-7

References: Sentence 9.6.1.2.(2)

10. d) safety

Reference: Sentence 9.6.1.4.(6)

11. c) wired glass

Reference: Sentence 9.6.1.4.(6)

MODULE FOUR - DOORS

EXERCISE # 1- DOORWAY SIZES AND MANUFACTURING STANDARDS OF DOORS FOR HOUSES

1. a) not more than 100 mm

Reference: Clause 9.8.8.1.(4)(b)

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2.

MARK	Width x Height	Div. B Code reference
	minimum / mm	
D-1(1)	810 x 1 980	9.5.11.1.(1) → Row 1 of Table 9.5.11.1.
D-2(2)	760 x 1 980	9.5.11.1.(1) → Row 6 of Table 9.5.11.1.
D-3 (3)	Unspecified	no reference
D-4(4)	810 x 1 980	9.5.11.1.(1) → Row 2 of Table 9.5.11.1.
D-5	760 x 1 980	9.5.11.1.(1) → Row 6 of Table 9.5.11.1.
D-6	610 x 1 980	9.5.11.1.(1) → Row 4 of Table 9.5.11.1.
D-7	Unregulated	no reference
D-8	610 x 1 980	9.5.11.1.(1)→ Row 3 of Table 9.5.11.1.
D-9	Unregulated	no reference
D-10	Unregulated	no reference

EXERCISE # 2 - MINIMUM THERMAL RESISTANCE OF EXTERIOR DOORS FOR HOUSES

1. c) on enclosed unheated vestibules and cold cellars

SB-12 references: Sentence 2.1.1.1. (2) → 2.1.1.9.(1)

2. d) the overall coefficient of heat transfer, thermal conductance, of a window insert in an exterior type swing door, in a sidelight and in a transom is not regulated.

SB-12 reference: Sentence 2.1.1.1.(9)

3. d) CAN/CSA-A440.2, "Fenestration Energy Performance"

SB-12 references: Sentence 2.1.1.8.(2) → 1.4.1.1.(1)

4. a) not more than 1.6 $W/m^2 \cdot K$

SB-12 references: Clause 2.1.1.1.(1)(b) → 2.1.1.8.(1)(a) → Column 2 of Table 2.1.1.3.A via Column 7 of Table 1.2 of SB-1

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5. a) not more than 1.6 $W/m^2 \cdot K$

SB-12 reference: Clause 2.1.1.1.(1)(b) → 2.1.1.8.(1)(a) → Column 2 of Table 2.1.1.3.C via Column 7 of Table 1.2 of SB-1

6. a) not more than 1.6 $W/m^2 \cdot K$

SB-12 reference: Clause 2.1.1.1.(1)(a) → 2.1.1.8.(1)(a) → Column 2 of Table 2.1.1.2.A via Column 7 of Table 1.2 of SB-1

7. a) not more than 1.6 $W/m^2 \cdot K$

SB-12 reference: Clause 2.1.1.1.(1)(a) → 2.1.1.8.(1)(a) → Column 2 or 3 of Table 2.1.1.2.C via Column 7 of Table 1.2 of SB-1

8. b) not less than 25

SB-12 references: Clause 2.1.1.8.(1)(b) → Column 3 of Table 2.1.1.8.

9. b) not less than 21

SB-12 references: Clause 2.1.1.8.(1)(b) → Column 3 of Table 2.1.1.8.

EXERCISE # 3 - CONTINUITY OF AIR BARRIER SYSTEM

1. a) True

Code reference: Sentence 9.25.3.3.(10)

2. a) caulking

Code reference: Clause 9.25.3.3.(11)(b)

MODULE FIVE - WINDOWS AND SKYLIGHTS

EXERCISE # 1 - MINIMUM UNOBSTRUCTED GLASS AREAS FOR ROOMS IN HOUSES

1. when the space is provided with electric lighting

References: Sentence 9.7.1.2.(1) and Row 1, Col. 3 of Table 9.7.1.2.

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3. c) deduct the area occupied by the frame and sash from the area of the rough opening

Reference and reason: Sentence 9.7.1.2.(1) makes reference to "...minimum window glass area for rooms..." and the heading of Columns 2 and 3 of Table 9.7.1.2. is "Minimum Unobstructed Glass Area"

4. Because the second floor contains bedrooms and does not have a door on the second level that provides direct access to the exterior, the second floor requires at least one egress window that conforms to Article 9.7.1.3.

EXERCISE # 2 - MINIMUM UNOBSTRUCTED GLASS AREAS FOR ROOMS IN HOUSES

1. the openable windows of the MITEC House are not in a dwelling unit that is located above another suite.

Reference: Clause 9.7.1.6.(2)(a)

2. any opening greater than 100 mm × 380 mm are horizontal openings at the top of the said openable window,

   or

   the top surface of the sill of the openable window is located more than 480 mm above the finished floor on one side of the said openable window.

References: Clauses 9.7.1.6.(2)(b) and (c)

3. b) less than 900 mm above the surface of the said stair, ramp or landing

Reference: Sentence 9.7.5.3.(2)

4. a) less than 1 070 mm above the surface of the said stair, ramp or landing

Reference: Sentence 9.7.5.3.(1)

EXERCISE # 3 - PERFORMANCE OF WINDOWS, DOORS AND SKYLIGHTS - GENERAL PERFORMANCE CRITERIA

1. c) resist the ingress of precipitation into interior space,

Reference: [Clause 9.7.3.1.(1)(a)]

2. c) control air leakage,

Reference: [Sentence 9.7.3.1.(3)

3. b) minimize surface condensation on the warm side of the component,

Reference: [Clauses 9.7.3.2.(1)(a)]

EXERCISE # 4 - MANUFACTURING AND INSTALLATION DESIGN STANDARDS OF WINDOWS AND SKYLIGHTS

1. d) Article 9.7.3.1.

2. a) 2.5 mm thick

References: Sentences 9.6.1.3.(1) and A-9.6.1.3.(1) and Table A-9.6.1.3.(1)B

3. d) AAMA/WDMA/CSA101/I.S.2/A440

References: Sentences 9.7.4.1.(1) and 9.7.4.2.(1)

4. d) AAMA/WDMA/CSA101/I.S.2/A440

References: Sentences 9.7.4.1.(1) and 9.7.4.2.(1)

5. d) the windows of the basement and the first storey

Reference: Sentence 9.7.6.1.(1)

6. b) 1.65 m^3/h for each metre of sash crack length

Reference: Sentence 9.7.1.7.(1)

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EXERCISE # 5- MINIMUM THERMAL PERFORMANCE OF WINDOWS FOR HOUSES

1. d) CAN/CSA-A440.2, "Energy Performance Evaluation of Windows and Sliding Glass Doors"

SB-12 References: Sentence 2.1.1.8.(2)

2. a) not more than 1.6 W/m²·K

SB-12 references: Clause 2.1.1.1.(1)(b) → 2.1.1.8.(1)(a) → Column 2 of Table 2.1.1.3.A via Column 7 of Table 1.2 of SB-1

3. c) not more than 1.6 W/m²·K

SB-12 references: Clause 2.1.1.1.(1)(b) → 2.1.1.8.(1)(a) → Column 2 of Table 2.1.1.3.C via Column 7 of Table 2.1 of SB-1

4. a) not more than 1.6 W/m²·K

SB-12 references: Clause 2.1.1.1.(1)(a) → 2.1.1.8.(1)(a) → Column 2 of Table 2.1.1.2.A via Column 7 of Table 1.2 of SB-1

5. c) not more than 1.6 W/m²·K

SB-12 references: Clause 2.1.1.1.(1)(a) → 2.1.1.8.(1)(a) → Column 2 or 3 of Table 2.1.1.2.C via Column 7 of Table 1.2 of SB-1

6. c) not less than 94%

SB-12 reference: Clause 2.1.1.1.(1)(a) → 2.1.1.8.(1)(a) → Column 4 or 5 of Table 2.1.1.2.A via Column 7 of Table 1.2 of SB-1

7. b) not less than 25

SB-12 references: Clause 2.1.1.8.(1)(b) → Column 3 of Table 2.1.1.8.

8. b) not less than 25

SB-12 references: Clause 2.1.1.8.(1)(b) → Column 3 of Table 2.1.1.8.

9. b) not less than 21

SB-12 references: Clause 2.1.1.8.(1)(b) → Column 3 of Table 2.1.1.8.

10. b) not less than 21

SB-12 references: Clause 2.1.1.8.(1)(b) → Column 3 of Table 2.1.1.8.

11. a) not more than 2.8 W/m²·K

SB-12 references: Clause 2.1.1.1.(1)(a) and (b) → Tables 2.1.1.2.A, 2.1.1.2.B, 2.1.1.2.C, 2.1.1.3.A, 2.1.1.3.B and 2.1.1.3.C

EXERCISE # 6 - RATIO OF THE GROSS AREA OF WINDOWS TO GROSS AREA OF PERIPHERAL WALLS

1. a) Gross area of windows = (2×2)+2(1.75×1.5)+3(3×1.5)+(1×1)

   Gross area of windows = 23.75 m²

   Gross area of peripheral walls = 2(2.5×12)+2(2.5×10)

   Gross area of peripheral walls = 110 m²

   23.75 m² is what percent of 110 m² ?

   23.75 = x% × 110,

   23.75 = x × 0.01 × 110

   23.75 = 1.1 x

   x = 23.75 ÷ 1.1

   ∴ the ratio is 21.59%

   or

$$\frac{x\%}{23.75\,m^2} = \frac{100\%}{110\,m^2}$$

   b) The ratio of the gross area of glazing to the gross area of peripheral walls is 21.59% (more than 17% but not more than 22%). Under Sentence 2.1.1.1.(8) and Table 2.1.1.2.A , because the designer has selected Compliance Package D, windows and sliding glass doors would require a coefficient of heat transfer, U-value of 1.8 W/m²·K. In turn, Clause 2.1.1.1.(8)(b) would require the glazing to be upgraded to 1.6 W/m²·K.

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2. a) Gross area of windows = (2×2)+2(1.75×1.5)+3(3×1.5)+(1×1)
+(2.5×1.5)

Gross area of windows = 27.5 m^2
Gross area of peripheral walls = (5×12)+(2.5×12)+2(2.5×10)

+2(½×2.5×10)
Gross area of peripheral walls = 165 m^2
27.5 m^2 is what percent of 165 m^2?
27.5 = x% × 165
27.5 = x × 0.01 × 165
27.5 = 1.65 x
x = 27.5 ÷ 1.65
∴ the ratio is 16.6%
or

$$\frac{x\%}{27.5m^2} = \frac{100\%}{165m^2}$$

b) The ratio of the gross area of glazing to the gross area of peripheral walls is 16.6%. Under Sentence 2.1.1.1.(7) and Table 2.1.1.3.A , because the designer has selected Compliance Package D, windows and sliding glass doors would require coefficient of heat transfer, U-value of 1.6 W/m^2·K.

EXERCISE # 7 - AIR INFILTRATION CHARACTERISTICS FOR WINDOWS AND OTHER FENESTRATION AND CONTINUITY OF AIR BARRIER SYSTEM

1. a) True

Code reference: Sentence 9.25.3.3.(10)

2. d) spray foam insulation

Code reference: Clause 9.25.3.3.(11)(b)

3. a) caulking

Code reference: Clause 9.25.3.3.(12)(b)

MODULE SIX - STAIRS, RAMPS, HANDRAILS AND GUARDS

EXERCISE # 1 - MINIMUM DIMENSIONS OF THE COMPONENT PARTS OF STAIRS AND CLEARANCES IN STAIRCASE

1.

HOUSE -INTERIOR STAIR DETAILS			
	Component Part	**Dimension mm**	**Div. B Reference**
1	max. run, private	355	Table 9.8.4.2. Columns 4 & 5
	min. run, private	210	
2	max. tread depth, private	355	Table 9.8.4.2. Columns 6 & 7
	min. tread depth, private	235	
2(a)	max. reduction of min. tread depth of 235 mm by bevel or curve	15	9.8.4.6.(1)(a)
2(b)	max. reduction of tread depth of 245 to 355 mm by bevel or curve	25	9.8.4.6.(1)(b)
3	max. rise, private	200	Table 9.8.4.2. Columns 2 and 3
	min. rise, private	125	
4	min. tread thickness (1)	25	9.8.9.5.(1)
5	min. stairway width	860	9.8.2.1.(2)
6	min. headroom clearance	1 950	9.8.2.2.(1)(b)

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4. There is no difference, required safety glass for use in doors, sidelights, windows and guards must be of the laminated or tempered type conforming to CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass" or wired glass conforming to CAN/CGSB-12.11-M, "Wired Safety Glass".

References: Clauses 9.6.6.2.(2)(a) and (b), 9.7.3.1.(1)(a) and (g), 9.8.8.7.(1)(a) and (b)

5. If a guard in a House is not in compliance with SB-7, it must be designed to resist the loads specified in Table 9.8.8.2. or the designer must demonstrate that the proposed guard construction will provide effective performance.

References: Sentences 9.8.8.2.(1), (3) and (5)

EXERCISE # 5a - HEIGHT OF WINDOW SILLS ABOVE FLOORS OR GROUND IN HOUSES

1. the openable windows of the MITEC House are not in a dwelling unit that is located above another suite.

Reference: Sentence 9.8.8.1.(6)

2. any opening greater than 100 mm × 380 mm are horizontal openings at the top of the said openable window,

   or

   the top surface of the sill of the openable window is located more than 480 mm above the finished floor on one side of the said openable window.

References: Clauses 9.8.8.1.(6)(b) and (c)

3. b) less than 900 mm above the surface of the said stair, ramp or landing

Reference: Sentence 9.8.8.1.(8)

4. a) less than 1 070 mm above the surface of the said stair, ramp or landing

Reference: Sentence 9.8.8.1.(7)

EXERCISE # 6- CONSTRUCTION OF EXTERIOR STAIRS FOR HOUSES

1. d) comply with Section 9.12.

References: Sentence 9.8.9.2.(3) → 9.12.2.2.(4), with 2 risers are permitted to be laid on ground level, full depth foundations exceed the minimum provisions of the Code

2. The exterior steps serving the secondary entrance at D-2 of the MITEC House would be required to comply with Sentences 9.12.2.2.(1), (2) and (5) if they were of concrete construction, were not cantilevered from the foundation wall and had more than 2 risers.

References: Sentence 9.8.9.2.(3) → 9.12.2.2.(3)

3. a) Part 4, using the loads and deflection and vibration limits specified in Part 4 or 9 or good engineering practice

References: Sentence 9.8.9.2.(2) → Subsection 9.8.10. → Clause 9.4.1.1.(1)(b) and Subclauses 9.4.1.1.(1)(c)(i) and (ii)

4. Cantilevered exterior concrete steps at D-2 of the MITEC House could be designed to be anchored to the concrete foundation wall because the foundation wall is 300 mm thick which exceeds the minimum of 200 mm.

Reference: Sentence 9.8.10.2.(1)

5. d) 32 Mpa with air entrainment of 5 to 8%

References: Clause 9.3.1.6.(1)(a) and Sentence 9.3.1.6.(2)

6. In the case when an additional notice under Division C, Clause 1.3.5.2.(1)(g) is not provided for, it is advisable to have the Plans Examiner make a note about provisions of Sentence 9.8.10.3.(1) of Division B on the set of plans that is given back to the applicant when the permit is issued. This, to bring the potential problem to the attention of the permit holder, see Div. C, Article 1.3.2.2.

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2.

DETAILS OF INTERIOR GUARD FOR STAIRWAY OPENING SERVING A SINGLE DWELLING UNIT			
Ref. № & Component Part		**Dimension**	**Div. B Reference**
1	Openings in required guard must prevent the passage of a spherical object having a diameter of:	100 mm	9.8.8.5.(1)
2	Min. height of interior guard	900 mm	9.8.8.3.(2)
Required guards must be designed so that attachments [1] and openings [1] that could facilitate climbing are not located between:		140 mm and 900 mm above the walking surface	9.8.8.6.(1)

3. b) required

Reference: Clause 9.8.8.1.(1)(a)

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4.

DETAILS OF GUARDS AND HANDRAILS FOR INTERIOR STAIRS SERVING A SINGLE DWELLING UNIT			
Ref. № and Component Part		**Dimension**	**Div. B Reference**
3	Min. height of top of handrail	865 mm	9.8.7.4.(2)(a)
3	Max. height of handrail	965 mm	9.8.7.4.(2)(b)
4	Min. height of guard on flight of steps	900 mm	9.8.8.3.(4)
Openings in required guard must prevent the passage of a spherical object having a diameter of:		100 mm	9.8.8.5.(1)
Required guards must be designed so that attachments and openings that could facilitate climbing are not located between:		140 mm and 900 mm above the walking surface	9.8.8.6.(1)

5. b) required

Reference: Clause 9.8.8.1.(1)(a)

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EXERCISE # 6 - SIGNAGE AND LIGHTING OF A SHARED EXIT IN A HOUSE WITH TWO DWELLING UNITS

1. a) the House has a building height of two storeys and a basement

Reference: Clause 9.9.11.3.(1)(a)

2. d) illuminated continuously

Reference: Sentence 9.9.11.3.(3)

3. b) at all times by a light fixture supplied by an electrical circuit

References: Sentence 9.9.11.3.(4)

4. b) 10 lux

Reference: Sentence 9.9.12.3.(4)

5. c) CSA 22.2 № 141-02

References: Sentence 9.9.12.3.(7)

MODULE EIGHT - FIRE PROTECTION

EXERCISE # 1 - AN INTRODUCTION TO FIRE PROTECTION AND OCCUPANCY CLASSIFICATION FOR HOUSES

1. b) Clause 1.4.1.2.(1)(b) of Division A

2. d) 60 degrees or more to the horizontal

Reference: Sentence 9.10.1.2.(1)

3. b) Part 3 of Division B

Reference: Sentence 9.10.1.3.(1)

4. d) extends more than one storey below ground level or exceeds 600 m^2 in area

Reference: Sentence 9.10.1.3.(3)

5. a) Part 6

Reference: Sentence 9.10.1.4.(2)

6. d) Group C residential

References: Sentence 9.10.2.1.(1) and Row 1 of Table 9.10.2.1.

EXERCISE # 2 - DETERMINATION OF RATINGS AND BUILDING SIZE FOR HOUSES

1. c) CAN/ULC-S102

References: Sentence 9.10.3.2.(1) → 3.1.12.1.(1), see Subsection 1.3.1.

2. d) Table 3.1.1.A. of SB-2

Reference: Sentence 9.10.3.2.(1)

3. a) the underside

Reference: Sentence 9.10.3.3.(1)

4. a) the underside

Reference: Sentence 9.10.3.3.(1)

5. d) up to three or fewer storeys excluding basement

Reference: Div. A, Clause 1.1.2.4.(1)(a)

6. c) both sides

Reference: Sentence 9.10.3.3.(3)

7. b) it is more than 10% of the area of the dwelling unit

Reference: Clause 9.10.4.1.(1)(a)]

EXERCISE # 3 - CONSTRUCTION TYPES AND PERMITTED OPENINGS IN RATED WALL AND CEILING ASSEMBLIES OF HOUSES

1. d) for electrical and similar outlet boxes provided such outlet boxes are tightly fitted in the opening and offset where they occur on each side of the fire separation

References: Sentences 9.10.5.1.(3)

2. b) Section 5.3. of SB-2

Reference: Sentence 9.10.5.1.(4)

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6.

INTERIOR WALL AND CEILING FINISH THAT MAY BE USED TO PROTECT FOAMED PLASTIC INSULATION IN HOUSES	DIV. B, REFERENCE
Plastering	9.29.4.
Gypsum Board Finish with Taped Joints	9.29.5
Plywood Finish	9.29.6.
Hardboard Finish	9.29.7.
Insulating Fibreboard Finish	9.29.8.
Particleboard, OSB or Waferboard Finish	9.29.9.

7. the foamed plastic insulation must have a cross-sectional flame-spread rating of not more than 500,

and

the foamed plastic insulation must be covered on the interior surface with a metallic foil,

and

the door assembly must have a surface flame-spread-rating of not more than 200,

and

the door assembly must not incorporate an air space.

References: Clauses 9.10.17.10.(2)(a) to (c)

EXERCISE # 13 - INSTALLATION OF SMOKE ALARMS IN DWELLING UNITS

1. c) 6 smoke alarms

Reference: Clause 9.10.19.3.(1)(a)

2. In a dwelling unit, one smoke alarm is required to be installed on each floor level and per sleeping room. In the case of the MITEC House, one smoke alarm per floor level would satisfy.

References: Clauses 9.10.19.3.(1)(a) to (b)

3. The Code would require a smoke alarm to be installed inside a bedroom on the second floor level of the MITEC House

Reference: Sub-clause 9.10.19.3.(1)(b)

4. b) in a location between the sleeping room and the remainder of the storey

Reference: Sub-Clause 9.10.19.2.(1)(b)(ii)

5. b) at or near the ceiling and in accordance with the manufacturer's instructions

References: Sentences 9.10.19.3.(3) and 9.10.19.7.(1)

6. Smoke alarms in dwelling units are permitted to be battery operated where the building is not supplied with electrical power; and, during a Part 11 renovation when compliance alternative C175 is used.

References: Sentence 9.10.19.3.(2) and 11.3.1.2.(1) → 11.5.1.1.(2)

7. When more than one smoke alarm is required in a dwelling unit, the smoke alarms must be wired so that the activation of one alarm will cause all alarms within the dwelling unit to sound.

Reference: Sentence 9.10.19.5.(1)

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8. A manually operated device shall be incorporated within the circuitry of a smoke alarm installed in a dwelling unit so that it will silence the signal emitted by the smoke alarm for a period of not more than 10 minutes, after which time the smoke alarm will reset and again sound the alarm if the level of smoke in the vicinity is sufficient to reactuate the smoke alarm.

Reference: Sentence 9.10.19.6.(1)

EXERCISE # 14 - SB-2 FIRE PERFORMANCE RATINGS

2. a) Subsection 2.1.1. of SB-2, "Minimum Equivalent Thickness for Fire-Resistance Rating of Masonry and Concrete Walls"

   b) Subsection 2.3.1. of SB-2, "Minimum Fire-Resistance Rating of Wood and Steel Framed Walls, Floors and Roofs"

   c) Subsection 2.3.3. of SB-2, "Limitations of Component Additive Method for Wood and Steel Framed Walls, Floors and Roofs"

   d) Subsection 2.8.5., "Addition of Plaster top Reinforced Concrete Columns"

   e) Sentence 1.1.2.(1) and Table 1.1.2. of SB-2

   f) Subsection 3.1.7., "Referenced Standards" and Column 2 of Tables 3.1.1.A. and 3.1.1.B.

3. c) 90 minutes

SB-2 reference: Sentence 2.3.1.(1)

4. d) 4 hours

SB-2 references: Sentence 2.1.1.(1), Row 4 and Column 8 of Table 2.1.1.

EXERCISE # 15 - EQUIVALENT THICKNESS

1. a) Volume of voids
= 120mm x 140mm x 190mm x (2)
= 6,384,000 mm^3
SB-2 reference: Sentence 1.6.1.(5)

Gross volume of block
= 390mm x 190mm x 190mm
= 14,079,000 mm^3
SB-2 reference: Sentence 1.6.1.(4)

Net volume of block
=14,079,000 mm^3 - 6,384,000 mm^3
= 7,695,000 mm^3
SB-2 reference: Sentence 1.6.1.(3)

Equivalent thickness of block is
=190 mm x 7,695,000 mm^3 ÷ 14,079,000 mm^3
=104 mm

2. b) 2 h of fire-resistance rating

SB-2 reference: Row 5 and Column 6 of Table 2.1.1.

EXERCISE # 16 - FIRE-RESISTANCE RATING OF A FRAMED WALL ASSEMBLY

1. a) Contribution of gypsum board
15.9 mm Type X gypsum board = 40 min

SB-2 reference: Sentence 2.3.4.(1) and Table 2.3.4.A

   b) Contribution of light steel frame
steel studs at 300 mm o.c. = 10 min

SB-2 reference: Sentence 2.3.4.(1) and Table 2.3.4.C

   c) Contribution of insulation
Rock fibre insulation in steel stud wall = 0 min

SB-2 reference: Sentence 2.3.4.(1) and Table 2.3.4.D.

   d) Fire-resistance rating of assembly = 50 min

ANS

MODULE ELEVEN - DAMPPROOFING, WATERPROOFING AND SOIL GAS CONTROL

EXERCISE # 1 - EXTERIOR DAMPPROOFING OF FOUNDATION WALLS

1. Coved with mortar at the intersection of the projection of the footing with the foundation wall when the first course of block is laid and parged on the exterior surface below finished ground level with not less than 6 mm of mortar conforming to Section 9.20.

References: Clauses 9.13.2.4.(1)(a) and (b)

2. all holes and recesses resulting from the removal of ties must be sealed with cement mortar or dampproofing material (on both the exterior and interior surfaces of the foundation wall).

Reference: Sentence 9.13.2.4.(2)

3. a) over the parging (including the coved portion over the footing) below the finished ground level.

Reference: Sentence 9.13.2.5.(1)

b) over the concrete below the finished ground level.

Reference: Sentence 9.13.2.5.(1)

4. d) CAN/CSA-S406-92, "Construction of Preserved Wood Foundations"

References: Sentences 9.13.2.8.(1) and Subsection 1.3.1.

EXERCISE # 2 - INTERIOR DAMPPROOFING OF FOUNDATIONS WALLS AND FLOORS-ON-GROUND

1. b) is not specified

Reference: None

2. 170 ng/(Pa.s.m^2) or more.

Reference: Sentence 9.13.2.6.(2)

3. a) Not less than 0.15 mm thick polyethylene sheet or type S roll roofing with joints lapped not less than 100 mm.

References: Sentences 9.13.2.7.(2) and (3)

b) No fewer than 2 mopped-on coats of bitumen, not less than 0.05 mm thick polyethylene sheet or another material providing an equivalent performance.

References: Clauses 9.13.2.7.(4)(a) to (c)

4. When the concrete used for the slab-on-ground has a compressive strength of not less than 25 Mpa after 28 days it shall be deemed that the floor-on-ground is dampproofed and a dampproofing material may be omitted from below and above such slab-on-ground.

Reference: Sentence 9.16.4.5.(1)

EXERCISE # 3 - WATERPROOFING OF EXTERIOR OF FOUNDATIONS WALLS AND FLOORS-ON-GROUND

1. parged on the exterior surface below finished ground level with not less than 6 mm of mortar conforming to Section 9.20.

Reference: Sentence 9.13.3.4.(1)

2. all holes and recesses resulting from the removal of ties must be sealed with mortar or waterproofing material (on both the exterior and interior surfaces of the foundation wall).

Reference: Sentence 9.13.3.4.(2)

3. no fewer than 2 layers of bitumen-saturated membrane, with each layer cemented in place with bitumen and coated overall with a heavy coat of bitumen.

Reference: Sentence 9.13.3.5.(1)

4. have a system of membrane waterproofing provided between 2 layers of concrete, with each slab of concrete not less than 75 mm thick and with the floor membrane mopped to the foundation wall waterproofing membrane to form a complete seal.

Reference: Sentence 9.13.3.6.(1)

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5. c) CGSB-37-GP-63M, "Cloth, Glass, Coated, for Membrane Waterproofing Systems and Built-Up Roofing", or "CGSB-37-GP-64M, Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-Up Roofing"

References: Sentence 9.13.3.3.(1) of Code → Subsection 2.1.1. of CAN/CGSB-37.3-M

EXERCISE # 4 - SOIL GAS CONTROL AND SB-9

1. the Town of Elliot Lake in the Territorial District of Algoma, the Township of Faraday in the County of Hastings and the geographic Township of Hyman in the Territorial District of Sudbury.

References: Clauses 9.1.1.7.(1)(a), (b) and (c)

3. a) a course of masonry units without voids or flashing material extending across the full width of the masonry units to effectively seal the voids, and with the course of masonry without voids or the flashing located at the level of the adjoining floor and sealed in accordance with Section 3.3. of SB-9, or ground cover required by Article 9.18.6.1. and sealed to said ground cover, in the absence of a floor.

SB-9 references: Clauses 1.1.(1)(a), (b) and 1.1.(2)(a), (b)

b) not less than 100 mm of coarse clean granular material containing not more than 10% of material that will pass a 4 mm sieve and located near the centre of the floor, the depth of the layer of granular material must be increased to 150 mm for a radius of at least 300 mm centred on the position of the pipe required by Sentence 3.2.(2) of SB-9.

SB-9 and Part 9 References: SB-9 Sentences 3.2.(1) and (3) → Sentence 9.16.2.1.(1)

c) not less than 100 mm in diameter, installed in the vertical position through the concrete floor-on-ground such that the bottom end of the pipe is open to the granular drainage layer and its top end extends above the concrete floor-on-ground to provide for the connection of depressurization equipment.

SB-9 references: Clauses 3.2.(2)(a) and (b)

d) equipped with a removable cap seal and labelled to indicate that it is intended only for the removal of soil gas from below the floor-on-ground. e.g., "Use Only for Soil Gas Removal"

SB-9 references: Sentences 3.2.(4) and (5)

4. HC pub 4171 "Guide for Radon Measurements in Residential Dwellings (Homes) 2008"

SB-9 references: Sentence 3.2.(6) and (8)

5. d) the Chief Building Official or the Registered Code Agency having jurisdiction

SB-9 reference: Sentence 3.2.(7)

6. a subfloor depressurization system must be installed to reduce the radon concentration to a level below 200 Bq/m³ in the normal occupancy area.

SB-9 reference: Sentence 3.2.(9)

7. Article 9.32.3.8. of Division B and measures must be taken to ensure that any resultant decrease in soil temperature will not adversely affect the foundations.

SB-9 references: Clauses 3.2.(10)(a) and (b)

EXERCISE # 5 - INSTALLATION OF SOIL GAS BARRIERS FOR FLOORS-ON-GROUND

1. either below the slab or applied to the top of the slab on condition that when the latter is the case, a separate floor is installed over the concrete floor-on-ground.

SB-9 references: Clauses 3.1.(1)(a) and (b)

2. When the soil gas barrier is installed below the concrete slab on-ground, the joints must be lapped not less than 300 mm and when the soil gas barrier is installed above the concrete slab on-ground, the joints must be sealed.

SB-9 references: Sentences 3.1.(2) and (3)

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3. a sheet or panel type material with an air leakage characteristic not greater than 0.02 L/(s·m2) measured at an air pressure differential of 75 Pa or when polyethylene sheet is used, it must conform to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction".

SB-9 and Part 9 References: Sentence 3.1.(4) of SB-9 → Articles 9.25.3.2. and 9.25.3.3., see Subsection 1.3.1.

4. For a framed floor-on-ground, the joints in a panel type soil gas barrier must be sealed to prevent air leakage

SB-9 and Part 9 References: Sentence 3.1.(4) of SB-9 → Sentence 9.25.3.3.(1)

5. For a framed floor-on-ground, joints in flexible sheet material used as a soil gas barrier must be sealed or lapped not less than 100 mm and clamped between framing members, furring, or blocking and rigid panels.

SB-9 and Part 9 References: Sentence 3.1.(4) of SB-9 → Clauses 9.25.3.3.(2)(a) and (b)

EXERCISE # 6 - SEALING OF CONCRETE FLOOR-ON-GROUND AT ITS PERIMETER AND PENETRATIONS TO RESIST SOIL GAS LEAKAGE INTO THE BUILDING

1. The flexible sealant between the perimeter of a concrete floor-on-ground and the inner face of adjacent foundation walls is to ensure the continuity of the soil gas barrier. The flexible sealant is a caulking material that will remain resilient, is non-hardening and will not shrink or crack.

MODULE TWELVE - DRAINAGE

EXERCISE # 1 - FOUNDATION WALL DRAINAGE

1. when the proponent submits an alternative solution that demonstrates, on the basis of a subsurface investigation carried out by a qualified person, that the groundwater level and soil conditions are such that drainage at the bottom of the foundation wall may be omitted.

References: Div. B, Sentence 9.14.2.1.(1) and Div. A, Subsection 1.2.1. and Division C, Section 2.1.

2. when the foundation wall contains the building interior and insulation of said foundation wall extends to more than 900 mm below the adjacent exterior finished ground level.

References: Sentences 9.14.2.1.(1) and (2)

3. d) such foundation walls are waterproofed

References: Sentence 9.14.2.1.(2) and Clause 9.14.2.1.(5)(b)

EXERCISE # 2 - DRAINAGE AND HOUSES, A REVIEW

2. d) insulated to more than 900 mm below the adjacent exterior ground level

Reference: Clause 9.14.2.1.(2)(a)

3. d) 125 mm of granular material containing not more than 10% of material that will pass a 4 mm sieve

References: Clause 9.14.4.1.(1)(a) and Sentence 9.14.4.2.(1)

4. a) True

Reference: Sentence 9.14.2.1.(1)

5. d) sewer, drainage ditch or dry well

Reference: Sentence 9.14.5.1.(1)

MODULE THIRTEEN - FOOTINGS AND FOUNDATIONS

EXERCISE # 1 - FOOTINGS AND FOUNDATIONS FOR HOUSES - APPLICATION AND CONCRETE

1. b) stable soils, with an allowable bearing pressure of 75 kPa or greater

References: Subclauses 9.15.1.1.(1)(a)(i), (b)(i) and (c)(i)

2. d) Subsections 9.15.2. to 9.15.6. or CSA Z240.10.1, "Site Preparation, Foundation, and Anchorage of Mobile Homes"

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12. b) 105 mm

References: Clause 9.15.3.8.(1)(b)

13. c) 383 mm

Reference: Clause 9.15.3.8.(1)(b)

14. a) True

References: Subclauses 9.15.1.1.(a)(i), 9.15.1.1.(b)(i) and 9.15.1.1.(1)(c)(i)

15. d) max. rise of 600 mm and min run of 600 mm

References: Clauses 9.15.3.9.(1)(a) and (b)

EXERCISE # 4 - FOUNDATION WALLS

1. a) laterally supported at the top

Reference: Clause 9.15.4.3.(2)(c)

2. a) 150 mm

Reference: Sentence 9.15.4.2.(1) → Row 1, Columns 2 and 4 of Table 9.15.4.2.A.

3. a) 150 mm

Reference: Sentence 9.15.4.2.(1) → Row 5, Columns 2 and 4 of Table 9.15.4.2.A.

4. c) 240 mm

Reference: Sentence 9.15.4.2.(1) → Row 11, Columns 2 and 4 of Table 9.15.4.2.A.

5. b) 190 mm

Reference: Sentence 9.15.4.2.(4) → Row 4, Columns 1, 2, 5 and 6 of Table 9.15.4.2.B.

6. b) laterally unsupported at the top

Reference and reason: Clauses 9.15.4.3.(2)(a) to (c), none of the conditions describing lateral support at the top of the foundation wall are present

7. d) 300 mm

Reference: Sentence 9.15.4.2.(1) → Row 4, Columns 2 and 3 of Table 9.15.4.2.A.

8. d) 300 mm

Reference: Sentence 9.15.4.2.(1) → Row 8, Columns 2 and 3 of Table 9.15.4.2.A.

9. e) required to be designed under Part 4

Reference and reason for choice: Sentence 9.15.4.2.(1) → Table 9.15.4.2.B., the height of 1 475 mm between the basement floor and exterior ground level exceeds the values shown in Column 3

10. b) 190 mm

Reference: Sentence 9.15.4.2.(4) → Table 9.15.4.2.B., Row 4, Columns 1, 2, 3 and 4

11. d) at the top and at the bottom

Reference: Sentence 9.15.4.2.(3)

12. a) 140 mm

References: Clause 9.15.4.2.(2)(a) and Subclause 9.15.4.5.(2)(a)(i) → Table 9.15.4.5.A., Row 2, Column 3

13. d) must conform to CAN/CSA-A23.1, "Concrete Materials and Methods of Concrete Construction", with a maximum aggregate size of 19 mm or Part 4, "Structural Design"

References: Sentence 9.15.2.1.(1) → Sentence 9.3.1.1.(4) and Clause 9.3.1.1.(4)(a) and Subsection 1.3.1.

14. b) 10M bars at 380 mm o.c.

Reference: Subclause 9.15.4.5.(2)(a)(i) → Table 9.15.4.5.A. Row 2, and Column 3

15. d) 1-10M bar placed not more than 300 mm from the top of the foundation wall and 10M bars spaced not more than 600 mm o.c.

Reference: Subclauses 9.15.4.5.(1)(a)(i) and (ii)

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16. d) CSA-G30.18, "Carbon Steel Bars for Concrete Reinforcement"

References: Sentence 9.15.2.1.(1) → Subclause 9.3.1.1.(4)(b)(i) and Subsection 1.3.1.

MODULE FOURTEEN - FLOORS-ON-GROUND

EXERCISE # 1 - FLOORS-ON-GROUND FOR HOUSES

1. A bond-breaking material is any construction material such as sand, polyethylene sheet or foamed plastic to name a few, that will prevent the concrete floor-on-ground from binding to the top of the concrete footing or the rock underlying the concrete floor-on-ground.

2. The Designer would need to submit an alternative solution showing that the omission of grading or drainage under a floor-on-ground will provide the level of performance that would otherwise be achieved. This, on the basis of tests such as a subsurface investigation including groundwater conditions or other evaluations.

References: Div. B, Sentence 9.16.3.1.(1) and Division A, Subsection 1.2.1. and Division C, Section 2.1.

3. b) in conformance with Part 4, "Structural Design"

Reference: Sentence 9.16.1.2.(1)

4. d) a wood-framed floor complying with CAN/CSA-S406, "Construction of Preserved Wood Foundations" or designed under Part 4, "Structural Design", and supported by the structure is provided

References: Clause 9.16.1.3.(1)(b)

5. a) 15 MPa

References: Sentence 9.3.1.6.(1) → 9.16.4.5.(2)

MODULE FIFTEEN - COLUMNS

EXERCISE # 1 - COLUMNS FOR HOUSES

1. Where a connection is not prescribed in Part 9, such connections must be designed according to good engineering practice such as provided in the CWC, "Engineering Guide for Wood Frame Construction", or be designed according to Part 4, "Structural Design", using the loads and deflections specified in Part 9, "Housing and Small Buildings" or Part 4.

References: Articles 9.4.1.1. and A-9.4.1.1.

2. The proponent would need to submit an application for the use of an Alternative Solution under Clause 1.2.1.1.(1)(b) of Division A. The documentation of Alternative Solutions under Subsection 2.1.1. of Division C would need to demonstrate that the past performance of the design of lateral support will achieve the level of performance required by Article 9.4.1.1. of Division B.

3. The contravener has two options. Firstly, comply with the order by constructing a new footing at the proper location under the column. Secondly, apply for an Alternative Solution that demonstrates that the foundation system will achieve the level of performance required by Sentence 9.17.2.1.(1).

4. Where a structural member is different is size from what is prescribed in Part 9, such structural member must be designed according to good engineering practice such as provided in the CWC, "Engineering Guide for Wood Frame Construction", or be designed according to Part 4, "Structural Design", using the loads and deflections specified in Part 9, "Housing and Small Buildings" or Part 4.

References: Articles 9.4.1.1. and A-9.4.1.1.

5. a) No. Unless it can be shown under Part 4 that the 107.5 mm top plate will achieve the level of performance provided by a 152 mm wide plate that matches the width of the built-up wood beam.

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MODULE EIGHTEEN - MASONRY AND ICF WALLS NOT IN CONTACT WITH THE GROUND

EXERCISE # 1 - ABOVE-GROUND MASONRY UNITS, MORTAR and MASONRY SUPPORT

1. a) up to 11 m high on the foundation walls

Reference: Subclause 9.20.1.1.(1)(a)(i)

2. b) Sa (0.2) is greater than 0.55

Reference: Sentence 9.20.1.2.(1)

3. c) 10 MPa

References: Sentence 9.20.2.7.(1) → Table 9.20.2.7., Row 1, Column 3

4. d) not permitted in this application

Reference: Sentence 9.20.2.4.(1)

5. b) Type N mortar

References: Sentence 9.20.3.2.(1) → Table 9.20.3.2.A., Row 5, Columns 1 and 3

6. b) 1 part Portland cement, 1 part lime, 4½ to 6 parts fine aggregate by volume

References: Sentence 9.20.3.2.(3) → Table 9.20.3.2.B., Row 4, Columns 2, 3 and 6

7. d) 1 part Type N masonry cement, 2¼ to 3 parts fine aggregate by volume

References: Sentence 9.20.3.2.(3) → Table 9.20.3.2.B., Row 5, Columns 4 and 6

8. d) 20 mm

References: Sentences 9.20.4.1.(1) and (2)

9. d) L-102 mm × 89 mm × 7.9 mm

References: Sentence 9.20.5.2.(1), (2)→ Table 9.20.5.2.A., Row 4 Column 2

10. a) L-89 mm × 89 mm × 6.4 mm

References: Sentence 9.20.5.2.(1), (2) → (3) → Table 9.20.5.2.B., Row 2 Columns 1, 2, 3, and 5

11. b) 2Ls-127 × 89 × 7.9

References: Sentence 9.20.5.2.(1), (2)→ Table 9.20.5.2.A., Row 3 Column 4 for 305 mm thick interior masonry wall → Column 8

12. d) L-127 × 89 × 7.9

References: Sentence 9.20.5.2.(1), (2) → (3) → Table 9.20.5.2.B., Row 4, Columns 1, 2, 3, & 5

EXERCISE # 2 - THICKNESS & HEIGHT, CHASES & RECESSES, SUPPORT OF LOADS, BONDING & TYING, LATERAL SUPPORT, ANCHORAGE OF ROOFS, FLOORS & INTERSECTING WALLS, CORBELLING

1. c) 190 mm

Reference: Sentence 9.20.6.1.(2)

2. c) 6 m

Reference: Sentence 9.20.6.2.(3)

3. c) 70 mm

References: Clauses 9.20.6.3.(2)(b) and 9.20.10.1.(2)(b)

4. a) 70 mm

Reference: Sentence 9.20.6.4.(1)

5. b) 100 mm

Reference: Sentence 9.20.7.2.(2)

6. d) 4-times the wall thickness

Reference: Clause 9.20.7.3.(1)(a)

7. d) solid masonry units not less than 50 mm high

Reference: Sentence 9.20.8.1.(1)

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9. d) CSA A371, "Masonry Construction for Buildings"

Reference: Sentence 9.20.15.2.(1), see Subsection 1.3.1.

10. c) ASTM A123 / A123M and a coating of 610 g/m^2

References: Sentence 9.20.16.1.(1) and Table 9.20.16.1., Row 3, see Subsection 1.3.1.

EXERCISE # - 4 ABOVE-GROUND FLAT ICF WALLS

1. c) 140 mm

Reference: Clause 9.20.17.1.(1)(a)

2. d) 10M bars at not more than 600 mm o.c. vertically

Reference: Subclause 9.20.17.2.(1)(a)(ii)

3. c) 10M bars at not more than 400 mm o.c. horizontally

Reference: Clause 9.20.17.2.(2)(a)

4. d) 1 200 mm of corners

Reference: Sentence 9.20.17.3.(1)

5. d) 1-10M bar at the top and 1-10M bar at the bottom of the opening

Reference: Sentence 9.20.17.3.(3)

6. b) 900 mm

References: Sentence 9.20.17.4.(2)

7. d) of not less than 12.7 mm in diameter and embedded not less than 100 mm into the concrete and spaced not more than 1 200 mm o.c.

References: Clauses 9.20.17.6.(1)(a) and (b) and Sentence 9.20.17.6.(2)

8. d) more than 1 200 mm in width

Reference: Sentence 9.20.17.4.(4)

9. d) 3-82 mm nails, toe-nailed at each truss

References: Sentence 9.20.17.6.(3) → Table 9.23.3.4., Row 19

10. d) staggered 12.7 mm anchor bolts that are not more than 275 mm apart

Reference: Clause 9.20.17.5.(3)(b) → Table 9.20.17.5., Row 4, Columns 1 and 2

MODULE NINETEEN - CHIMNEYS AND FLUES

EXERCISE # 1 CHIMNEY AND APPLIANCE VENTING TERMINOLOGY

1. Appliance, 2. Breeching, 3. Chimney, 6. Flue Collar, 7. Flue Pipe

EXERCISE # 2 MASONRY, CONCRETE AND FACTORY-BUILT CHIMNEYS FOR SOLID-FUEL-BURNING APPLIANCES AND OTHER AUTHORITIES HAVING JURISDICTION IN THE CASE OF GAS, PROPANE AND OIL-BURNING APPLIANCES

1. b) not more than 120 kW

Reference: Clause 9.21.1.1.(1)(a)

2. a) CAN/ULC-S629-M, "650°C Factory-Built Chimneys"

Reference: Sentence 9.21.1.2.(1), see Subsection 1.3.1.

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EXERCISE # 3 CHIMNEY FLUES FOR SOLID FUEL-BURNING APPLIANCES AND APPLIANCES SHARING A CHIMNEY FLUE

1. adequate draft can be maintained for each appliance,

Reference: Sentence 9.21.2.2.(1)

and

the appliances are located on the same storey,

Reference: Sentence 9.21.2.2.(2)

and

the connection for the solid-fuel burning appliance at the chimney is below the connection for the oil-burning appliance,

Reference: Sentence 9.21.2.2.(3)

and

the solid-fuel burning appliance is listed for such installation,

Reference: Sentence 9.21.2.1.(3)

and

the requirements of CSA-B365, "Installation Code for Solid-Fuel-Burning Appliances and Equipment" is complied with,

References: Sentence 9.21.2.1.(3) and 9.21.2.4.(1) → 6.2.1.4.(1), (5) and 9.33.1.2.(1), see Subsection 1.3.1.

and

the installation of the oil-burning appliance complies with its respective installation requirements,

Reference: Sentence 9.21.2.1.(3)

and

the height of a masonry chimney is not more than 12 m and that of a factory-built chimney complies with CAN/ULC-S629-M, "650°C Factory-Built Chimneys"

References: Clause 9.21.1.1.(1)(a) and Sentence 9.21.1.2.(1)

and

in total, the appliances that share a chimney flue have a combined rated heat output of 120 kW or less.

Reference: Clause 9.21.1.1.(1)(a)

2. Area of fireplace opening is 1.5m × 0.82 m = 1.23 m^2. Therefore, a chimney flue with a diameter of 390 mm to 450 mm would be acceptable.

References: Sentence 9.21.2.5.(1) → Table 9.21.2.5.A., Row 9, Columns 1, 2 and 3

3. Area of openings is 2x1.2 m × 0.53 m = 1.27 m^2. Therefore, a chimney flue measuring 400 mm × 400 mm would be acceptable.

References: Sentence 9.21.2.5.(1) → Table 9.21.2.5.B., Row 9 and Columns 1, 6 and 7

4. a) A chimney flue serving a fireplace is prohibited from serving any other appliance.

Reference: Sentence 9.21.2.1.(1)

b) A chimney flue serving an incinerator is prohibited from serving any other appliance.

Reference: Sentence 9.21.2.1.(1)

c) A solid-fuel burning appliance is prohibited from being connected to a chimney flue serving a natural gas-fired appliance.

Reference: Sentence 9.21.2.1.(2)

d) A solid-fuel burning appliance is prohibited from being connected to a chimney flue serving a propane-fired appliance.

Reference: Sentence 9.21.2.1.(2)

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9: Not less than 190 mm, including any firebrick liner less than 51 mm thick

Reference: Sentence 9.22.3.1.(1)

10: Not less than 190 mm

Reference: Sentence 9.22.7.2.(1)

11: Not less than 50 mm thick for the back and sides

Reference: Clause 9.22.2.2.(1)(a)

Not less than 25 mm thick for the floor

Reference: Clause 9.22.2.2.(1)(b)

With joints in firebrick liner offset from the joints in the backup masonry

Reference: Sentence 9.22.2.2.(3)

12. Not less than 140 mm

Reference: Sentence 9.22.7.2.(1)

13. Not less than 50 mm

Reference: Sentence 9.22.9.2.(1)

EXERCISE # 4 - EXISTING MASONRY FIREPLACES AND INSTALLATION OF LISTED FIREPLACE INSERTS AND LISTED HEARTH-MOUNTED STOVES

1. The minimum thickness of solid masonry units and clearances to combustible materials required by the Code are not easily verifiable. Combustion air required by Article 9.22.1.4. may be omitted.

   Verify if, in fact the fireplace has been used: Look for signs of discolouration on the masonry units and firebrick liner and pyrolysis on adjacent combustible materials that can be visually inspected.

MODULE TWENTY-ONE - WOOD FRAME CONSTRUCTION

EXERCISE # 1 - Scope, General and Fasteners

1. d) framing members spaced at not more than 610 mm o.c. and a maximum live load of not more than 2.4 kPa

References: Clauses 9.23.1.1.(1)(b) and (d)

2. d) protection from dampness is not required

Reference: Sentence 9.23.2.3.(2)

3. c) 50 mm

Reference: Sentence 9.23.2.5.(2)

4. b) 2 - 82 mm steel wire or common spiral nail

References: Sentences 9.23.3.1.(1) and 9.23.3.4.(1) → Table 9.23.3.4., Row 1, Columns 1, 2 and 3

5. a) 5 - 82 mm steel wire or common spiral nail

References: Sentences 9.23.3.1.(1) and 9.23.3.4.(1) → Table 9.23.3.4., Top Row 10, Columns 1, 2 and 3

6. b) 3 - 101 mm steel wire or common spiral nail

References: Sentences 9.23.3.1.(1) and 9.23.3.4.(1) → Table 9.23.3.4., Lower Row 9, Columns 1, 2 and 3

7. a) 2 - 82 mm steel wire or common spiral nail at each end

References: Sentences 9.23.3.1.(1) and 9.23.3.4.(1) → Table 9.23.3.4., Row 17, Columns 1, 2 and 3

8. b) 51 mm - 3 / support

References: Sentences 9.23.3.5.(1)and (2) → Table 9.23.3.5., Row 1 Columns 1, 5 and 6

9. d) 51 mm spaced 150 mm o.c. along edges and 300 mm o.c. along intermediate supports

References: Sentence 9.23.3.5.(1). → Table 9.23.3.5., Row 6, Columns 1, 2 and 6

10. a) 1.6 mm with not less than a 9.5 mm crown

Reference: Sentence 9.23.3.5.(2)

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7. d) not permitted unless it is incorporated in the design.

Reference: Sentence 9.23.5.5.(1)

8. a) 12.7 mm diameter bolts @ 2 400 mm o.c. max.

Reference: Sentence 9.23.6.1.(2)

9. a) 38 mm × 89 mm

Reference: Sentence 9.23.7.1.(1)

EXERCISE # 4 - FLOOR JOISTS AND THEIR SUPPORTS

1. c) 89 mm or as described in Tables A-8 to A-11

Reference: Sentence 9.23.8.1.(1)

2. b) 38 mm

Reference: Sentence 9.23.8.3.(1)

3. c) may have butt joints in individual members as long as the butted joints are located within 150 mm of the mid quarter points of the span and as long as not more than ½ of the individual members have a joint in the same span

References: Sentences 9.23.8.3.(3) and (5)

4. a) 12.7 mm diam. bolts spaced at 1 200 mm o.c. max. and located not more than 600 mm from each end of the beam

Reference: Sentence 9.23.8.3.(8)

5. a) 38 mm

Reference: Sentence 9.23.9.1.(1)

6. c) 38 mm × 64 mm

Reference: Sentence 9.23.9.2.(2)

7. b) 19 mm × 64 mm

Reference: Clause 9.23.9.4.(1)(a)

8. c) 38 mm × 38 mm or 19 mm × 64 mm

References: Sentence 9.23.9.4.(2), Clauses 9.23.9.4.(3)(a)(i) and 9.23.9.4.(4)(a)

9. d) not more than 2 100 mm from each support or other row of bridging

References: Sentence 9.23.9.4.(2), Subclause 9.23.9.4.(3)(a)(ii) and Clause 9.23.9.4.(4)(b)

10. a) 1 200 mm

Reference: Sentence 9.23.9.5.(1)

11. c) 800 mm

Reference: Sentence 9.23.9.6.(1)

12. c) doubled joists or blocking

Reference: Sentence 9.23.9.8.(1)

13. b) the floor joists as long as the distance to the support of such joists is not more than 900 mm

Reference: Sentence 9.23.9.8.(5)

14. d) must be sized by calculations

Reference: Sentence 9.23.9.9.(2), see Section 9.4.

15. b) doubled header joist

Reference: Clause 9.23.9.9.(3)(b)

EXERCISE # 5 - Wall Studs, Wall Plates and Framing Over Openings.

1. b) 38 mm × 89 mm @ 610 mm o.c.

References: Sentence 9.23.10.1.(1) → Table 9.23.10.1, Row 5 in Column 2 and Columns 1, 3, 4 and 5

2. a) 38 mm × 89 mm @ 305 mm o.c.

References: Sentence 9.23.10.1.(1) → Table 9.23.10.1, Row 7 lower entry in Column 2 and Columns 1, 3, 4 and (5)

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3. a) 38 mm × 89 mm @ 305 mm o.c.

References: Sentence 9.23.10.1.(1) → Table 9.23.10.1., second Row from the bottom in Column 2 and top entries in Columns 3, 4 and 5

4. d) loadbearing and non-loadbearing interior and exterior walls

References: Subclauses 9.23.10.6.(2)(b)(i) and (ii)

5. b) 38 mm × 64 mm on the flat

References: Clauses 9.23.11.1.(1)(a) and (b)

6. d) if the concentrated loads from the supported members are not more than 50 mm from the supporting stud

Reference: Sentence 9.23.11.3.(3)

7. c) 75 mm × 150 mm × 0.91 mm galvanized steel straps or its equivalent

Reference: Sentence 9.23.11.4.(4)

8. d) a lintel made of two - 38 mm thick members the same width as the wall plates

Reference: Sentence 9.23.12.1.(2)

9. d) residential loads only, where the studs are more than 38 mm × 64 mm in size, and the supported joists span is not more than 4.9 m and supported trusses span not more than 9.8 m

Reference: Sentence 9.23.12.3.(1)

10. d) 2.24 m

References: Sentences 9.23.12.3.(2) and (3)

11. d) 184 mm

References: Clause 9.23.12.3.(2)(b) → 9.23.12.3.(3)(a) → Table A-15, Row 1, Columns 1, 2 and 8, 2-38 × 140 can span 1.93 m → Clause 9.23.12.3.(3)(a), 140 mm + 50 mm = 184 mm

EXERCISE # 6 - Roof and Ceiling Framing.

1. b) if the opening is wider than 2 rafter/joist spacing

Reference: Sentence 9.23.13.2.(1)

2. b) 38 mm

Reference: Sentence 9.23.13.3.(1)

3. d) 50 mm deeper than the common rafters they support

Reference: Sentence 9.23.13.6.(1)

4. c) 1 in 3 or greater

Reference: Sentence 9.23.13.7.(1)

5. d) 2 400 mm

Reference: Sentence 9.23.13.7.(2)

6. a) not less than 45° to the horizontal

Reference: Sentence 9.23.13.7.(4)

7. b) may be omitted if the roof slope is 1 in 3 or steeper

Reference: Sentence 9.23.13.8.(4)

8. b) 5-75 mm

References: Sentence 9.23.13.8.(5) → Table 9.23.13.8., upper values of Row 3, Column 8

9. c) 6

References: Sentence 9.23.13.8.(6) → value in Table 9.23.13.8. + 1

10. d) if a gypsum board ceiling finish is applied to the underside of the joists.

Reference: Sentence 9.23.13.9.(1)

11. c) at least 25 mm deeper than ceiling joists without roof loading

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Reference: Sentence 9.23.13.10.(1)

12. c) L/360

References: Clause 9.23.13.11.(1)(b) → Table 9.23.13.11., Row 2, upper values to Columns 2 and 3

EXERCISE # 7 - Subflooring

1. c) Grade D-2 or D-3 in accordance with ANSI A-2008.1

References: Sentences 9.23.14.2.(1), (2) and (3)

2. a) perpendicular to the direction of the floor joists

Reference: Sentence 9.23.14.4.(1)

3. a) perpendicular to the direction of the floor joists

Reference: Sentence 9.23.14.4.(2)

4. d) 18.5 mm

References: Sentence 9.23.14.5.(1) →Table 9.23.14.5.A., Row 3, Columns 1 and 2

5. c) 1F24

References: Sentence 9.23.14.5.(1) → Table 9.23.14.5.B., Row 3, Columns 1 and 2

6. a) 12.5 mm

References: Sentence 9.23.14.5.(1) → Clause 9.23.14.5.(2)(a)

7. c) 15.5 mm

References: Sentence 9.23.14.5.(1) → Table 9.23.14.5.A., Row 1, Columns 1 and 2

8. c) 15.9 mm

References: Sentence 9.23.14.5.(1) → Table 9.23.14.5.A., Row 1, Column 3

9. b) not less than 45° to the floor joists

Reference: Sentence 9.23.14.7.(1)

10. a) 17.0 mm

References: Sentence 9.23.14.5.(1) → Table 9.23.14.5.A., Row 1 Columns 1 and 5

11. d) 184 mm

Reference: Sentence 9.23.14.7.(3)

EXERCISE # 8 - Roof Sheathing.

1. b) perpendicular to the framing

References: Sentences 9.23.15.3.(1) and (2)

2. a) not be less than 2.0 mm

Reference: Sentence 9.23.15.4.(2)

3. d) 286 mm

Reference: Sentence 9.23.15.5.(1)

4. d) 15.5 mm with edges unsupported or supported

References: Sentence 9.23.15.7.(1) → Table 9.23.14.5.A., Row 1, Columns 1 and 2, see Sentence 9.23.14.3.(1)

5. c) 11.1 mm

References: Sentence 9.23.15.7.(2) → Table 9.23.15.7.A., Row 3, Columns 1 and 4, and Article 9.23.15.6.

6. d) 19 mm and a maximum width of 286 mm

References: Sentence 9.23.15.7.(2) → Table 9.23.15.7.A., Row 3, Columns 1 and 6, and Article 9.23.15.5.

7. d) 0.33 mm thick galvanized steel sheets

Reference: Clause 9.23.15.7.(3)(a)

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EXERCISE # 9 - Wall Sheathing

1. a) 6.0 mm

References: Sentence 9.23.16.2.(1) → Table 9.23.16.2.A., Row 8, Columns 1, 2 and 3

2. b) CSA O437.0-93

References: Sentence 9.23.16.2.(1) → Tables 9.23.16.2.A., Row 5, Columns 1, and 4 and Subsection 1.3.1.

3. c) 38 mm polystyrene, Type 1

Reference: Sentence 9.23.16.3.(1)

4. a) not less than 2.0 mm

Reference: Sentence 9.23.16.5.(1)

MODULE TWENTY-TWO - SHEET STEEL STUD WALL FRAMING

EXERCISE # 1 - SHEET STEEL STUD WALL FRAMING

1. c) 400 mm o.c. max.

References: Clause 9.24.1.5.(1)(a) → 9.29.5.9.(3)(b)

2. b) 3.6 m max.

References: Sentence 9.24.2.1.(1) → Table 9.24.2.1., Row 2, lower entry in Column 3

3. b) 30 mm × 63 mm @ 610 mm o.c.

References: Sentence 9.24.2.1.(1) → Table 9.24.2.1., Row 2, lower entry in Columns 2 and 3 and Column 1

4. a) 0.46 mm

Reference: Sentence 9.24.2.2.(1)

5. b) 30 mm × 91 mm × 0.85 mm @ 305 mm o.c. max.

References: Sentence 9.24.2.5.(1) → Table 9.24.2.5., Row 3, Columns 1, 2 and 3

6. b) 300 mm o.c. max.

Reference: Sentence 9.24.3.1.(2)

7. b) not less than 12 mm

Reference: Sentence 9.24.3.2.(1)

8. d) 12. 7 mm thick gypsum wallboard

Reference: Sentence 9.24.3.7.(3)

MODULE TWENTY-THREE - HEAT TRANSFER, AIR LEAKAGE, CONDENSATION CONTROL, RESOURCE CONSERVATION AND ENERGY EFFICIENCY

EXERCISE #1

1. b) The building is not intended for use on a continuing basis during the winter months

Reference: Sentence 9.25.1.1.(1)

2. a) A 2 mm gap between installed sheets

Reference: Sentences 9.25.5.1.(3) and 9.23.16.5.(1)

EXERCISE # 2 - AIR BARRIER SYSTEMS

1. c) 0.019 L/(s×m^2)

Reference: Sentence 9.25.3.2.(1)

2. a) by extending the air barrier system across the intersection

Reference: Sentence 9.25.3.3.(4)

3. d) Non-combustible material at the second floor ceiling that is taped to the air barrier system and caulked to the vent with high temperature caulking

Reference: Sentence 9.25.3.3.(14)

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4. a) True

References: Sentences 9.25.3.4.(1) and 9.25.4.1.(1)

EXERCISE #3 - Vapour Barriers

1. b) prevent condensation due to water vapour diffusion in a wall space, floor space, attic space or roof space

References: Sentence 9.25.4.1.(1) and definition of vapour barrier in Clause 1.4.1.2.(1)(b) of Division A

2. b) 60 ng/(Pa×s×m^2)

Reference: Sentence 9.25.4.2.(1)

3. a) close to warm side of insulation, to prevent condensation in the assembly

Reference: Sentence 9.25.4.3.(2)

EXERCISE #4 - Properties and Position of Materials in Building Envelope

1. b) Shall be designed according to Part 5

Reference: Sentence 9.25.5.1.(2)

EXERCISE #5 - Position of Low Permeance Materials

1. d) 0.35

References: Note (1) of Table 9.25.5.2. → Col 7 of Table of SB-1, 6100 DD → Row 3 Col. 2, Table 9.25.5.2.

EXERCISE #6 - Energy Efficiency Design

1. b) If the building is intended for occupancy on a continuing basis during the winter months only

Reference: [Sentence 12.2.1.1.(3)]

EXERCISE # 7 - LEVELS OF INSULATION FOR HOUSES

1. c) RSI 4.23

SB-12 References: Clause 2.1.1.1.(1)(a) via Table 1.2 of SB-1 → 2.1.1.2.(1) → Table 2.1.1.2.A, Row 4, Column 2

2. d) RSI 2.10

SB-12 References: Sentence 2.1.1.1.(1) → 2.1.1.5.(1)

3. b) not less than 50 mm above the crawl space floor

Reference: Div. B, Sentence 9.25.2.3.(4)

4. b) in an attic space over a ceiling sloped at 1.5 in 12

Reference: Div. B, Clause 9.25.2.4.(2)(b)

MODULE TWENTY-FOUR - ROOFING

EXERCISE # 1 - ROOFING MATERIALS AND SLOPES

1. a) True

Reference: Sentence 9.26.1.1.(1)

2. b) False

References: Sentences 9.26.1.1.(2) and A-9.26.1.1.(2)

3. c) may be installed in accordance with the methods described in CAN3-A123.52-M

References: Sentence 9.26.1.2.(1), see Subsection 1.3.1.

4. c) CSA A123.1 / A123.5

References: Clause 9.26.2.1.(1)(l), see Subsection 1.3.1.

5. d) 19 mm long, 1.6 mm in diameter with a 25 mm crown

Reference: Sentence 9.26.2.3.(2)

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3. a) CAN/CGSB-51.32-M

References: Sentence 9.27.3.1.(2) → 9.27.3.2.(1) and Subsection 1.3.1.

4. a) True

References: Sentence 9.27.3.1.(2) → 9.27.3.3.(1) → 9.27.3.5.(1)

5. d) an exterior insulating sheathing panel with an integral sheathing membrane is used

References: Sentence 9.27.3.1.(2) → 9.27.3.3.(1) → 9.27.3.4.(1)

6. c) 100 mm

Reference: Sentence 9.27.3.3.(2)

7. a) two layers of sheathing membrane

Reference: Sentence 9.27.3.5.(1)

8. d) need not comply with the minimum thicknesses specified for the wall sheathing materials listed in Table 9.23.16.2.A.

9. a) does not require a sheathing membrane

Reference: Sentence 9.27.3.6.(1)

EXERCISE # 3 - FLASHING AND CAULKING TO PROTECT EXTERIOR WALLS FROM PRECIPITATION

1. c) 0.33 mm thick

Reference: Clause 9.27.3.7.(1)(b)

2. c) wall detail

3. b) wall section

4. d) be compatible with and adhere to the substrate to which it is applied

Reference: Clause 9.27.4.2.(1)(c)

5. a) 5 mm

Reference: Clause 9.27.3.8.(4)(d)

EXERCISE # 4 - ATTACHMENT OF CLADDING TO PROTECT EXTERIOR WALLS FROM PRECIPITATION

1. d) framing members, furring members or blocking between framing members

Reference: Sentence 9.27.5.1.(1)

2. b) to framing or furring members or to blocking between studs

Reference: Sentence 9.27.5.1.(1)

3. c) 38 mm × 38 mm

Reference: Sentence 9.27.5.2.(1)

4. c) to furring that is not less than 38 mm × 9.5 mm

Reference: Sentence 9.27.5.1.(5)

5. c) 19 mm × 64 mm

References: 9.27.5.1.(1) → 9.27.5.3.(2)(a)

6. d) 1-51 mm nail @ 600 mm o.c.

References: Sentence 9.27.5.4.(1) → Table 9.27.5.4., Row 2, Columns 1, 2 and 4

EXERCISE # 5 - VARIOUS CLADDING TO PROTECT EXTERIOR WALLS FROM PRECIPITATION

1. d) 25 mm

References: Sentence 9.27.6.3.(2) → Clause 9.27.6.3.(2)(b)

2. c) must not be less than 65 mm or more than 350 mm

Reference: Sentence 9.27.7.2.(1)

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