

BCCP – Sample Questions Released October 2006

(Includes Sample Questions from 2005 Exam

(Answers on Page 11)

Section A

No Questions Released – see sample questions from 2002–2004 Examinations posted at <http://www.apeg.bc.ca/reg/DesignatedStructuralEngineer.html>.

Section B

MB6. A plan of the high-rise building shown in Diagram B-3 is subjected to full wind load acting on a principal horizontal axis as shown. Assume that the wind load is the same on each of the 2 principal axes. What is the maximum factored torsional wind load for which the building must be designed in accordance with the BC Building Code?

- A. 0.
- B. 4.6 kN-m/m (1 kip-ft/ft).
- C. 12 kN-m/m (2.2 kip-ft/ft).
- D. 8 kN-m/m (1.8 kip-ft/ft).

MB21. In accordance with BCBC 1998 Part 4, loads for design of formwork for concrete shall be in accordance with:

- a) Occupancy loads specified in Table 4.1.6.3.
- b) Requirements of CSA A23.3 ‘Design of Concrete’.
- c) Requirements of CSA S269.3 ‘Concrete Formwork’
- d) Requirements of the Canadian Portland Cement Association.

MB22. In accordance with BCBC 1998 Part 4 Limit States Design, the most unfavourable effect due to live load shall be calculated:

- a) Based upon L, W and T acting simultaneously.
- b) Based upon L acting with W and/or T acting simultaneously.
- c) Based upon L, W and T acting alone or in combination with a factor of 0.70 for any two force effects or 0.60 for all three acting simultaneously.
- d) Based upon L, W and T acting alone or in combination with a factor of 0.67 for any two force effects or 0.50 for all three acting simultaneously.

MB25 In accordance with BCBC 1998 Part 4, the design occupancy loads for garage areas intended for use by light passenger vehicles shall include:

- a) 2.4kPa uniform load in conjunction with a concentrated load of 11kN acting over a 600mmx600mm area.
- b) 2.4kPa uniform load or a concentrated load of 11kN acting over a 750mmx750mm area.
- c) 6.0kPa uniform load in conjunction with a concentrated load of 18kN acting over a 750mmx750mm area.
- d) 6.0kPa uniform load or a concentrated load of 18kN acting over a 750mmx750mm area.

Section C

MC6. A post-disaster multi-storey building with nominally ductile reinforced concrete shear walls has the following inelastic calculated lateral deflections due to seismic loads. The deflections at each level are measured from ground level. Does this building satisfy the code limitations for lateral drift under seismic conditions?

Level 3: 1.8in 46mm
Level 2: 1.13in 29mm
Level 1: 0.55in 14mm

Floor to floor height = 12ft 3600mm.

- A. Yes.
- B. No.

MC40. In a one-storey rectangular masonry building with a concrete roof, the inertia of which elements contribute to the total base shear?

- i) the roof
- ii) the walls parallel to the seismic force
- iii) the walls perpendicular to the seismic force

- A. (i) only.
- B. (i) and (ii) only.
- C. (i) and (iii) only.
- D. (i), (ii) and (iii).

Section D

No Questions Released – see sample questions from 2002–2004 Examinations posted at <http://www.apeg.bc.ca/reg/DesignatedStructuralEngineer.html>.

Section E 10,11

ME10.A 4 storey concrete shear wall building has been designed for an R factor of 2.0. A linear elastic analysis of the shearwall system, using gross concrete sections and the code equivalent static load, indicates that the wall would be subject to a lateral displacement of 50 mm (2") at the roof level.

Assuming the shear wall has a cracked section stiffness of $0.7 I_{gross}$, what is the appropriate ultimate anticipated deflection at the roof level under a design seismic load according to the intent of Clause 21.2.2?

- A. 50 mm (2").
- B. 70 mm (2.9").
- C. 100 mm (4 ").
- D. 140 mm (5.7").

(see page 4 for ME11)

ME11.An engineer was required to evaluate an existing building with a floor-to-floor height of 2.75 m (9'). The lateral stability of the building is provided by a system of 250 mm thick (10" thick) shear wall. All walls are provided with distributed reinforcement of 10M @ 300 mm (12") vertical and horizontal each face and with 25M typical end zone reinforcements tied with 10M @ 150mm (10M @ 6") on centres. Assume tied zones are required.

What is the maximum appropriate R factor to be used for the seismic evaluation of this building?

- A. R = 3.5
- B. R = 2.0
- C. R = 1.5
- D. R = 1.0

Section F

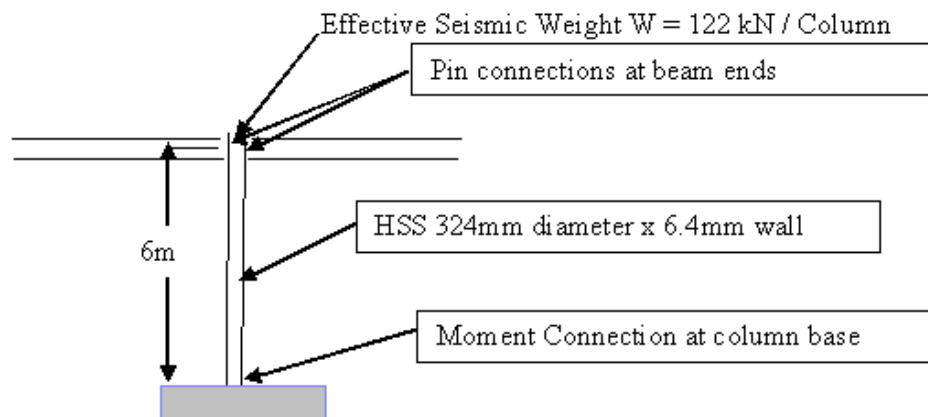
MF25.The introductory clauses of S16.1-01 include requirements for information to be shown on structural drawings. Which of the following is NOT specifically called for to be shown on the structural drawings?

- A. Proposed connections between typical floor elements.
- B. Floor levels and dimensions to column centerlines.
- C. Camber of trusses and beams.
- D. The category of the structural system used as the seismic force resisting system.

MF53. The seismic provisions of the steel code refer to a factor R_y when computing the probable yield stress. For G40.21 350W Class C HSS members used in a brace bay, which would be the appropriate value of R_y ?

- A. 1.1
- B. 1.0
- C. 0.9
- D. The designer must use values obtained from mill tests.

MF54.



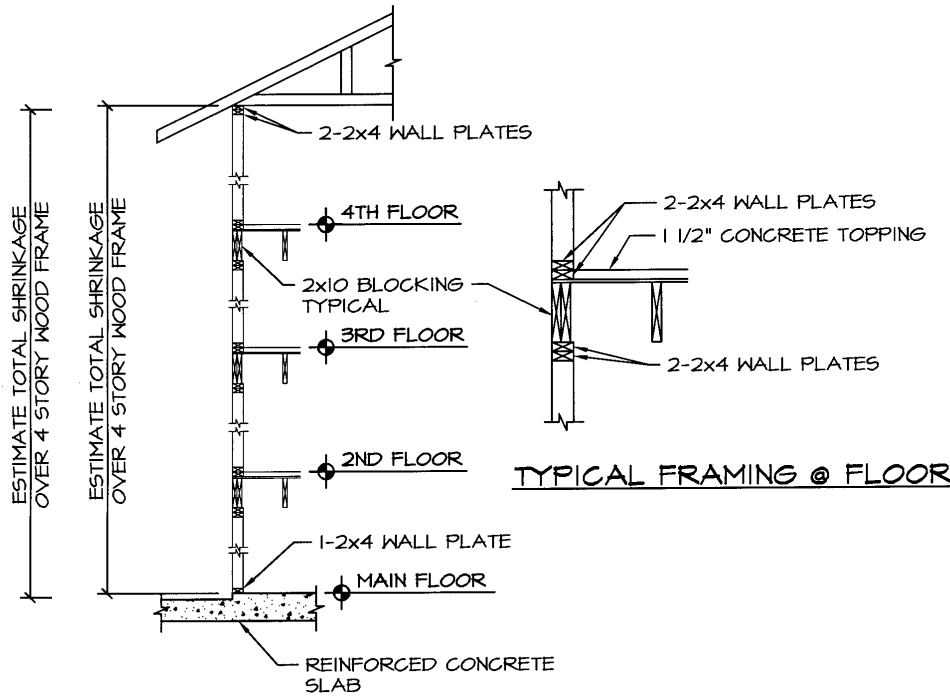
Rather than using a traditional moment frame with moment connected beams, the steel column is cantilevered up from a moment connection at the foundation as shown to act as a bracing element in a low seismic zone in a single storey building.

How would the appropriate seismic moment when designing this type of seismic system be determined?

- A. This is not an acceptable system for resisting seismic loads.
- B. Treat as Limited Ductile (Limited Ductility) Moment Resisting Frame $R=2.0$.
- C. Treat as Cantilevered Column structure $R=1.5$.
- D. Treat as Cantilevered Column structure $R=1.0$.

Section G

Diagram G-1



The shrinkage coefficient “C” can be calculated from

$$C = \frac{\% \text{ shrinkage from Green to Oven Dry}}{\text{Green Moisture content}} \times \frac{1}{100}$$

Assuming a green moisture content of 28% which shrinks 4% radially and 7% tangentially from green to oven dry, the shrinkage coefficient for average radial and tangential shrinkage is $C = 0.002$.

The shrinkage of a wood member can be estimated from

$$S = D \times M \times C \text{ where}$$

- S = shrinkage in inches (mm)
- D = actual dressed dimension in inches (mm)
(thickness or width)
- M = percent of change in moisture change considered
- C = shrinkage coefficient

MG1 Using Diagram G-1, estimate the total shrinkage at the top of the four-storey wood frame building shown if the wood was installed at 19% moisture content and the equilibrium moisture content is 6%.

- A. 19 mm (0.75 inches).
- B. 28 mm (1.10 inches).
- C. 38 mm (1.50 inches).
- D. 51mm (2.00 inches).

MG18. What is the maximum spacing between three or more essentially parallel joists in order that the System Case 2 strength of joists may be used instead of assuming that the joist is a single member?

- A. 406mm (16").
- B. 610mm (24").
- C. 812mm (32").
- D. 1220mm (48").

MG39. A sawn timber beam graded to Beam and Stringer Grade according to Table 5.3.1C is supported on 4 equally spaced posts. Assuming uniformly distributed factored load, W , span L , and elastic beam behaviour, the maximum factored designed bending moment in determining requirements for bending resistance is:

- a) $WL^2/8$
- b) $WL^2/10$
- c) $WL^2/12.5$
- d) $WL^2/11$

MG47. What is the maximum permissible R -value for a building in seismic Zone with $Z_a = 6$, $Z_v = 5$, zonal velocity ratio $v = 0.30$ which combines both plywood and gypsum wall board shear walls to resist the seismic load in the same direction?

- a) $R = 3.0$
- b) $R = 2.0$
- c) $R = 1.5$
- d) $R = 1.0$

Section H

MH25. Under CSA S304.1-94 and A370-94, what is the maximum allowable spacing for brick ties?

- A. 400 mm vertically; 800 mm horizontally.
- B. 600 mm vertically; 800 mm horizontally.
- C. 600 mm vertically; 600 mm horizontally.
- D. 800 mm vertically; 600 mm horizontally.

Answers

Section B

MB6 – C
MB21 – D
MB22 – C
MB25 – B

Section C

MC6 – B
MC40 – D

Section E

ME10 – D
ME11 – C

Section F

MF25 – A
MF53 – A
MF54 – C

Section G

MG1 – C
MG18 – B
MG39 – A
MG47 – B

Section H

MH25 –