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Seismic Structural Design for Part 9 Wood-Frame Buildings

The purpose of this bulletin is to clarify the application of Section 9.4. Structural Requirements in the 2006 BC Building Code, specifically for seismic structural design of Part 9 wood-frame buildings that fall within the scope of Sentence 9.4.2.1.(1). These Part 9 wood-frame buildings have no specified earthquake or wind loads and are not required by the BC Building Code to be designed for lateral loads.

Appendix note *A-9.4.1.1.(3) Structural Design for Lateral Wind and Earthquake Loads* was intended to bring to code users' attention that specific seismic design is indeed not necessary in most cases but may become so in some. This appendix note created some confusion when applied with appendix note *A-9.4.1.1. Structural Design*, resulting in a wide variance of design application and of enforcement by regulators. For this reason, appendix notes *A-9.4.1.1. Structural Design* and *A-9.4.1.1.(3) Structural Design for Lateral Wind and Earthquake Loads* in the 2006 BC Building Code are revised (see attachment).

Sentence 9.4.1.1.(1) provides explicit structural design approaches for Part 9 buildings, including wood-frame buildings. Following any one of the approaches, or a combination of them, would be compliant with the Code's requirements. A recent Building Code Appeal ruling (BCAB #1647) states that it is the choice of the owner/designer to determine which structural design method described in Sentence 9.4.1.1.(1) to use.

Changes to seismic design requirements for Part 9 wood-frame buildings are being proposed for the next edition of the national building code on which the BC Building Code is based. Public review and the opportunity to comment on these proposed changes will begin in September 2008 and can be accessed through www.housing.gov.bc.ca/building.

Attachment: appendix notes *A-9.4.1.1. Structural Design* and *A-9.4.1.1.(3) Structural Design for Lateral Wind and Earthquake Loads* in the 2006 BC Building Code are revised

Revised Appendix Notes A-9.4.1.1. and A-9.4.1.1.(3) in 2006 British Columbia Building Code

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A-9.4.1.1. Structural Design

Article 9.4.1.1. establishes the principle that the structural members of Part 9 buildings must

- comply with the prescriptive requirements provided in Part 9,
- be designed in accordance with accepted good practice, or
- be designed in accordance with Part 4 using the loads and limits on deflection and vibration specified in Part 9 or Part 4.

Whereas it is possible to design and construct a Part 9 building entirely using only one of the three approaches given in Sentence 9.4.1.1.(1), a combination of approaches is usually used and acceptable. For example, as alluded to in Sentence 9.4.1.1.(2), wall framing may comply with the prescriptive requirements in Subsections 9.23.3., 9.23.10., 9.23.11. and 9.23.12., while the floor framing may be engineered.

Design according to Part 4 or to accepted good engineering practice, such as that described in the “Engineering Guide for Wood Frame Construction” (the CWC Guide) published by the Canadian Wood Council, requires engineering expertise.

A-9.4.1.1.(3) Structural Design for Lateral Wind and Earthquake

The only explicit treatment of structural loads in Section 9.4 is for gravity. For Part 9 wood-frame buildings meeting the requirements of 9.4.2.1. (1), wind and earthquake loads (lateral loads) are dealt with implicitly.

The majority of low-rise, wood-frame buildings (such as those meeting 9.4.2.1.(1)) have a great deal of structural redundancy and continuity and have more than enough capacity to resist lateral loads due to wind and earthquake. For example, in a traditional house configuration, even if there are a few large openings in the exterior walls for windows and sliding doors, the many interior partitions act as braced or sheathed wall panels and provide adequate lateral stability. Therefore, in such cases, additional explicit prescriptive requirements for wind and earthquake loads are not necessary.

However, not all Part 9 buildings have configurations or details that will provide adequate resistance to lateral loads. For example, newer houses may have few interior partitions and very large openings in the exterior walls. Mercantile buildings might be long and narrow with almost entirely windowed walls on the ends and few structurally attached interior partitions. The “Engineering Guide for Wood Frame Construction” (the CWC Guide) published by the Canadian Wood Council also identifies situations where the Part 9 prescriptive requirements are

considered to be inadequate for resisting lateral loads. The CWC Guide may be used to provide acceptable engineering solutions that are alternative to Part 4.

Many buildings have been constructed, and some still are, with the lowest level exterior walls as short, wood-frame knee- or pony-walls. In the past, these were often constructed with no lateral bracing and with no interior partitions. See Figure A-9.4.1.1. (3)B. Storeys with knee-walls should be considered as storeys for the purpose of determining building height and the application of the Part 9 structural requirements.