Guidelines

for

Professional Structural Engineering Services

for

Part 9 Buildings

in

British Columbia

V3.0

Association of Professional Engineers
and Geoscientists of British Columbia

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PREFACE

The *Guidelines for Professional Structural Engineering Services for Part 9 Buildings* (Guidelines) were prepared by the Executive of the Structural Engineers Association of British Columbia (SEABC). The SEABC advises the Council of *APEGBC* on matters related to the practice of structural engineering in British Columbia.

The Building Codes Committee and the Consulting Practice Committee of the APEGBC also provided input to these guidelines which were adopted by the Council of APEGBC. APEGBC is committed to maintaining the high quality of the services *APEGBC professionals* provide to their *clients* and the public. *APEGBC professionals* are professionally accountable for their work under the *Engineers and Geoscientists Act*, which is enforced by APEGBC.

The intent of the guidelines is to establish standards of practice that *APEGBC Professionals* should follow to fulfill their professional obligations, especially in regard to their primary duties to protect the safety, health and welfare of the public; to protect the environment; and to promote health and safety within the workplace. Failure to meet the intent of these guidelines could be evidence of unprofessional conduct and lead to disciplinary proceedings by *APEGBC*.

APEGBC supports the principle that *APEGBC professionals* should receive fair and adequate compensation for professional services, including the services provided to comply with these guidelines. Low fees are not a justification for services that do not meet the standards set out in these guidelines. *APEGBC professionals* may wish to discuss these guidelines with their *clients* when receiving instructions for scope of services and reaching agreements regarding compensation.

DEFINITIONS

The following definitions are specific to these guidelines. All references in the text to these terms are italicized.

APEGBC Professional
A registered member, a licensee or the holder a limited licence of the Association of Professional Engineers and Geoscientists of British Columbia (*APEGBC)*.

Authority Having Jurisdiction (AHJ)
The local government body with the authority to administer and enforce the applicable *Building Code*.

Building Code
The *British Columbia Building Code* (*BCBC*), *Vancouver Building Bylaw* (*VBBL*) or the *National Building Code of Canada* (*NBCC*).

Client
The party who owns the building or is formally acting as the ownerôs representative.

Coordinating Registered Professional
Coordinates the design documents and field reviews of all applicable registered professionals for the duration of the project and coordinates the submission of the *LoAs* of the various registered professionals. The *coordinating registered professional* could be an architect or an engineer.

Letters of Assurance (LoAs)
Administrative forms required by Division C Part 2 of the applicable *Building Code* before permits are issued. The forms certify to the *AHJ's* that appropriate professionals have been retained and that engineering calculations have been performed in accordance with *Part 4* ï structural design (where required)

Part 9 Buildings
Buildings which fall under the definition of Part 9 as identified in the applicable *Building Code*.

Primary Structural System
The combination of elements which support the building's self weight and the applicable live load based on occupancy, use of the space and environmental loads such as wind, snow and seismic forces.

Secondary Structural Elements
Elements that are structurally significant for the function they serve but do not contribute to the overall strength or stability of the *primary structural system*. Examples of *secondary structural elements* are: prefabricated glazing systems, cladding, and seismic restraints for architectural, mechanical and electrical elements.

Specialty Structural Elements
Structural elements which are designed by the specialty *structural engineer*. These elements, normally fabricated off-site, may require specialized fabrication equipment or a proprietary fabrication process not usually available at the job site (for example open web steel joists, wood

trusses, combination wood and metal or plywood joists, precast concrete elements, and other prefabricated structural components).

Structural Engineer
An *APEGBC professional* who is responsible for the design, structural integrity, and preparation of documents for a particular *secondary structural element* and/or a *specialty structural element*. There may be several *structural engineers* working on a *Part 9 building* but only one *SER.*

Structural Engineer of Record (SER)
The *APEGBC professional* with responsibility for the structural integrity of the *primary structural system* and for substantial conformance of the *secondary structural elements* and *specialty structural elements* with the *primary structural system* and for evaluating the effects of *secondary structural elements* on the *primary structural system*.

1.0 INTRODUCTION

These guidelines apply to the practice of structural engineering for buildings, or parts of buildings or renovations to existing buildings, governed by Part 9 of the *building code*. Considerations which municipalities or *AHJs* may have in relation to the practice of *APEGBC professionals* are also discussed. The guidelines set out the general standards of professional practice that *APEGBC professionals* should follow.

APEGBC professionals must exercise professional judgment when providing professional services; as such, the application of the guidelines can vary depending on the circumstances. The guidelines may be used to assist *APEGBC professionals* in establishing the scope of services and the contract terms with their *clients*.

1.1 KEY ISSUES FOR *PART 9 BUILDINGS*

The three key issues that should not be overlooked in the design of *Part 9 buildings* are:

- **Potential Inability of Some Modern *Part 9 Buildings* to Adequately Resist Lateral Forces due to Earthquake or Wind**

  The prescriptive provisions of Part 9 provide for the pre-engineered design of structural components to resist gravity loads ï e.g. floor joist span and wall stud spacing ï and also lateral loads (braced wall panels) due to earthquakes or windstorms. Those prescriptive requirements, however, may not adequately address the design of some modern buildings with open layouts, few interior walls, high ceilings with large floor openings, and significantly interrupted exterior wall framing, many windows or very large doors.

- **Part 4 Components in *Part 9 Buildings***

  Some structural components of *Part 9 buildings* need to be designed to Part 4 of the *building code*. These components need to be properly supported and integrated into the overall building. Whenever any component designed to Part 4 is required, the *AHJ* may require *LoAs* along with the application for a building permit.

  The component designer may not be able to provide *LoAs* if he or she is not also designing the structural support and integration of the components into the overall building. This latter function is normally performed by an *SER*; however, the owner or developer may not have retained an *SER*.

  The initial absence of an *SER* on a project may lead to:

  (a) Issues with the support and integration of the Part 4 components into the overall building;
  (b) delays in the application for a building permit pending the appointment of an *SER*; or
  (c) potential late changes to the design of the building.

- **Alterations, Rehabilitation, Renovations or Repairs to Existing *Part 9 Buildings***

  Sections 1.1.1.2 and 2.2.1.1 of the *building code* prescribe that when a building is altered, rehabilitated, renovated or repaired, or when there is a change in occupancy, the level of life safety and building performance must not be decreased below a level that already exists; however, the lateral load resistance of a building may be affected by increasing the size of the openings in the floors, walls or roof elements as part of a renovation or addition. The net effect may be difficult to evaluate for a *Part 9 building* since there may not have been any explicit lateral load design for the existing building.

1.2 PERMITTING REQUIREMENTS FOR *PART 9 BUILDINGS*

The permitting requirements for *Part 9 buildings* may vary significantly from one *AHJ* to the next. These variations may relate to some of the above issues, and:

(a) The variation in seismic or wind hazards across the province.

(b) The fact that the *LoAs* for structural design are preferably provided by the *SER.*

It is recommended that *APEGBC professionals* check with the *AHJ* for the latest requirements before starting work on a *Part 9 building* project. Some municipalities may in fact always require the engagement of an SER.

2.0 QUALIFICATIONS AND RESPONSIBILITIES OF THE *APEGBC PROFESSIONAL*

2.1 QUALIFICATIONS

The Code of Ethics of APEGBC states, in part, that members and licensees shall*:*

> *"undertake and accept responsibility for professional assignments only when qualified by training or experience."*

It is APEGBC's position that an *APEGBC professional* who has suitable training or experience in this field of practice is appropriately qualified for the services covered in these guidelines. An *APEGBC professional* with the *Structural Engineer* ("Struct.Eng.") designation is not required for the services covered in these guidelines.

Where an *APEGBC professional* is called to perform an independent review of a structural design, the independent reviewer must be an *APEGBC professional* with appropriate experience with the type of structure being reviewed. The level of experience required for a specific structure will depend on the risk presented by the structure and the complexity of the structure. The independent reviewer's experience must be sufficient to critique concepts and identify deficiencies in structures with complexity equal or greater than the structure being reviewed. Experienced *APEGBC professionals*, in the commercial building sector, suggest a minimum of six years experience with a particular structural system would be appropriate for most projects in that field.

2.2 STRUCTURAL DESIGN OF NEW BUILDINGS AND *LETTERS OF ASSURANCE*

APEGBC professionals may be involved in the structural design of *Part 9 buildings* in two different ways:

(a) As a *structural engineer* designing a *secondary structural element*, a *specialty structural element*[1] (e.g. roof trusses), or, an independent part of the building not covered by the prescriptive requirements of Part 9 (as required by the *building code*).

(b) As the *SER* responsible for the *primary structural system.* Note that current provincial legislation does not mandate the engagement of an *SER* for *Part 9 buildings; h*owever, an *SER* is often required to provide the appropriate *LoAs*.

Even if there are several *APEGBC professionals* working on different Part 4 components of a *Part 9 building,* this does not automatically mean that one of them is acting as the *SER*. This can be problematic. The lack of an *SER* could contribute to a lack of clarity concerning professional responsibilities as follows:

2.2.1 Situation with an *SER* formally engaged on the project:

- The *SER* coordinates the design of the various Part 4 *specialty structural elements* to make sure that they are designed consistently.

[1] Note: Some pre-engineered specialty components such as manufactured beams may not require design by a *structural engineer* provided that the design is covered by manufacturer's literature as referenced in the product evaluation report prepared by the Canadian Construction Material Centre.

- Each of the specialty *structural engineer* designers of the Part 4 *specialty structural elements* would normally submit a Schedule S (APEGBC 2005: Bulletin K) to the *SER.*
- The *SER* would review the shop drawings for the *secondary structural elements* and the *specialty structural elements* to make sure that they are properly accommodated into the *primary structural system* and to make sure that there is a complete load path to the foundation.
- The *SER* would sign and seal the *LoAs* to the *AHJ* (Note: In this case, the procedure for *Part 9 buildings* is the same as for Part 3 buildings).
- Scopes of work and professional responsibilities are clear. The *SER* works with the specialty *structural engineer* designers to establish the site-specific loads and design criteria and coordinates with the specialty *structural engineer* designers to achieve a *primary structural system* that meets acceptable engineering standards.

2.2.2 Situation Without an *SER* Formally Engaged on the Project:

- There is no proper recipient for the Schedule S (Schedule S is a certification from a component designer to the engineer of record in the same discipline - in this case the *SER* (APEGBC 2005: Bulletin K).
- Schedule S is not a substitute for a *LoA* because Schedule S has no status in the *building code*.
- *AHJ*s may still require *LoA*s because they generally cannot accept the responsibility of checking that designs of buildings or components have been carried out in accordance with Part 4*.*
- In the absence of an *SER*, the *specialty* or *secondary structural element structural engineer* designer of a Part 4 component may be asked by the *AHJ* to sign a *LoA* instead of a Schedule S.
- The *specialty* or *secondary structural element structural engineer* designer of the Part 4 component may not be able to sign a *LoA* on the basis that this would require a significant change to his or her scope of work. Note that as a rule, no changes of the wording on the *LoAs* are permitted (APEGBC 2005: Bulletin K). As a result, a *structural engineer* signing a *LoA* generally has to sign for anchorage and seismic restraint.
- There may be a delay in the processing of the building permit due to the issues concerning (a) whether *LoAs* are required, and, (b) who can properly sign such a *LoA*.
- The *AHJ* may delay the issuance of an occupancy permit upon completion of construction due to the lack of a *LoA* from the *SER*.
- If there is no *SER*, no *LoA* and no Schedule S, there is an increased risk that some aspects of the structural design may not be properly coordinated.

2.2.3 Should Designers of Part 4 Components Sign *Letters of Assurance*?

The question arises as to whether one of the *structural engineer* designers of the Part 4 components should at some stage review the drawings for the overall structure, or for the support of the component, thus performing some or all of the functions of an *SER* as a prelude to signing *LoAs*. If, however, the drawings for the supporting structure are not

formally part of an *APEGBC professional's* scope of work, then the *APEGBC professional* does not have control over these drawings in terms of the final details. A significant change in scope may be required and a *specialty* or *secondary structural element structural engineer* designer may not wish to take on this extra scope e.g. on the basis that his or her scope of practice and expertise is limited to roof trusses and not the design of complete buildings.

A *structural engineer* designing Part 4 components may refuse to sign *LoAs* on the basis that they are not the *SER*. APEGBC supports this position, because, in the absence of an *SER*, it is very difficult for a *structural engineer* to sign a *LoA* for the structural aspects of a Part 4 component without taking on some of the responsibilities of an *SER*.

2.2.4 Definition of Scope for New Buildings

APEGBC professionals taking on the *SER* function and signing *LoAs* for a new building should clearly identify their scope in their contacts and discussions with the c*lient*. They should also specify that they are obligated to design to good engineering practice with regard to wind and seismic design of the overall structure (see Section 3.1).

APEGBC professionals designing only specialty or secondary Part 4 components should explicitly exclude the *SER* function from their scope of work. Further, in excluding the *SER* function, each *structural engineer* component designer should recommend to the *client* that an *SER* be engaged at the start of the project for at least four reasons:

(a) to make sure that the Part 4 structural components are properly supported and connected to the *primary structural system*,

(b) to make sure that non-structural components are also properly supported and connected to the *primary structural system*,

(c) to make sure that there are no administrative delays associated with the initial lack of an *SER* to sign *LoAs*, and,

(d) to avoid the possibility of unexpected changes to the design or layout of the building as may be dictated by an *SER* engaged at a later stage of the project to review and take responsibility for the overall design.

2.3 RENOVATIONS OR ADDITIONS

APEGBC professionals should be aware that an existing *Part 9 building* may have been designed using only the prescriptive requirements of Part 9 and there may not have previously been *any* professional engineer taking responsibility for the *primary structural system*.

To avoid giving the impression that they are taking responsibility for the design of the overall structure unless that is their specific intention, *APEGBC professionals* should clearly define their scope of services to their *clients* involving the renovation or addition to an existing *Part 9 building*. Unless the renovation is extensive, it may be difficult or impossible to certify the design of the existing structure due to coverings or finishes.

3.0 PROFESSIONAL PRACTICE FOR NEW AND EXISTING BUILDINGS

3.1 DESIGN TO GOOD ENGINEERING PRACTICE

APEGBC professionals are required to design in accordance with good engineering practice. For *Part 9 buildings*, this means that the vulnerability of the *primary structural system* to gravity and lateral loads should be evaluated and mitigated as necessary. Sentence 9.4.1.1(1)(b) and Subclause 9.23.13.1(1)(b)(iii) of the *building code* states that structural members and their connections must be designed according to good engineering practice, such as the Canadian Wood Council (CWC) 2009, *"Engineering Guide for Wood Frame Construction"*. *APEGBC professionals* designing *Part 9 buildings* are therefore required to apply the CWC 2009 as a minimum standard of practice for gravity and lateral loads.

If the building, or part of the *primary structural system*, is not of wood frame construction, an *APEGBC professional* must design in accordance with Part 4 of the *building code*.

3.2 EFFECT OF GEOTECHNICAL CONDITIONS ON SEISMIC EVALUATIONS OR CALCULATIONS

Part C of the CWC 2009 does not mention requirements based on soil conditions; however, Part B of the CWC 2009 contains requirements based on an assumed acceleration-based site coefficient Fa. Since soil conditions can impact the structural design, *APEGBC professionals* are cautioned to use an appropriate Fa value. Where questions arise about the soil bearing capacity or the seismic loading of foundations, APEGBC recommends the *SER* retain, or have his or her *client* retain, the expertise of a geotechnical engineer.

3.3 DESIGN OF PART 4 *SPECIALTY STRUCTURAL ELEMENTS*

The design of Part 4 *specialty structural elements* for a *Part 9 building* is generally no different from the design of Part 4 *specialty structural elements* for a Part 3 building with the following exceptions:

- The load, deflection and vibration criteria may be reduced in accordance with Part 9.
- If there is no *SER* initially engaged on the project, the designer of the Part 4 *specialty structural elements* may have to deal with some additional coordination with *clients*, *AHJs*, and the designers of other Part 4 *specialty structural elements* (see Section 2.2.2).

A *structural engineer* designing a *specialty structural element* should not convert his or her scope of work to that of an *SER* without due diligence. If no *SER* has been engaged previously, it is likely that the *primary structural system*, at that stage, has only conformed to the prescriptive requirements of Part 9. In that case, an *APEGBC professional* converting his or her scope of work to *SER* may find that the layout/design does not meet the requirements for good engineering practice (see Section 3.1). This could mean that the *APEGBC professional* will need to make significant changes to the design or the layout.

3.4 RENOVATIONS AND ADDITIONS

An existing building may have been designed using only the prescriptive requirements of Part 9. Nevertheless, there may be inherent lateral load resistance if the building uses a

traditional wood frame layout (CWC 2009). However, a major renovation or addition could significantly weaken or overload the very elements that give more traditional *Part 9 buildings* their inherent resistance to wind or earthquake loads (e.g. uninterrupted walls, or floor or roof diaphragms).

Generally the renovation or addition should be designed to current standards and the modifications should not weaken the existing building. Clause 1.1.1.2, Division A ï Part 1 of the *British Columbia Building Code 2012* gives direction in this matter and reads as follows:

> *"1.1.1.2 Application to Existing Buildings*
> *1) Where a building is altered, rehabilitated, renovated or repaired, or there is a change in occupancy, the level of life safety and building performance shall not be decreased below a level that already exists."*

The *structural engineer* can conform to the *building code* philosophy by ensuring that the design and construction plans for an addition or renovation to a *Part 9 building* are such that one of the following rational schemes is explicitly selected:

a) The addition or renovation is structurally independent from the existing building and does not interact with the existing building to resist lateral loads. In this case, the addition or renovation does not weaken the existing structure and the addition or renovation conforms to Section 3.1 of these guidelines.

b) The addition is connected to the existing structure such that the *entire structure* conforms to Section 3.1 of these guidelines. In this case, the existing structure needs to be evaluated and strengthened - where required.

c) The addition is connected to the existing structure but designed such that its own lateral load resistance meets the full requirements of Section 3.1 of these guidelines as if the addition were isolated new construction. This option should only be selected if the addition does not diminish the lateral load resistance of the existing structure.

d) The addition is connected to the existing structure but designed so that the lateral resistance of the addition is at least equal to the lateral resistance of any portion of the existing structure that is removed to create the addition. Further, the addition does not increase the lateral forces carried by the intact elements of the existing structure by more than 5%. In this case, the engineer provides an explicit calculation or note to demonstrate that he or she is satisfied that the 5% criterion has been met. The addition should be connected appropriately to the existing structure to provide any replacement resistance that is required.

For each addition or renovation, it is recommended that the *structural engineer* document which of the above schemes has been selected. This information should be retained in the project files.

3.5 OBSERVATION OF DEFICIENCIES

In carrying out their specific structural engineering services, *APEGBC professionals* may become aware of a significant deficiency in other aspects of the building that involves the practice of professional engineering. In such instances, the engineer must act in a

fashion which is consistent with the intent of the APEGBCõs Code of Ethics, APEGBC Bylaw 14(a), specifically (9) which states that *APEGBC professionals* must:

> *"report to their association or other appropriate agencies any hazardous, illegal or unethical professional decisions or practices by members, licensees, or others"*

On this basis, the *APEGBC professional* observing a significant deficiency in other aspects of the building has a duty to report it to the owner or their representative. If the owner or their representative does not respond appropriately, then the observing *APEGBC professional* must inform the APEGBC and the *AHJ* of the significant deficiency.

A particular issue for *Part 9 buildings* occurs when an *APEGBC professional* engaged to carry out *any* structural engineering services for an existing structure notes that the *primary structural system* likely does not meet the standard for good engineering practice in terms of the lateral load resistance. In that case, the *APEGBC professional* should verbally inform the *client* of the risk with the structure in accordance with APEGBCõs Code of Ethics, specifically (8) which states that *APEGBC professionals* must:

> *"present clearly to employers and clients the possible consequences if professional decisions or judgments are overruled or disregarded*ò

If the *client* does not wish to proceed with any actions to mitigate the risk then it is recommended that the *APEGBC professional* express their concerns in writing, and, note that he or she cannot take responsibility for the *primary structural system*. It is recommended that in such communication the *APEGBC professional* note that all *APEGBC professionals* are obligated to design in accordance with good engineering practice.

3.6 INFORMATION TO BE PROVIDED

To assist *AHJs* and others in who may, in the future, refer to the specifications and drawings for a single- and two-family *Part 9 building*, *APEGBC professionals* should include the following information on their design documents:

- the method used in the design, either
    - Part B or Part C of CWC 2009, or
    - Part 4 of the applicable *building code*.
- notes regarding the applicable requirements of the applicable *building code* to the design, including but not limited to:

    General
    - climatic loads, such as snow (Ss), rain (Sr), wind (q), seismic (Sa);
    - live loads ï floors and roofs;
    - dead loads of floors and roofs indicating the types of material used, such as roof tile, concrete topping, and others as applicable;
    - dead loads of architectural components (e.g. cladding, chimneys, canopies) with unusual loading;

- specification and standards for sheathing, lumber, fasteners, steel connectors, hold-downs and anchor bolts ï where a standard specification is applicable, it is sufficient to indicate ñwhere applicableò to indicate that not all components are used in the design; and
- assumed soil bearing capacity ï where soil report is available, reference the soil report.

For Part B or Part 4

- assumed site classification;
- acceleration-based site coefficient, Fa and Fv;
- Rd, Ro coefficients;
- shearwall details including framing, type of sheathing, nailing size and spacing, blocking; and
- details of all elements participating in the load path including drag struts, hold-downs, straps, etc. to show how forces are transferred from roof to foundation.

For Part C

- bracewall details including framing, type of sheathing, nailing size and spacing, blocking;
- percentage (%) of bracewall panels in each braced wall band at each floor level; and
- anchorage of bracewall panels including material, size and spacing.

APEGBC professionals should be aware of the preferences or mandatory requirements that *AHJs* may have with respect to the type and presentation of information to be included in the submissions they receive.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

An *APEGBC professional* must carry out appropriate quality assurance/quality control (QA/QC) during all phases of professional engineering services on *Part 9 buildings*.

4.1 APEGBC QUALITY MANAGEMENT REQUIREMENTS

APEGBC professionals are obligated to abide by the quality management requirements of the APEGBC bylaws. To meet the intent of the requirements when providing structural engineering services on a *Part 9 building*, *APEGBC professionals* must establish and maintain a documented quality management processes for their practices which must include as a minimum:

- The application of the relevant APEGBC Professional Practice Guidelines [Act, s. 4.1(2)(b) and Bylaw 11(e)(4)(h)]
  - An *APEGBC professional* must have sufficient broad-based experience in these guidelines and any other relevant APEGBC guidelines such as the *APEGBC Guidelines for Structural Engineering Services for Building Projects*.

- Retention of complete project documentation [Bylaw 14(b)(1)]
  - An *APEGBC professional* must apply the *APEGBC Quality Management Guidelines – Retention of Project Documentation*

- Regular, documented checks using a written quality control process [Bylaw 14(b)(2)]
  - An *APEGBC professional* must apply the *APEGBC Quality Management Guidelines – Documented Checks of Engineering and Geoscience Work.*

- Documented field reviews of projects during implementation or construction [Bylaw 14(b)(3)]
  - An *APEGBC professional* must apply the *APEGBC Quality Management Guidelines – Documented Field Reviews During Implementation or Construction.*

- Documented independent review of structural designs [Bylaw 14(b)(4)]
  - An *APEGBC professional* must apply the *APEGBC Quality Management Guidelines – Documented Independent Review or Structural Designs* provides guidance on this process.
  - Some conventional, wood frame, one- and two-family dwellings fall entirely within the prescriptive requirements of Part 9 of the *Building Code* and do not necessarily require the involvement of an *APEGBC professional*. Where the structural design of a one- or two-family dwelling is based on Part 9, and includes a design for lateral resistance which conforms to the prescriptive requirements in Part C of the CWC 2009, an independent review of the design is not required. Where the CWC 2009 lateral resistance evaluation indicates that a structural design conforming to Part B of the CWC 2009 or Part 4 is required, an independent review is required.

- Authentication of documents by the application of the *APEGBC Professional's* seal [Act, s.20(9)]
  - The *APEGBC professional* must apply the *APEGBC Quality Management Guidelines – Use of the APEGBC Seal*
  - The *APEGBC professional* must apply his or her seal to estimates, specifications, reports, documents, plans or things that have been prepared in his or her professional capacity or under his or her direct supervision.

- Professional engineering activities can only be delegated by the *APEGBC professional* to subordinates if the *APEGBC professional* provides direct supervision of that subordinate [Act s. 1(1)]
    - If certain aspects of the structural engineering services, such as field reviews, are delegated to subordinates, they must be carried out under the direct supervision of the *APEGBC professional*. The *APEGBC professional* assumes full responsibility for all work so delegated.

5.0 REFERENCE DOCUMENTS

- *British Columbia Building Code* (*BCBC* 2012)
- *National Building Code* (*NBCC* 2010)
- Engineering Guide for Wood Frame Construction Published by the Canadian Wood Council (CWC 2009)
- *Vancouver Building Bylaw* (*VBBL 2007* ï *VBBL 2012* to supersede when in effect)
- City of Vancouver Bulletin 2001-011-BU, Seismic Design of One and Two Family Dwellings, Revised April 19, 2007
- City of Vancouver Bulletin 2003-001-AD/BU, Guidelines for Seismic Evaluations of One and Two Family Dwellings, Revised April 19, 2007
- APEGBC Guidelines for Structural Engineering Services for Building Projects
- APEGBC (2005) Bulletin K: Letters of Assurance and Due Diligence including Appendix A ï Specialty Engineer ï Assurance of Professional Design and Field Review (Schedule S).