



Professional Engineers
and Geoscientists of BC

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Professional Practice Guidelines

Building Enclosure Engineering Services

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ARCHITECTURAL INSTITUTE OF BRITISH COLUMBIA

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1.0 DEFINITIONS

The following definitions are specific to these Guidelines. These defined words and terms are italicized within the text of the Guidelines. If the definition is based on the *British Columbia Building Code* then this is indicated within the definition by including (*BCBC*) at the end of the definition. Explanatory notes regarding the specific application of the definition for the purpose of the Guidelines may also be provided.

AIBC

The Architectural Institute of British Columbia.

AIBC/APEGBC Building Enclosure Agreement

Refers to *AIBC* and *APEGBC* document “Points of Principle, Building Envelope Professional” (April 18, 2001), subject to the “Memorandum of Agreement between *APEGBC* and *AIBC*” (April 2, 1996).

APEGBC

The Association of Professional Engineers and Geoscientists of British Columbia.

Architects Act

The Architects Act [RSBC 1996] c. 17.

ASHRAE

The American Society of Heating, Refrigerating and Air-Conditioning Engineers.

authority having jurisdiction (AHJ)

Means the governmental body responsible for the enforcement of any part of the *building code* or the official or agency designated by that body to exercise such a function. (*BCBC*)

BCBC

The *British Columbia Building Code*.

building code

Includes the *British Columbia Building Code*, the *City of Vancouver Building By-law*, and the *National Building Code*.

building enclosure

Includes materials, components and assemblies as defined in Article 5.1.2.1 of the *building code*; *building enclosure* is synonymous and can be used interchangeably with ‘building envelope’.

building enclosure engineer (BEE)

A *member* who focuses his or her practice in the field of *building enclosure* engineering and is qualified to do so as described in these Guidelines.

client

The party who contracts with a *BEE* for the provision of *building enclosure* engineering services by the *BEE*.

construction documents

Include all the plans and supporting documents such as engineering and architectural *design drawings* and *specifications*.

constructor(s)

The contractor(s), sub-contractor(s) and trade contractor(s) responsible for the construction of a building.

coordinating registered professional (CRP)

Means a *registered professional* retained to coordinate all design work and *field reviews* of the *registered professionals* required for the project. (*BCBC*)

design drawings

Drawings (except *record drawings*, see below), including supplemental sketches or drawings, prepared by a *registered professional* at any stage of a building project. *Design drawings* submitted for building permitting, must be signed, sealed and dated by the *registered professional* who assumes overall responsibility for the design.

direct supervision

Means the responsibility for the control and conduct of the engineering or geoscience work of a subordinate.

enhanced building envelope services

Refers to services provided by a *BEE*, and mandated by an *AHJ*, to address *building enclosure* performance issues as acceptable solutions relating to Sections 5.4, 5.5 and 5.6 of the *Building Code*. *Enhanced building envelope services* must be provided in a manner consistent with *AIBC/APEGBC* Bulletin 34: Building Envelope Services – Appropriate Professional Practice.

Engineers and Geoscientists Act

The *Engineers and Geoscientists Act* [RSBC 1996] c. 116.

field reviews

Means a review of the work

- a) at a project site of a development to which a building permit relates, and
- b) where applicable, at fabrication locations where building components are fabricated for use at the project site

that a *registered professional* in his or her professional discretion considers necessary to ascertain whether the work substantially complies in all material respects with the plans

and supporting documents prepared by the *registered professional* for which the building permit is issued. (*BCBC*)

letters of assurance

Legal accountability documents under Section 2.2.7 in Part 2 of Division C of the *British Columbia Building Code 2006* and the City of Vancouver *Building By-Law No. 9419*. Otherwise known as *Schedules A, B, C-A and C-B*, are See most recent edition of ‘Guide to the Letters of Assurance in the B.C. Building Code 2006’. See *schedule*.

local regulations

Local building by-laws or other regulations applicable to the *AHJ*.

maintenance

The actions taken periodically to sustain a desired or required level of performance; *maintenance* includes cleaning, minor *repairs*, replacement of smaller components and activities that limit the deleterious effects to the *building enclosure*.

member

Means a registered member of the *APEGBC*. Where appropriate for the purposes of these Guidelines, *member* also includes an *APEGBC* engineering licensee, or the holder of an *APEGBC* limited licence in engineering with an appropriate scope specified in the limited licence.

Model Schedules D and C-D

Alternate accountability documents to be used when *AHJs* are mandating *enhanced building envelope services*. They are not *letters of assurance*. *Model Schedules D and C-D* are provided as part of the *AIBC/APEGBC* Bulletin 34: Building Envelope Services – Appropriate Professional Practice.

owner

Means any person, firm or corporation controlling the property under consideration during that period of application of the *building code*. (*BCBC*) The *owner* is often different (e.g. the developer) when a building is being designed and constructed, than after the building construction is complete and is being used for its intended purpose (e.g. a strata corporation).

primary structural system

The combination of elements that supports the self-weight of a building and the applicable live load based on occupancy, use of the spaces and environmental loads such as wind, snow and seismic forces.

record drawings

Drawings prepared as a record to document what was constructed. The types of information provided vary, but can include measurements, elevations, sizes or notes added to the *construction documents*. They are typically prepared by the *constructor*.

registered professional

Means a person who is registered or licensed to practise as an architect under the *Architects Act*, or a person who is registered or licensed to practise as a professional engineer under the *Engineers and Geoscientists Act*. (BCBC)

registered professional of record (RPR)

Means a *registered professional* retained to undertake design work and *field review* in accordance with the *building code*. (BCBC)

rehabilitation

The process of undertaking a program of comprehensive and systemic reconstruction of the *building enclosure* assemblies and details, so that it can fulfill its originally intended functions. *Rehabilitation* projects are most often initiated because of premature failure.

renewal

The process of undertaking a program of systemic reconstruction or replacement of aged elements of the *building enclosure*. *Renewal* projects are very similar in scope to *rehabilitation* projects but are not associated with premature failure; rather, the work is needed due to normal wear and aging associated with an element reaching the end of its *service life*.

renovation

The process of undertaking improvements or changes to the *building enclosure* as a part of a more general program for the building related to changes in functional, performance or occupancy requirements rather than premature failure or the need for *renewal*.

repair

The process of undertaking the reconstruction or replacement of specific elements of the *building enclosure* so that it can fulfill its originally intended functions. Unlike *rehabilitation*, a *repair* is undertaken because of a premature failure but is non-systemic and, therefore, focussed on one specific aspect of the construction, or is localized to one area of a building.

schedule

Accountability document, in the form of a schedule, to be submitted by *registered professionals of record* as required by the *building code*. See *letters of assurance*.

secondary structural element

A structural design element that is structurally significant to the function it serves but does not contribute to the overall strength or stability of the *primary structural system*. Examples can include fastening and strength of curtain wall systems, frames of other types of glazed assemblies, steel stud infill panels, various claddings, roof anchors, guardrails, most sheathing within wall assemblies, and seismic restraints for architectural, mechanical and electrical design elements.

service life

The actual period of time that any element performs its intended function(s) without *rehabilitation, renewal, or repair* associated with premature failure, but with periodic *maintenance*.

specifications

A written description of the materials, standards of quality, minimum performance requirements, and construction requirements for design elements of a building project.

submittal

Items required by the *construction documents* to be submitted by the *constructor* to the *CRP*, such as requests for payment, progress reports, shop drawings, materials samples, manufacturer's literature, concrete mix designs, aggregate gradation reports, schedules, etc. A *submittal* is used to communicate how the *constructor* intends to specifically meet the intent of the *construction documents*.

supporting registered professional (SRP)

A *registered professional* who provides services to support the *registered professional of record* for a particular component or sub-component of a discipline. See *APEGBC Bulletin K: BCBC - Letters of Assurance in the BC Building Code and Due Diligence*, September 2010. Also see *AIBC/APEGBC Practice Note 16: Professional Design and Field Review by Supporting Registered Professionals*.

supporting schedule

Accountability document – such as Schedule S-B or Schedule S-C of *AIBC/APEGBC Practice Note 16: Professional Design and Field Review by Supporting Registered Professionals* – used by a *supporting registered professional* in support of a *registered professional of record*.

2.0 INTRODUCTION

- 2.0.1 In 1999, the Council of the Association of Professional Engineers and Geoscientists of the Province of British Columbia (*APEGBC*)¹ adopted the first version of “Guidelines for Professional Practice Building Envelope Professional Engineer”. Members of the Building Envelope Committee of *APEGBC* reviewed the 1999 document and other relevant documents, such as *AIBC*’s Bulletin 34, endorsed by *APEGBC*, and produced this current document.
- 2.0.2 These Guidelines form part of *APEGBC*’s ongoing commitment to maintaining the quality of services that its *members* provide to their *clients* and the public. Professional engineers and professional geoscientists are professionally accountable for their work under the *Engineers and Geoscientists Act*, which is administered by *APEGBC*.

2.1 Purpose of the Guidelines

- 2.1.1 These Guidelines set out the standards of practice that a *building enclosure engineer (BEE)* must generally follow and meet when providing *building enclosure* engineering services for building projects. See Section 2.3.
- 2.1.2 These Guidelines also address typical project organization and responsibilities of the various stakeholders; quality assurance/quality control; and professional registration and education, training and experience.
- 2.1.3 Building enclosure expertise is shared with architects, so these Guidelines provide some guidance regarding this shared responsibility for various types of building projects.

2.2 Scope of the Guidelines

- 2.2.1 These Guidelines apply to the practice of *building enclosure* engineering; in particular, this practice includes the requirements of Part 5, 9 and 10 (*BCBC* only) of the applicable *building code* as well as *local regulations*.
- 2.2.2 A *BEE* must exercise professional judgment when providing services. The application of these Guidelines will vary depending on the circumstances; however, the services must not vary significantly from the overall intent of these Guidelines See section 2.3.
- 2.2.3 These Guidelines can be used to assist in establishing the objectives, scope of professional services, level of effort and terms of reference for an agreement between a *BEE* and his or her *client*; however, these Guidelines are not intended for use as part of the contract between a *BEE* and his or her *client*.
- 2.2.4 These Guidelines also take into account the commitments that the *AHJs* may require from *BEEs* as set out in the *schedules*.

¹ Expressions in italics are defined in Section 1.0.

2.2.5 These Guidelines relate to the provision of services for new buildings and existing buildings, and reflect the *AIBC/APEGBC Building Enclosure Agreement*.

2.3 Compliance with these Guidelines

2.3.1 Notwithstanding the purpose and scope of these Guidelines, a *member's* failure to follow one or more of these Guidelines does not necessarily mean that the *member* has failed to meet his or her professional obligations. Such decisions depend upon the *member's* exercise of professional judgment including weighing facts and circumstances particular to a project. Determining whether a *member* has met his or her professional obligations will involve a comparison of the *member's* services to these Guidelines and the expected actions of a reasonable and prudent *member* in similar circumstances.

3.0 QUALIFICATIONS OF THE BUILDING ENCLOSURE ENGINEER

3.0.1 Appropriate qualifications for a *BEE* must include core competencies which are considered basic and fundamental to the provision of *building enclosure engineering* services. These core competencies include theoretical and academic knowledge, as well as practical experience as described in these Guidelines. To achieve designs that will meet the desired performance objectives for the *building enclosure*, the *BEE* must also effectively translate these competencies into practice, and must be aware of and recognize the numerous factors associated with building projects that may affect these designs.

3.1 Core Competencies

3.1.1 Building Codes and Standards

3.1.1.1 The *BEE* must have a detailed knowledge of applicable *building code*, standards and *local regulations*, namely:

- Parts 1 and 2 of the applicable *building code*, particularly with respect to application and professional design and review;
- Parts 5, 9 and 10 (*BCBC* only) of the *building code*, particularly those sections associated with condensation control, water penetration control, heat, air and moisture transfer; and
- Parts 3 and 4 of the applicable *building code* as they apply to the *building enclosure*.

3.1.1.2 The *BEE* must have a good understanding of the relevant technical standards related to the elements of the *building enclosure*.

3.1.2 Theoretical and Technical Knowledge

3.1.2.1 The *BEE* must have a thorough understanding of the following areas of theory and technical knowledge as they relate to the performance of *building enclosure* and their specific practice:

.1 Materials Knowledge:

- materials physical and chemical properties,
- mechanisms of deterioration,
- behaviour of wood, concrete, metals, plastics, gypsum and other materials as they are used in *building enclosure* construction including moisture transport, moisture retention or storage characteristics, and relative movement, freeze-thaw characteristics,
- determination/measurement of moisture content levels of materials used in *building enclosure* construction, and

- performance thresholds and relationships between materials and environments: corrosion rates, fungal germination and growth thresholds, decay of wood and prevention of these mechanisms of deterioration;

.2 Building Physics:

- defining boundary conditions: interior, exterior climate and microclimate,
- impact of location, weather, and building shape on exposure to wetting and *building enclosure* design;
- moisture physics: storage and transport processes by diffusion, convection, capillary action, gravity, wind pressure, sorption relationships and osmosis,
- use of heat, air and moisture flow calculations, and simulation tools for *building enclosure* design and analysis,
- heat transfer: conduction, convection, radiation, and secondary modes due to latent phase changes,
- energy usage calculations and analysis, simulation tools,
- mass transport and condensation: air, water vapour and pollutants,
- consideration of wetting, drying, storage and material properties to prevent problematic accumulation of moisture within the *building enclosure*,
- accommodation of thermal and moisture movements, and
- accommodation of structural loads; and

.3 Components, Assemblies and Other Building Systems:

- interdependence of elements of the *building enclosure* with other building systems and functional requirements: including but not limited to environmental control systems (i.e. lighting, heating, cooling and ventilation system), plumbing, structure, and fire safety,
- integration of theoretical and technical knowledge regarding materials to apply to elements that are used as part of the *building enclosure*, and
- assessment of the appropriateness of heat, air and moisture control functions of the elements that comprise the *building enclosure*.

3.1.3 Construction Document Preparation and Design Review

3.1.3.1 The *BEE* must be familiar with the content and preparation of *building enclosure* related *construction documents* and must be able to apply his or her knowledge to the design and design review of *building enclosures*. This competency includes but is not necessarily limited to:

- the ability to assess exposure conditions related the building site and determine appropriate external environmental loads and assess internal loads imposed on the *building enclosure* due to use and occupancy;

- the development and determination of appropriate *building enclosure* assemblies and selection of components and materials for the environmental conditions and compatibility with adjoining materials;
- calculation of heat, air and moisture transfer through elements and assemblies in conformance with good practice such as are described in ASHRAE Handbooks (see Appendix A) and simulation tools;
- design and preparation of detail drawings that clearly identify the work required at various *building enclosure* locations and the ability to identify whether the designs produced by others adequately address the performance issues identified above;
- provision of continuity of primary heat, air and moisture control functional surfaces or barriers throughout the *building enclosure*.

3.1.4 Investigation, Assessment and Testing

- 3.1.4.1 The *BEE* must be knowledgeable and have experience with the various techniques, standards and protocols related to investigation, assessment and testing of *building enclosure* elements and assemblies. This competency includes the applicability and limitations of these standards and protocols, as well as the appropriate use and calibration of testing equipment and instruments.
- 3.1.4.2 As a fundamental component of field work, the *BEE* must be able to visually review the as-built construction of elements of the *building enclosure* to identify the potential for *building enclosure*-related performance problems and areas at risk for water penetration, condensation, air leakage and heat loss.

3.1.5 Construction Field Review

- 3.1.5.1 The *BEE* must have experience in reviewing the construction of *building enclosure* elements in the field for the purpose of confirming substantial compliance with the *construction documents* and the *building code*. The *BEE* must possess the ability to identify deviations from the design intent, as well as variations in site conditions from those planned or expected.
- 3.1.5.2 To assist in determining whether the construction of the *building enclosure* is in substantial compliance with the *construction documents*, the *BEE* must possess the ability to review test results, manufacturers' product information, shop drawings, prototypes, and samples.
- 3.1.5.3 The *BEE* must be knowledgeable of contract administration responsibilities for new construction projects, as well as for *building enclosure rehabilitation* and *renewal* construction projects where the *BEE* may provide a broader scope of services, such as acting as payment certifier as defined by the British Columbia *Builders Lien Act*.

3.2 Experience

3.2.1 Application of Knowledge

- 3.2.1.1 The *BEE* must have knowledge and experience in the application of building science principles as they relate to the assessment of performance of the *building enclosure*.
- 3.2.1.2 This competency includes the ability to apply informed, professional judgment calls where risk assessment is concerned, including:
- the identification of risks and benefits of alternatives;
 - the determination of consequences of selection of alternatives, decisions and actions;
 - the relative costs of various acceptable alternatives; and
 - the application and implication of local construction practices.

3.2.2 Professional Qualifications

- 3.2.2.1 In accordance with the APEGBC Code of Ethics, a *member* must restrict his or her practice to his or her fields of competence. *APEGBC* has not implemented a specialist designation for *BEEs*; however, *members* must consider the following criteria as providing reasonable bench marks for a *BEE*:
- be a *member* registered with *APEGBC* for a minimum of three years;
 - have a minimum of five years of documented *building enclosure* experience demonstrating the core competencies listed in these Guidelines, with a minimum of two years of *building enclosure* experience for projects located in British Columbia; and
 - demonstrate evidence of building science education, through either:
 - college or university courses, or
 - programs provided by professional organizations such as *APEGBC* or *AIBC*, or industry groups such as *ASHRAE*, or
 - self-study confirmed by successfully challenging the *AIBC BEEP* exam.
- 3.2.2.2 As may be required, the *BEE* must be prepared to provide documented evidence of satisfactory work experience.

3.2.3 Professional Development

- 3.2.3.1 It is important that a *BEE* keep up with current knowledge and training relevant to their practice. A *BEE* must make a demonstrable effort to maintain knowledge.

3.2.4 Reference Materials

3.2.4.1 Appendix A provides a list of reference materials with which a *BEE* should be familiar.

4.0 GUIDELINES FOR PROFESSIONAL PRACTICE

4.0.1 This section provides guidance on the technical services that a *BEE* may provide on a building project, and is organized into two primary parts corresponding to:

- Construction Project Services: services provided by a *BEE* in connection with a new building, *renovation*, *renewal*, *rehabilitation* or *repair* project. Sections 5.1 to 5.3 provide a description of roles and responsibilities associated with these types of projects.
- Other Services: services provided that typically do not involve a construction project, nor require the submission of *schedules*. A description of roles and responsibilities for these types of projects is provided in section 5.4.

4.0.2 The services described below are not intended to be exhaustive, or to include all the services that may be provided by a *BEE*, and should be considered in conjunction with other provisions of these Guidelines.

4.0.3 Before commencing services, the *BEE* must communicate with the *client* and other team members as required to:

- determine and agree upon the terms of reference, confirm the scope of services to be provided, as well as the elements of the *building enclosure* to which the services are applicable;
- reach an agreement on fees, payment schedule and professional liability insurance; and
- reach an agreement on and complete a contract. Document No. 31 Engineering Agreement between Client and Engineer, and Document No. 32 Agreement between Engineer and Subconsultant both prepared by the Association of Canadian Engineering Companies are recommended as a basis for a contract. Alternately, *AIBC* Document 8C – 2010 Standard Short Form Agreement Between Client and Consultant could be considered.

4.1 Construction Project Services

4.1.1 Overview

4.1.1.1 The basic scope of services outlines the *BEE's* responsibility with respect to the *building enclosure* performance issues of the *building code*.

4.1.1.2 Each project will dictate different roles and responsibilities for the *BEE*. Several typical project situations are described in these Guidelines. The scope of engineering services will vary for each of these types of projects. For example, work on an existing building will mean that certain design parameters have already been determined or resolved.

4.1.1.3 Similarly, the different roles on projects will dictate a different scope of services for a *BEE*. For a new construction project, an architect will usually be the *RPR*;

the *BEE* may provide supporting coordination, design, construction documentation and *field review* services. On a *rehabilitation* or *renewal* project, the *BEE* may be the *RPR* and the *CRP*. These additional roles and responsibilities are outlined in Section 5.2.3 and are distinct from the *BEE*'s technical services described in this section.

- 4.1.1.4 The *BEE*'s technical tasks undertaken in assessing and providing guidance regarding the control of heat, air and moisture, and other performance attributes that may form part of their scope are the same for new construction projects as they are for a *rehabilitation* and *renewal* projects. It is simply the way the information is communicated or documented that varies by project type.
- 4.1.1.5 The description of the technical tasks that follows has been done primarily in the context of a new construction project with the recognition that the delivery mechanism will vary depending on project type and scope.

4.1.2 Conceptual or Schematic Design Phase

- 4.1.2.1 In the conceptual or schematic design phase, the *BEE* must:
 - .1 Attend, as required, meetings with the applicable *registered professionals* and the design team to obtain information regarding the functional, aesthetic, cost and scheduling requirements.
 - .2 Focus on the *building enclosure* elements and performance requirements appropriate to the agreed scope of services.
 - .3 Assist the design team in identifying the need for any other *registered professionals* to address the *building enclosure* performance requirements for the project.
 - .4 Define the *building enclosure* design criteria and loads for the location and intended use and occupancy, and review the criteria with the design team. The criteria includes interior and exterior environmental loads, and design criteria related to condensation control, water penetration control, heat, air and moisture transfer and other performance criteria as is appropriate for the scope of services provided for the project.
 - .5 Review applicable *building code*, standards, *local regulations*, restrictions, insurance or warranty requirements, and other factors affecting the design of the *building enclosure* to meet the performance requirements for the *building enclosure*.
 - .6 Review the compatibility and the interaction of the *building enclosure* with other building systems.
 - .7 Review the preliminary design concept, together with alternate design concepts where appropriate.
 - .8 Consider the requirements of other *registered professionals* and provide information relating to the *building enclosure* design, as they may reasonably require.

- .9 Document the results of this phase in a format suitable to the design team and the *client*.

4.1.3 Design Development Phase

- 4.1.3.1 In the design development phase, the accepted conceptual design is developed in sufficient detail to enable the commencement of the *construction documents* by all participants in the design team.
- 4.1.3.2 The *BEE* must:
 - .1 Review preliminary drawings of assemblies for *building enclosure* elements forming part of the agreed scope of services potentially including walls, windows and other glazed elements, roofs, balconies, decks, below and at-grade elements, and typical interface details between these assemblies to confirm that they can meet the established design criteria.
 - .2 Review durability of *building enclosure* elements, and consider *maintenance, renewal* and *service life* requirements. The guidance on durability should include disclosure of expected services lives and as well as impact of design decisions on likely maintenance and *renewal* activities (nature of activity and frequency). Specific consideration should be given to the following items:
 - .1 Expected *service life* of the *building enclosure* elements and associated performance attributes.
 - .2 Expected *service life* of the *building enclosure* elements relative to the *client's* mandate.
 - .3 Consideration of the layering of *building enclosure* elements, so that *repair* and replacement of elements with shorter service lives does not require the removal or replacement of items with longer service lives; and
 - .4 Materials' compatibilities and resistance to various mechanisms of deterioration, given the nature, function and exposure of the materials.
 - .3 Document the results of this phase in a format suitable to the design team and the *client*.

4.1.4 Construction Documents Phase

- 4.1.4.1 In the *construction documents* phase the *BEE* must:
 - .1 Review the *construction documents* to verify they adequately describe *building enclosure* elements, meet the intent of the *building code*, and that the design can achieve the design criteria that were established during the schematic design phase and further developed during the design development phase. Specifically this review must include:
 - the continuity of thermal insulation, moisture, air and vapour barriers; and
 - confirmation of drainage paths.
 - .2 Provide technical input into the *specifications*.
 - .3 Assist in establishing testing and inspection requirements.

- .4 Assist in obtaining the required approvals, licences and permits, including preparation of the relevant documentation required by *local regulations* and the *AHJ*. Where required, complete, sign and seal required *schedules* – such as *schedule D* for the City of Vancouver or *Schedule E* for the City of Burnaby – and submit same to the *AHJ*; or submit *supporting schedule S* to the *RPR*, as appropriate (See Chapter 5.0).
- .5 Document the results of this phase in a format suitable to the design team and the *client*.

4.1.5 Construction Procurement Phase

4.1.5.1 In the construction procurement phase, the BEE must:

- .1 Provide assistance to the applicable *registered professionals* in preparing addenda to the *construction documents*.
- .2 Provide clarification of the *construction documents* as required during the tender and negotiation process.

4.1.6 Construction Phase

4.1.6.1 In the construction phase, the *BEE* must provide *field review* services for all *building enclosure* elements that the *BEE* has designed or reviewed in earlier project phases.

4.1.6.2 The *field reviews* may include the review of proprietary components such as windows that have been designed by a *member* for a manufacturer. In such a case, the *field review* is undertaken for the purpose of reviewing the integration of this component into the overall *building enclosure* as well as a quality assurance role to help confirm that the installed component meets the overall performance criteria.

4.1.6.3 Some items reviewed by the *BEE* may also require review by other members of the design team or by testing or inspection agencies. Such work may include waterproof membranes, glazing, pre-cast concrete elements, welding, proprietary products, and primary and *secondary structural elements*.

4.1.6.4 Construction phase *field review* services must include, but not necessarily be limited to the following, and may vary depending upon the complexity of the job and the experience of the contractor:

- .1 Attend construction meetings, as required.
- .2 Assist in confirming, reporting and scheduling procedures for testing and field reviews.
- .3 Assist in confirming that the qualifications of fabricators meet the specifications.
- .4 Assist in review of submittals for general compliance with the construction documents.

- .5 Assist with the review of building enclosure-related shop drawings and other submittals for general conformance with the construction documents and the intent of the design.
- .6 Visit the site at sufficient frequency and extent, at the BEE's sole discretion, to ascertain whether the work substantially complies in all material respects with the construction documents and applicable portions of the building code. The review must include all assemblies and a substantial number of the details – rather than just a representative sampling – for those elements reviewed or designed by the BEE in earlier project phases. The field reviews by the BEE do not replace the field review requirements of the architect RPR for the building enclosure on new construction or renovation projects
- .7 Prepare field review reports outlining observations and discrepancies in the work and deliver them to the attention of the applicable RPR and the CRP.
- .8 Discrepancies noted during field reviews should be tracked, and the resolution of these discrepancies noted such that a list of unresolved discrepancies can be provided to the project team at any stage of the project. The BEE must attempt to confirm that discrepancies have been resolved in a satisfactory manner. This confirmation is preferably achieved through direct observation but, when this is not possible, other members of the design and construction team can be relied upon to confirm resolution.
- .9 Review reports provided by material and component manufacturers, as well as other reports prepared by Registered Professionals who are reviewing building enclosure elements.
- .10 Assist in arranging for and observing the mock-up and/or testing of key building enclosure elements such as wall assemblies or window installations, where required.
- .11 Review the continuity of thermal insulation, moisture, air and vapour barriers.
- .12 Review drainage paths.
- .13 Review the acceptability of the moisture content of wood products.
- .14 Confirm that components and materials used are those specified in the construction documents or are acceptable alternatives.
- .15 Upon completion of construction, complete, sign and seal applicable schedules or supporting schedules, and submit to the appropriate party.

4.1.7 Reporting

4.1.7.1 As an integral part of their services, the *BEE* must:

- Ensure that the results of the design and *field reviews* are effectively documented and communicated to applicable *members* of the design team.

- Notify applicable *members* of the design and construction team, and as may be appropriate, their *client*, regarding the implications and consequences of decisions and actions contrary to, or inconsistent with the *BEE's* advice.

4.2 Other Technical Considerations for Elements of the *Building Enclosure* and *BEE* Services

4.2.1 Separation of Dissimilar Indoor Environments

- 4.2.1.1 Building components, materials, and assemblies that separate dissimilar indoor environments fall within the scope of Part 5 of the *building code*. Such separations may include walls and floors between high humidity environments such as pools and hot-tubs and other indoor spaces. The *BEE's* responsibilities may include these environmental separations as part of their services; however, in addressing the primary environmental separation, it is not intended that the *BEE* take on responsibility for the waterproofing of pools, shower enclosures, and similar features. If the *BEE* has the relevant expertise, he or she could undertake the waterproofing of these features as optional services in the contract.
- 4.2.1.2 The *BEE* must work together with other project *registered professionals* such as the architect *RPR* or *CRP* to establish if there are significantly dissimilar indoor environments that require the *BEE's* involvement.

4.2.2 Below-Grade Assemblies

- 4.2.2.1 Below grade and at-grade assemblies are sometimes included as part of the services to be provided by a *BEE*. If these elements are included, the *BEE* must have knowledge of groundwater transport mechanisms and management techniques. When selecting and designing the appropriate methods and materials for water management below grade, the *BEE* must coordinate with the geotechnical engineer, civil engineer, mechanical engineer, structural engineer and *RPR* responsible for site drainage.
- 4.2.2.2 The *BEE* must consider:
- ground conditions and expected groundwater source rates;
 - likely ability of drainage systems to control local or general occurrence of hydrostatic pressures;
 - interior occupancies of below grade space and consequences of water penetration into these spaces, and other conditioning requirements;
 - requirements for water-proofing and/or damp-proofing;
 - waterproofing and damp-proofing methods, systems and materials and how they are practically used in construction; and
 - applicability and probable effectiveness of *repair* methods.

4.2.3 Secondary Structural Elements

4.2.3.1 Section 5.2 of the *building codes* contains the requirements to accommodate structural loads imposed by the *building enclosure*. These requirements include the design and anchoring of *building enclosure* assemblies and the attachment of cladding elements. If the design of *secondary structural elements* is included in the scope of services provided by the *BEE*, then it is important that the *BEE* have practical experience and knowledge of secondary structural issues including framing systems, structural attachment and anchoring. If a *BEE* undertakes secondary structural design, the *BEE* must have appropriate training and experience in structural design, and undertake the work in conformance with good engineering practice. The *BEE* must be familiar with the appropriate standards and applicable guidelines, and coordinate with the appropriate *RPR*.

4.2.4 Snow and Ice Considerations

4.2.4.1 As part of his or her services, a *BEE* may need to consider the management of moisture loads from accumulated snow and ice. To address these loads for buildings in some locations, the *BEE* will require specialized knowledge and experience. To minimize the potential for safety hazard due to the shedding of snow and ice from roofs, a *BEE* may provide services related to the design of snow retention systems and other applicable measures. A *BEE* who provides these services must have gained specialty knowledge through education and practical experience in the design, installation and review of the performance of snow management systems. The *BEE* must coordinate with the *CRP*, structural *RPR*, the architect *RPR* and any other affected *RPR*.

4.2.5 Acoustic Design

4.2.5.1 Parts 5 and 9 of *building codes* contain requirements for the design for acoustic separations. The associated necessary knowledge is not normally part of the expertise of a practicing *BEE*. Acoustic design is considered an optional specialty service and which is usually provided by a consultant with a specialty in acoustics.

4.2.6 Heat Transfer and Energy Use Assessment

4.2.6.1 Heat transfer is addressed in Section 5.3 of the *building codes*. To achieve compliance with Sections 5.4, 5.5 and 5.6, particularly with respect to the control of condensation, the *BEE* must consider heat transfer.

4.2.6.2 *Building codes* also contains requirements for energy efficiency of buildings that require expertise associated with heat transfer. A *BEE* may be retained to determine thermal resistance of *building enclosure* assemblies and components for use in assuring compliance with energy use requirements of *building codes* and reference standards such as the *National Energy Code for Buildings* (NECB) and ASHRAE 90.1. Alternately, this information may be used as input for simulations of energy use characteristics and for sizing of heating and cooling systems. When accepting such assignments, the *BEE* must provide the

net overall thermal resistance of assemblies as determined by good engineering practice, and must identify and document the methodology and assumptions.

4.2.6.3 Calculation or simulation of energy use characteristics requires specialized expertise and these services must only be offered by *BEEs* who have gained specialty knowledge through education and practical experience.

4.2.6.4 Energy use calculations must consider the:

- energy performance requirements in *building codes* and their referenced standards;
- requirements of the British Columbia *Energy Efficiency Act*;
- local climatic data;
- zoning and method of control of building mechanical and electrical systems;
- building operating condition and schedules, by zone;
- effective thermal resistance of opaque wall sections;
- effective thermal resistance and radiant heat transfer characteristics of glazed assemblies such as windows, doors, skylights;
- air change by ventilation and infiltration;
- thermal mass effects;
- internal heat gains;
- conceptual knowledge of building mechanical and electrical systems; and
- human performance characteristics of the building as a system.

4.2.6.5 When undertaking energy use calculation or simulations, the *BEE* must have been trained in the use of the simulation programs and models appropriate for the intended purpose i.e. show compliance with *building codes* if required. The *BEE* must identify the input assumptions clearly enough to allow for an audit by another consultant.

4.2.7 Durability

4.2.7.1 The *BEE* must consider the durability of materials in the environment to which they will be exposed, and the overall durability of the *building enclosure*. The purpose of the assessment of durability and *service life* expectancy is to allow the *owner* to make informed decisions but it is not a guarantee of *service life* performance. Many factors will impact the actual *service life* of *building enclosure* assemblies, components and materials.

4.2.7.2 Formal evaluations of the *building enclosure* assemblies' durability, such as is required for the LEED™ durability credit requires additional knowledge in the consideration of durability. The reporting for a durability assessment must be appropriate for the intended purpose - i.e. show compliance with LEED™, if required – and must identify all input assumptions and judgments of life expectancies clearly enough to be audited by another consultant.

4.3 Other Services

4.3.1 Scope of Other Services

4.3.1.1 In addition to the services described for construction projects, the *BEE* may also provide services for projects that will not normally be associated with the actual construction of a building and do not involve the preparation of *construction documents*. Other services could include any of the services described in the following sub-sections.

4.3.2 Building Enclosure Condition Assessments

4.3.2.1 *Building enclosure* condition assessments are carried out for several purposes and the extent of reviews and reporting requirements will vary by purpose. Two of particular relevance to the practice of a *BEE* are:

- .1 Condition Assessments for *Maintenance, Renewal, Repair* and *Rehabilitation* Planning Purposes
 - .1 Condition assessments can be commissioned to establish baseline information to be relied upon in establishing the need for *maintenance, renewal, major repairs* or *rehabilitation* of the *building enclosure*; furthermore, the baseline information may represent the basis for planning of future capital expenditures for the *building enclosure*.
 - .2 The level of detailed investigation and the extent of sampling of conditions must be sufficient to clearly establish the current conditions and future prognosis for performance. The information must also be sufficiently detailed so that it can be used to support recommendations for targeted *repairs, systemic renewal, or rehabilitation*. The publication entitled “Building Envelope Rehabilitation Consultant Guide and Owner/Property Manager Guide” of the Canada Housing and Mortgage Corporation is considered a guideline for appropriate engineering practice in this area.
 - .3 Decisions regarding the necessity for *maintenance, renewal, repair* or *rehabilitation* may be made by the *client* based on a variety of factors including the current conditions and future prognosis for performance. While the *client* may consider other factors, the *BEE* must clearly differentiate between factors related to his or her findings of the current condition, and other circumstantial factors such as market value that may inform decisions regarding the *building enclosure*. The *BEE* must limit his or her comments and advice to areas within the *BEE*'s expertise. Other factors that the *client* may consider can include financing, insurance, warranty, and real estate value.
 - .4 Often several alternate *renewal, repair* or *rehabilitation* approaches can be presented to address the current conditions. It is important that the

BEE identify and present the relative technical advantages of these alternate strategies.

.2 Due Diligence Assessments

- .1 “ASTM E2018 Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment Process” outlines process and reporting requirements for walk-through visual assessments appropriate for some applications such as real-estate transactions (due diligence assessments) and initial risk reviews that do not include exploratory openings, physical sampling of conditions or testing. These condition assessments are commissioned by *owners* and prospective *owners* to establish building quality, future performance risks and potential costs. This level of assessment is typically not as detailed as those assessments used for *maintenance*, *renewal*, *repair* and *rehabilitation* planning purposes.

4.3.3 Building Asset Management Planning

4.3.3.1 *BEEs* may provide services related to planning for *maintenance* and *renewal* for buildings. The names used for these planning types of projects are not consistent within the industry but include ‘*maintenance* manuals’, ‘depreciation reports’, and ‘reserve fund studies’. While these projects are focussed on physical elements of the building, they are also financial planning tools. As a result, the *BEE* involved in these projects must clearly present the assumptions made with respect to financial information and estimates, accuracy, potential upgrades, validity of future projections, and any other limitations.

4.3.3.2 These planning documents typically obtain basic quantifiable information related to the building systems (size, extent and age of various elements) from the available drawings; however, the plans do not necessarily rely on information gathered regarding the current condition of the building. The *BEE* must identify the limitations of the information presented in this regard within the reporting.

4.3.3.3 The *BEE* may take the lead in preparing multi-system plans and include other building systems in addition to the *building enclosure*. In these instances, it is important that the team uses consistent assumptions and that it is clear how the interfaces between the systems are addressed.

4.3.3.4 Guidance documents regarding Building Asset Management Planning, and in particular Reserve Studies include:

Reserve Fund Study Standards: The Essential Elements (Technical Bulletin No, 1), Real Estate Institute of Canada, 2000

Capital Planning Replacement, Canada Mortgage and Housing Corporation, 2005

Reserve Funding for Condominiums, Canadian Condominium Institute, 2003

4.3.4 Targeted Investigations

- 4.3.4.1 Targeted investigations focus on the identification of the cause and appropriate *repair* work to address a specific performance problem or failure. The scope is usually limited to one area of a building or one aspect of the construction. Targeted investigations often use similar techniques as employed in *building enclosure* condition assessment projects, however, there is a greater need to clearly identify the cause-to-effect scenarios associated with the performance problem or failure. This type of information is particularly necessary when the findings and associated report will be used to assist in resolving a dispute.
- 4.3.4.2 Often several alternate *repair* approaches can be considered to address the performance problem(s). It is important that the *BEE* identify and present the relative advantages of alternate strategies.

4.3.5 Second Opinion Engagements

- 4.3.5.1 Second opinions on the works of other *registered professionals* may be requested for a variety of reasons. When undertaking second opinion assignments, a *BEE* must:
- notify the involved *registered professionals* that a second opinion review is being undertaken;
 - review documents and provide an impartial assessment of whether:
 - the assessment measures conformed to appropriate industry practice,
 - a reasonable range of alternatives were considered, and
 - the data obtained in the assessment supports the recommendations;
 - if there is a negative response to any of the preceding, recommend additional investigation as appropriate;
 - review opinions of probable cost and provide an opinion on whether the cost seems appropriate; and
 - encourage the *client* to provide the report to the original *registered professionals* for their review and response.

4.3.6 Warranty Reviews

- 4.3.6.1 Warranty reviews are undertaken to assist in the identification of issues that may result in a warranty claim. The warranty under consideration could be a third-party warranty such as the one required under the *Homeowner Protection Act*, a product warranty, or other warranty as specified in the *construction documents*. Prior to the commencement of the services, the *BEE* must confirm the specific warranty product(s) that are the focus of the review, as well as the associated timelines.
- 4.3.6.2 It is also common during these reviews to make observations regarding the effectiveness of *maintenance* programs and to make recommendations for adjustments to these plans based on the observations.

- 4.3.6.3 When undertaking warranty reviews, the *BEE* must identify *building enclosure* performance issues, *building code* non-compliance, or other symptoms that may be representative of conditions covered by the warranty in question; however, the consideration of whether an observation, or condition, is covered by the warranty requires a full understanding of the *construction documents*, the warranty contract, applicable legislation and associated regulations, and possibly other documents. The *BEE* may not have access to these documents, nor have the expertise to assess their impact on the potential for warranty coverage; therefore, the *BEE* must limit his or her comments to the existence of symptoms, conditions or other findings of fact as opposed to providing opinions on the potential extent of warranty coverage.
- 4.3.6.4 The *BEE* must state the limitations in the scope or extent of undertaken in identifying observations, conditions, performance issues, or symptoms (e.g. visual only).

5.0 PROJECT ROLES AND RESPONSIBILITIES

- 5.0.1 The role and responsibilities of the *building enclosure engineer* varies depending on the scope of project and how other *registered professionals* are involved. Various *schedules* may be required by the *building code* and *local regulations* depending on the nature of the project. This section describes the responsibilities, functional relationships and use of *schedules* and *supporting schedules* for the *BEE* for a variety of project types. See Table 5.1 for a summary of the functional relationships and responsibilities for the *building enclosure* portion of projects.
- 5.0.2 The roles and responsibilities described in this section are consistent with *AIBC/APEGBC* Bulletin 34. In particular, see Section 5.6 for situations where an *AHJ* mandate *enhanced building envelope services*. The most current version of Guide to the Letters of Assurance in the B.C. Building Code 2006 should also be referenced for a more detailed explanation of the roles and responsibilities with respect to the use of *schedules* by the *RPR*.
- 5.0.3 The role of a *supporting registered professional (SRP)* is described in this section as well. See sub-section 5.5.

5.1 New Building Construction or Renovation Project

- 5.1.1 This description of roles and responsibilities relates to projects where a *building enclosure engineer* is providing services for a new building construction project or for a *renovation* project.
- .1 A *CRP* will be required for the project and can be either an architect or an engineer.
 - .2 As a reflection of the wide range of issues that must be considered, an architect must be the *RPR* for the architectural items in *Schedules B* and *C-B* and must have overall responsibility for the design and *field review* of the *building enclosure*. The *Architects Act* defines when an architect must be involved in a building project.
 - .3 The project's architect *RPR* must sign and seal the *building code*-mandated *Schedules B* and *C-B* for the *building enclosure*.
 - .4 The project's architect *RPR* must prepare an integrated set of *construction documents* for the *building enclosure*.
 - .5 A *BEE* may provide *SRP* services in support of the architect *RPR* with respect to the performance of the *building enclosure*. While these Guidelines only contemplate and provide guidance for engineers in this role, appropriately qualified architects may also fulfill this supporting role.
 - .6 The scope of services for the *SRP* must be documented in accordance with Section 4.0 of these Guidelines.
 - .7 If requested by the architect *RPR*, or as desired by the *BEE*, *Supporting Schedules S-B* and *S-C* are accountability documents, customized for the

scope of *building enclosure* services provided, in support of the architect *RPR*. *APEGBC* recommends that *supporting Schedules S-B and S-C* be utilized to clarify roles and responsibilities when supporting services are required for a component or system.

- .8 The architect *RPR* may provide the *BEE's Supporting Schedules S-B and S-C* to the *CRP*, but the supporting schedules are not intended to be provided to the *AHJ*.
- .9 Since the architect has overall responsibility for the design of the *building enclosure*, *Schedules B and C-B* for architectural items are not to be used or signed by the *BEE* for this type of project.

5.2 Building Enclosure Rehabilitation or Renewals Project

5.2.1 Primary Scenarios

- 5.2.1 This description of roles and responsibilities relates to projects where a *building enclosure engineer* is providing services for a *building enclosure rehabilitation or renewal* project. While there are several possible scenarios for the involvement of a *BEE* for these types of projects, the two primary scenarios include:
 - .1 an architect acts as the *RPR* for the architectural items on *Schedules B and C-B*; or
 - .2 a *BEE* acts as the *RPR* for the architectural items on *Schedules B and C-B*.

5.2.2 Rehabilitation or Renewal Project with an Architect as the RPR

- 5.2.2.1 For projects where an architect acts as the *RPR* :
 - .1 A *CRP* may or may not be required for the project depending on the need for multiple *RPRs*. When a *CRP* is required, the architect *RPR* usually fulfills the *CRP* role.
 - .2 The architect is the *RPR* for the architectural items on *Schedules B and C-B*.
 - .3 The *rehabilitation or renewal* project architect *RPR* must sign and seal the *building code* mandated *Schedules B and C-B* for the *building enclosure*.
 - .4 The architect *RPR* must prepare an integrated set of *construction documents* for the *building enclosure*.
 - .5 A *BEE* may provide *SRP* services in support of the architect *RPR* with respect to the performance of the *building enclosure*.
 - .6 The scope of these supporting *building enclosure* services must be documented and provided in accordance with Section 4.0 of these Guidelines.
 - .7 If requested by the architect *RPR*, or as desired by the *BEE*, *supporting Schedules S-B and S-C* are accountability documents, customized for the scope of *building enclosure* services provided, in support of the architect *RPR*. *APEGBC* recommends that *supporting schedules S-B and S-C* be

utilized to clarify roles and responsibilities when supporting services are required for a component or system.

- .8 At the *RPR's* discretion, *Supporting Schedules S-B and S-C* may be shared by the *RPR* with other *RPs*, the *CRP* or *client*.
- .9 *Schedules B and C-B* for architectural elements are not to be used or signed by the *BEE*.

5.2.3 Rehabilitation or Renewal Project with a *BEE* as the *RPR*

5.2.3.1 For projects where a *BEE* acts as the *RPR* :

- .1 A *CRP* may or may not be required for the project depending on the need for multiple *RPRs*. When a *CRP* is required, the *BEE RPR* usually fulfills this role.
- .2 The *BEE* is the *RPR* for the architectural items on *Schedules B and C-B*.
- .3 The *rehabilitation* or *renewal* project *BEE RPR* must sign and seal the *building code* mandated *Schedules B and C-B* for the *building enclosure*.
- .1 In accordance with the *AIBC/APEGBC Bulletin 34*, an architect must undertake a preliminary review of the *rehabilitation* or *renewal* program for all *building enclosure rehabilitation* or *renewal* projects prior to building permit application, for the purpose of identifying issues beyond the scope of services that can be provided by the *BEE RPR* and the need for work by any other *registered professionals*. This is a requirement of *APEGBC's* agreement with *AIBC* for this type of project.
- .2 The *BEE RPR* must prepare an integrated set of *construction documents* for the *building enclosure*.
- .3 Since the *BEE* is also the *RPR* for this scenario, a separate *SRP* for the *building enclosure* is not normally required.

5.3 Building Enclosure Repairs

5.3.1 A *BEE* may provide services related to a localized *building enclosure* performance problem. These projects are targeted in nature, either focussed on a specific failed element of the *building enclosure*, or focussed in one area of the building (e.g. window leak, roof leak, deteriorating stack of balconies).

5.3.2 Typically, the scope of these projects is so limited enough that a building permit is not usually required. The *BEE* must confirm the building permit requirements with the *AHJ*. If a permit is required then the roles and responsibilities for a *rehabilitation* project apply.

5.3.3 If building permits are not required there is no need for submission of the *schedules* required by the *building code*; however, depending on the scope of the project several *registered professionals* may be required and therefore *supporting schedules S-B and S-C* can be used as accountability documents.

5.3.4 Sketches or drawings will be required to describe the scope and nature of the construction work to be performed, as well as to specify the materials to be used.

5.4 Other Projects

5.4.1 In addition to building projects where a building permit is required and the *BEE* may be required to submit one or more *schedules*, the *BEE* may also provide services for other types of projects that will normally not involve the provision of any *schedules*. These projects are not normally associated with the actual construction of a building and do not involve the preparation of *construction documents*.

5.4.2 These services may include:

- *Building enclosure* condition assessments,
- Building asset management planning,
- Targeted investigations of *building enclosure* performance issues,
- Second opinions,
- Warranty reviews,
- Litigation support,
- Risk assessments,
- Testing of elements of the *building enclosure*, and
- Product or system development or evaluations.

5.4.3 Guidance regarding the services to be provided for the first five types of projects listed above is provided in Section 4.3.

Table 5.1: Functional Relationships for the *Building Enclosure* Portion of Typical Types of Projects

ROLES	PROJECT TYPE				
	NEW BUILDING CONSTRUCTION OR RENOVATIONS	<i>BUILDING ENCLOSURE REHABILITATION OR RENEWAL – Scenario 1</i>	<i>BUILDING ENCLOSURE REHABILITATION OR RENEWAL – Scenario 2</i>	<i>BUILDING ENCLOSURE REPAIRS</i>	OTHER PROJECTS (Investigations, Condition Assessments, etc)
COORDINATING REGISTERED PROFESSIONAL (CRP)	<ul style="list-style-type: none"> Either an architect or a professional engineer may fulfill the <i>CRP</i> role 	<ul style="list-style-type: none"> A <i>CRP</i> may or may not be required for the project depending on the need for multiple <i>RPRs</i> Where required, the architect usually fulfills the <i>CRP</i> role with the same responsibilities as for a new construction project 	<ul style="list-style-type: none"> A <i>CRP</i> may or may not be required for the project depending on the need for multiple <i>RPRs</i>. Where required, a <i>BEE</i> usually fulfills the <i>CRP</i> role 	<ul style="list-style-type: none"> A building permit is usually not required <i>Letters of assurance</i> and a <i>CRP</i> are not required for projects that do not require a building permit. The <i>BEE</i> must confirm that a building permit is not required for each project before proceeding on this basis If a permit is required then the roles for rehabilitation project apply 	<ul style="list-style-type: none"> <i>Letters of assurance</i> and a <i>CRP</i> are not required for projects that do not require a building permit
REGISTERED PROFESSIONALS OF RECORD (RPR)	<ul style="list-style-type: none"> An architect must act as the <i>RPR</i> for the <i>building enclosure</i> and submit <i>Schedules B</i> and <i>C-B</i>. The <i>BEE</i> must not submit <i>Schedules B</i> or <i>C-B</i> 	<ul style="list-style-type: none"> An architect must act as the <i>RPR</i> for the <i>building enclosure</i> and submit <i>Schedules B</i> and <i>C-B</i> The <i>BEE</i> must not submit <i>Schedules B</i> or <i>C-B</i> Other <i>RPRs</i> may be required depending on the scope 	<ul style="list-style-type: none"> When a <i>BEE</i> is the <i>RPR</i> for the <i>building enclosure</i>, the <i>BEE</i> submit <i>Schedules B</i> and <i>C-B</i> Other <i>RPRs</i> may be required depending on the scope 	<ul style="list-style-type: none"> Not required. See above. 	<ul style="list-style-type: none"> Not required. See above.
SUPPORTING REGISTERED PROFESSIONALS*	<ul style="list-style-type: none"> If required by the <i>RPR</i>, the <i>BEE</i> may submit <i>Supporting Schedules S-B</i> and <i>S-C</i> customized for the scope of services provided and in support of the architect's <i>Schedules B</i> and <i>C-B</i> 	<ul style="list-style-type: none"> The <i>BEE</i> may submit <i>Supporting Schedules S-B</i> and <i>S-C</i> customized for the scope of services provided and in support of the architect's <i>Schedules B</i> and <i>C-B</i> Other <i>SRPs</i> may be required depending on the scope 	<ul style="list-style-type: none"> An architect must review the scope of the project for the purposes of identifying the need for other <i>RPR</i> involvement; confirmation of this role can be provided using a <i>supporting schedule</i> Other <i>SRPs</i> may be required depending on the scope 	<ul style="list-style-type: none"> Other <i>SRPs</i> may be required depending on the scope of the project and the expertise of the <i>BEE</i> 	<ul style="list-style-type: none"> May be required depending on the scope of project, and expertise of the <i>BEE</i> <i>Supporting schedules S-B</i> and <i>S-C</i> could be utilized if desired but are not required
CONSTRUCTION DOCUMENTS	<ul style="list-style-type: none"> The architect <i>RPR</i> must prepare and take responsibility for the construction documents associated with the <i>building enclosure</i> 	<ul style="list-style-type: none"> The architect <i>RPR</i> must prepare and take responsibility for the construction documents associated with the <i>building enclosure</i> 	<ul style="list-style-type: none"> The <i>BEE</i> acts as <i>RPR</i> for the <i>building enclosure</i> and must prepare and take responsibility for the construction documents associated with the <i>building enclosure</i> 	<ul style="list-style-type: none"> As a minimum, some sketches will be required to describe the scope of work; provide necessary details; and specify the materials to be used 	<ul style="list-style-type: none"> Not typically required

* See Section 5.6 for other types of *building enclosure* accountability documents.

5.5 Supporting Registered Professional

5.5.1 The *RPR* – an architect for a new construction, and either an architect or a *BEE* for *rehabilitation* or *renewal* projects – takes responsibility for the design of the *building enclosure*. The *RPR* may rely upon other *registered professionals* and information in taking responsibility for the *building enclosure*. For example, another architect, a *BEE*, mechanical engineer or an engineer working for the window manufacturer may provide specific modelling and analysis services to support the energy performance values that are provided and used. In these instances, where another *registered professional* is providing support services, *Supporting Schedules S-B* and *S-C*, which are endorsed by the *AIBC* and the *APEGBC*, are the appropriate accountability documents to be provided to the *RPR*. The following notes are provided with respect to the use of *supporting registered professionals* and the *Supporting Schedules S-B* and *S-C*:

- *Supporting Schedules S-B* and *S-C* are not part of the *building code letters of assurance* and, therefore, are not intended to be submitted to the *AHJs*.
- The use of a *supporting registered professional* and *Supporting Schedules S-B* and *S-C* for any part of the *letters of assurance* is not mandatory, and is solely at the discretion of the *RPR*.
- The *RPR* for a building not required to have *letters of assurance* (e.g. smaller buildings or *repair* projects) may still utilize *supporting registered professionals* and *Supporting Schedules S-B* and *S-C*, if desired.
- *Supporting Schedules S-B* and *S-C* should be completed to suit the scope of services provided and can include design support services, *field review* services, or a combination of both services.

5.5.2 *AIBC/APEGBC's* 'Practice Note 16: Professional Design and Field Review by Supporting Registered Professional' and *APEGBC's* 'Bulletin K: Letters of Assurance in the BC Building Code and Due Diligence' should be consulted with respect to the appropriate use of *Supporting Schedules S-B* and *S-C*.

5.5.3 For a typical construction project with an architect *RPR*, the *BEE* providing *building enclosure SRP* services would provide the *Supporting Schedules S-B* and *S-C* to the *RPR* who is responsible for the *building enclosure* as part of the architectural portion on *schedules B* and *C-B*. The *supporting schedules* may also be provided to the *CRP* but are not intended to be provided to the *AHJ*.

5.6 Enhanced Building Envelope Services

5.6.1 Some *AHJs* have mandated a requirement for *enhanced building envelope services* and use alternate accountability documents in conjunction with these services. The *BEE* must provide these services in accordance with *AIBC/APEGBC's* Bulletin 34 and only sign alternate *building enclosure* schedules that are consistent with the *Model Schedules D* and *C-D* endorsed by *APEGBC* and *AIBC*. Examples of these approved alternate *building enclosure* schedules are *Schedules D-1* and *D-2* from the City of Vancouver, and

Schedules E-1 and E-2 from the City of Burnaby. It should be noted that, unlike *supporting Schedules S-B and S-C*, some of these alternate accountability documents may be required to be submitted to the *AHJ*.

5.7 Accountability Documents for Part 9 Buildings

- 5.7.1 The *Building code* does not generally require that *letters of assurance* or *schedules* be submitted for the *building enclosure* of Part 9 buildings. The only applicable exception relates Part 9 buildings designed with common egress systems and requiring the use of firewalls, as referenced in the *BCBC*, Division C, Subclause 2.2.7.1.(1)(c). There may be some instances where the design of an element of the *building enclosure* falls outside the scope of Part 9 and in these instances it may be appropriate to provide *Schedules B and C-B* that are modified to indicate the specific scope of the accountability.
- 5.7.2 Some *AHJs* may request that *schedules* be submitted generally for the *building enclosure* of Part 9 buildings. *BEEs* are cautioned that use of *Schedules B and C-B* for this purpose is not supported by *APEGBC* and could introduce a level of responsibility for the *BEE* that is not appropriate. Because they are intended to be used in support of another *registered professional* and are not intended for *AHJs*, *Supporting Schedule S-B and S-C* are also not appropriate. *BEEs* should be cautious in utilizing accountability documents for Part 9 buildings and using documents not endorsed by *APEGBC*. Modifying the basic wording of the *schedules* or *supporting schedules* must be done carefully to reflect the scope of service and accountability intended, and in accordance with the Guide to Letters of Assurance in the BC Building Code 2006.

5.8 Reliance on Others

- 5.8.1 The *BEE* may rely upon others for some aspects of his or her services, and some items within the *BEE's* scope may also require review by other *RPRs* who comprise the design team, or by testing or inspection agencies. Such work may include: roofing and waterproofing, glazing, pre-manufactured elements, proprietary products, and *secondary structural elements*. The involvement of others, however, does not relieve the *BEE* of his or her responsibility to see that the design review and *field reviews* of the other *Registered Professionals* are appropriately undertaken and, in their professional discretion, are acceptable. The *BEE* must be aware of the limitations in scope or applicability of the review, testing and inspection services provided by others.

5.9 Field Review Only

- 5.9.1 There may some instances where a *BEE* may not be involved in the design stage of a building but is involved in undertaking *field review* on behalf of another *RPR*. This scenario primarily arises when the designer is remote from the project and a local *registered professional* is retained to carry out the *field reviews*. In such instances, it is recommended that prior to agreeing to

undertake the *field reviews*, the *BEE* must review the design and satisfy himself or herself that the design is appropriate.

5.10 Multiple *BEEs* on One Project

5.10.1 Wherever possible, it is the preference of *APEGBC* and *AIBC*, that the same *registered professional* be responsible for the design documents and *field reviews*. Several *AHJs* and representatives from government departments have also voiced that same view. The *APEGBC* Bulletin K discusses the potential difficulties encountered when design documents and *field reviews* are prepared or conducted by different *registered professionals*.

5.11 Specialty Consulting Services Provided by Others

5.11.1 Specialty engineering or various consulting services provided by others may impact the services of a *BEE*. The *BEE* must be aware of these other consultants (e.g. Roofing Contractors Association of British Columbia (RCABC) roof inspectors, secondary structural engineers, curtain wall consultants, LEED™ consultant and others) and ensure that the work of those other consultants is integrated with the work of the *BEE*; furthermore, the work of other consultants does not relieve the *BEE* of his or her project responsibilities. For example, even if RCABC inspection services are provided by others, the *BEE* for a *rehabilitation* project must take responsibility for the roof(s) with respect to *Schedules B* and *C-B*.

5.12 Selection of Consultants

5.12.1 Recommended procedures for selecting an engineering consultant are described in various publications, including “Appointing Your Consulting Engineer Using Qualifications Based Solution” from the Association of Consulting Engineering Companies of British Columbia [formerly the Consulting Engineers of British Columbia]; the Infraguide – Best Practice “Selecting A Professional Consultant” from the Federation of Canadian Municipalities and the National Research Council; and “*Advice on Hiring a Professional Engineer or Professional Geoscientist in British Columbia*” by *APEGBC*.

5.12.2 *APEGBC* supports the principle that a *BEE* must receive fair and adequate compensation for professional services, including services provided to comply with these Guidelines. Insufficient fees do not justify the provision of services that do not meet the intent of these Guidelines. *BEEs* must refer to *APEGBC*’s “Fee Guidelines for Engineering Services”. When discussing an assignment and reaching an agreement on compensation, a *BEE* may wish to discuss both these Guidelines and the recommended fee Guidelines with his or her *client*.

5.13 Professional Liability Insurance

5.13.1 Before entering into an agreement to provide professional engineering services to the public, *APEGBC* Bylaw 17 requires that a *BEE* must notify the *client*, in

writing, whether or not professional liability insurance is held and the extent to which that insurance is applicable to the services provided.

5.14 Referral Fees

- 5.14.1 *BEEs* are strongly advised against accepting or providing referral fees or other such compensation in connection with a project for which they are providing *building enclosure* services. If a *BEE* does participate in a referral fee arrangement then as a minimum, the nature of the referral fee must be fully disclosed to the *client* and other parties to the project.

Appendix A – Documents Related to the Practice of Building Enclosure Engineering

APEGBC Documents

Advice on Hiring a Professional Engineer or Professional Geoscientist in British Columbia, March 2007.

[http://www.apeg.bc.ca/resource/publications/brochures/documents/APEG_HomeGuide.pdf]

Bulletin K: BCBC - Letters of Assurance in the BC Building Code and Due Diligence, September 2010.

[http://www.apeg.bc.ca/ppractice/documents/ppGuidelines/Bulletin_K_Updated_2010.pdf]

Code of Ethics, Bylaw 14(a).

[<http://www.apeg.bc.ca/resource/publications/actbylawscode.html>]

Fee Guidelines for Engineering Services.

[http://www.apeg.bc.ca/prodev/business/documents/fee_guide_eng_services.pdf]

Points of Principle, Building Envelope Professional, April 18, 2001.

[<http://www.apeg.bc.ca/ppractice/documents/ppGuidelines/beppointofprinciple.pdf>]

Technical and Practice Bulletin: Structural, Fire Protection and Building Envelope Professional Engineering Services for 5 and 6 Storey Wood Frame Residential Building Projects (Mid-Rise Buildings), April 2009, Revised March 1, 2011.

[<http://www.apeg.bc.ca/ppractice/documents/ppGuidelines/5and6StoreyWoodFrameBulletin.pdf>]

APEGBC/AIBC Documents

Bulletin 34: Building Envelope Services – Appropriate Professional Practice, Second Edition, April 2007 (updated January 2009 and August 2011).

[<http://www.apeg.bc.ca/ppractice/documents/ppGuidelines/Bulletin34.pdf>]

Memorandum of Agreement between The Association of Professional Engineers and Geoscientists of the Province of British Columbia and Architectural Institute of British Columbia, April 2, 1996.

[<http://www.apeg.bc.ca/ppractice/documents/apegbcuibcmoa.pdf>]

Practice Note 16: Professional Design and Field Review by Supporting Registered Professional, First Edition, September 2010.

[\[http://www.apeg.bc.ca/ppractice/documents/AIBC_Practice_Note_16.pdf\]](http://www.apeg.bc.ca/ppractice/documents/AIBC_Practice_Note_16.pdf)

Legislation, Codes and Related Documents

Architects Act [RSBC 1996] c. 17.

[\[http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96017_01\]](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96017_01)

British Columbia Building Code 2006, B.C. Reg. 295/98, Ministry of Forests and Range and Minister Responsible for Housing, Province of British Columbia.

Builders Lien Act [SBC 1997] c.45, Ministry of Employment and Investment, Province of British Columbia.

[\[http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_97045_01\]](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_97045_01)

Building By-law No. 9419, 2007, City of Vancouver [*Vancouver Building By-law*].

Energy Efficiency Act [RSBC 1996] c. 114, Ministry of Energy, Province of British Columbia.

[\[http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96114_01\]](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_96114_01)

Guide to the Letters of Assurance in the B.C. Building Code 2006, December 2010, Edition 5a, Building and Safety Standards Branch, Ministry of Public Safety and Solicitor General, Province of British Columbia.

[\[http://www.bccodes.ca/2006GuideLoA.pdf\]](http://www.bccodes.ca/2006GuideLoA.pdf)

Homeowner Protection Act [SBC 1998] c. 31

[\[http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_98031_01\]](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_98031_01)

National Building Code of Canada 2010, Canadian Commission on Buildings and Fire Codes, National Research Council of Canada.

National Energy Code of Canada for Buildings 2011, Canadian Commission on Buildings and Fire Codes, National Research Council of Canada.

Standard Forms of Contract

AIBC Document 8C – 2010 Standard Short Form Agreement Between Client and Consultant, Architectural Institute of British Columbia.

Document No. 31 – 2009 Engineering Agreement between Client and Engineer (ACEC 31), Association of Canadian Engineering Companies.

[\[http://www.acec.ca/pubs_download/101-Doc_31.pdf\]](http://www.acec.ca/pubs_download/101-Doc_31.pdf)

Document No. 32 Agreement between Engineer and Subconsultant (ACEC 32), Association of Canadian Engineering Companies.

Other Guidance Documents

2009 ASHRAE Handbook – Fundamentals, The American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2009.

Appointing your Consulting Engineer, Association of Consulting Engineering Companies of British Columbia [formerly Consulting Engineers of British Columbia], March 2006.

[\[http://www.acec-bc.ca/media/2557/QBS06.pdf\]](http://www.acec-bc.ca/media/2557/QBS06.pdf)

ASTM E 2018 – 8, Standard Guide for Property Condition Assessments: Baseline Property Condition Assessment Process, American Society for Testing and Materials (ASTM).

Building Enclosure Design Guide – Wood-Frame Multi-Unit Residential Buildings, Homeowner Protection Office, Branch of BC Housing, 2011.

[\[http://www.hpo.bc.ca/building-enclosure-design-guide\]](http://www.hpo.bc.ca/building-enclosure-design-guide)

Building Science for a Cold Climate, Hutcheon, N.B. and Handegord, G.O.P., National Research Council of Canada, 1983.

Building Science for Building Enclosures, Straube, John and Burnett, Eric, 2005.

Building Envelope Rehabilitation Consultant Guide and Owner/Property Manager Guide, Canada Mortgage and Housing, 2001.

[\[https://www03.cmhc-schl.gc.ca/catalog/productDetail.cfm?cat=40&itm=1&lang=en&fr=1350063961968\]](https://www03.cmhc-schl.gc.ca/catalog/productDetail.cfm?cat=40&itm=1&lang=en&fr=1350063961968)

Capital Planning Replacement, Canada Mortgage and Housing Corporation, 2005.

Energy Standard for Buildings except Low Rise Residential Buildings, ASHRAE 90.1, 2004, 2007 and 2010 The American Society of Heating, Refrigerating and Air-Conditioning Engineers and the 90.1 User's Manual.

Infraguide – Best Practice: Selecting a Professional Consultant, Federation of Canadian Municipalities and National Research Council of Canada, June 2006.

[\[http://www.sustainablecommunities.fcm.ca/files/Infraguide/Decision_Making_Investment_Planning/Selecting_Profess_Consultant.pdf\]](http://www.sustainablecommunities.fcm.ca/files/Infraguide/Decision_Making_Investment_Planning/Selecting_Profess_Consultant.pdf)

NAFS - North American Fenestration Standard / Specification for Windows, Doors, and Skylights, AAMA/WDMA/CSA101/I.S.2/ A440.00-08, jointly published by American Architectural Manufacturers Association (AAMA), the Window & Door Manufacturers Association (WDMA), and the Canadian Standards Association (CSA).

Rain Penetration and its Control, Canadian Building Digest No. 40, G.K. Garden, 1963.

Requirements for Exterior Walls, Canadian Building Digest No. 48, National Research Council of Canada, 1963.

Reserve Fund Study Standards: The Essential Elements (Technical Bulletin No, 1), Real Estate Institute of Canada, 2000.

Reserve Funding for Condominiums, Canadian Condominium Institute, 2003.