



BUILDINGS

STRUCTURAL ENGINEERING SERVICES FOR PART 3 BUILDING PROJECTS

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ENGINEERS &
GEOSCIENTISTS
BRITISH COLUMBIA

PREFACE

These *Professional Practice Guidelines – Structural Engineering Services for Part 3 Building Projects* were developed by Engineers and Geoscientists British Columbia (the Association) to guide professional practice related to structural engineering services for buildings that fall under Part 3 of the *British Columbia Building Code (BCBC)*, the City of Vancouver Building By-law (VBBL), or the *National Building Code (NBC)*, or parts of buildings governed by Part 4 of the *BCBC*, the VBBL, or the *NBC*.

In 1993, the Association’s Council adopted the first edition of *Guidelines for Structural Engineering Services for Building Projects*. In 2007, members of the Professional Practice Committee of the Structural Engineer’s Association of BC (SEABC) reviewed the 1993 document and produced a new document entitled *Professional Practice Guidelines – Structural Engineering Services for Part 3 Building Projects*, which the Association’s Council subsequently formally adopted in 2008.

These guidelines were revised in 2011 to provide consistency with the designations and the Letters of Assurance used in the *BCBC*. In 2016, these guidelines were further updated to provide clarity around the limited licensee designation, refer to the Association’s Bylaws for quality management, and refer to the Association’s *Sustainability* guidelines (Engineers and Geoscientists BC 2016).

This current revision provides added clarity around the minimum design and documentation requirements for structural permit drawings.

These guidelines outline the appropriate standard of practice to be followed at the time they were prepared. However, this is a living document that is to be revised and updated as required in the future, to reflect the developing state of practice.

PROFESSIONAL PRACTICE GUIDELINES
STRUCTURAL ENGINEERING SERVICES FOR PART 3 BUILDING PROJECTS

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ABBREVIATIONS

ABBREVIATION	TERM
BC	British Columbia
ACEC	Association of Consulting Engineering Companies
ACEC-BC	Association of Consulting Engineering Companies British Columbia
ASTM	American Society for Testing and Materials
<i>BCBC</i>	<i>British Columbia Building Code</i>
CRP	Coordinating Registered Professional
CSA	Canadian Safety Authority
EIT	Engineer-in-Training
<i>NBC</i>	<i>National Building Code of Canada</i>
RP	Registered Professional
RPR	Registered Professional of Record
SEABC	Structural Engineers Association of British Columbia
SER	Structural Engineer of Record
SRP	Supporting Registered Professional
VBBL	Vancouver Building By-law

PROFESSIONAL PRACTICE GUIDELINES
STRUCTURAL ENGINEERING SERVICES FOR PART 3 BUILDING PROJECTS

DEFINED TERMS

The following definitions are specific to these guidelines. These words and terms are capitalized throughout the document.

TERM	DEFINITION
Act	<i>Engineers and Geoscientists Act</i> [RSBC 1996], Chapter 116.
Additional Structural Engineering Services (Additional Services)	The structural engineering services provided by a Structural Engineer of Record for a building project that are in addition to the Basic Structural Engineering Services.
Association	The Association of Professional Engineers and Geoscientists of the Province of British Columbia, also operating as Engineers and Geoscientists BC.
Authority Having Jurisdiction	The jurisdictional body (usually municipal) with authority to administer and enforce the <i>BC Building Code (BCBC)</i> , the City of Vancouver Building By-law (VBBL), the <i>National Building Code of Canada (NBC)</i> , or a local building bylaw or code.
Basic Structural Engineering Services (Basic Services)	The structural engineering services provided by a Structural Engineer of Record that are basic to a building project.
Bylaws	The Bylaws of the Association made under the <i>Act</i> .
Client	The party who enters into a contract with a Structural Engineer of Record for the provision of structural engineering services.
Contract Documents	The documents, including engineering and architectural drawings and Specifications that are referenced in contracts for construction of a building.
Coordinating Registered Professional	A Registered Professional retained under Clause 2.2.7.2.(1)(a) of Division C of the <i>BCBC</i> to coordinate all design and Field Reviews of the Registered Professionals who are required for a project.
Design/Build Contractor	A contractor retained by an Owner to be responsible for both the design and construction aspects of a building project.
Design Drawings	Drawings (except Final Design Drawings, see below), including Site Instructions, prepared by a Registered Professional at any stage of a building project. Design Drawings, including those submitted for building permitting, or other purposes, must be signed, sealed, and dated by the Registered Professional of Record who assumes overall responsibility for the particular aspect of the design that he or she prepared.
Direct Supervision	The act of taking responsibility for the control and conduct of the engineering work of a subordinate, who could be an Engineer-in-Training (EIT), a person not registered or licensed to practice professional engineering, or another Engineering Professional.

TERM	DEFINITION
Engineering Professional(s)	Professional engineers and licensees who are registered or licensed by the Association and entitled under the <i>Act</i> to engage in the practice of professional engineering in British Columbia.
Engineers and Geoscientists BC	The business name for the Association.
Field Review	<p>The reviews conducted at the site of the implementation or construction of the engineering work by an Engineering Professional or his or her subordinate acting under his or her Direct Supervision, that the Engineering Professional in his or her professional discretion considers necessary to ascertain whether the implementation or construction of the work substantially complies in all material respects with the engineering concepts or intent reflected in the engineering documents prepared for the work.</p> <p>Defined in the <i>BCBC</i> as follows:</p> <p>“Field Review means a review of the work</p> <ul style="list-style-type: none"> (a) at a building site, and (b) where applicable, at locations where building components are fabricated for use at the building site <p>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.”</p>
Final Design Drawings	Design Drawings prepared by a Registered Professional to reflect design changes made during construction of a building project. These drawings are intended to incorporate addenda, change orders, and other significant design changes, but not necessarily Site Instructions. These drawings must be signed, sealed, and dated by the Registered Professional who assumes overall responsibility for the design.
General Contractor	A contractor who has a contract with an Owner for construction of all or a portion of a building project.
Letters of Assurance	Uniform, mandatory documents that are intended to clearly identify the responsibilities of key individuals in a building project.
Non-Structural Element	A design element of a building that is not a Primary Structural Element, Secondary Structural Element, or Specialty Structural Element. Examples can include non-bearing partitions and suspended ceilings.
Owner	A party who owns a building, or will own a building, once construction is complete.
Primary Structural Element	A beam, column, or other structural design element that, when combined with others, forms the Primary Structural System.
Primary Structural System	A combination of Primary Structural Elements that support a building's self-weight and applicable live loads based on occupancy, use of the space, and environmental loads such as wind, snow, and seismic forces.

TERM	DEFINITION
Registered Professional	<p>Defined in the <i>BCBC</i> as:</p> <ul style="list-style-type: none"> a) a person who is registered or licensed to practice as an architect under the <i>Architects Act</i>, or b) a person who is registered or licensed to practice as a professional engineer under the <i>Engineers and Geoscientists Act</i>.” <p>For the purposes of the <i>Engineers and Geoscientists Act</i>, this can include professional engineers and licensees having the appropriate scope of practice, all of whom must be qualified by training or experience to provide designs for building projects.</p>
Registered Professional of Record	Defined in the <i>BCBC</i> as a Registered Professional retained to undertake design work and Field Reviews in accordance with Subsection 2.2.7.3. of Division C.
Secondary Structural Element	A structural design element that is structurally significant for the function it serves but does not contribute to the overall strength or stability of the Primary Structural System. The design and Field Review of Secondary Structural Elements may fall under the responsibility of the Structural Engineer of Record or the Registered Professional providing supporting engineering services as the Supporting Registered Professional. Examples can include elevator support rails and beams, curtain wall systems, cladding, and seismic restraints for architectural, mechanical, and electrical design elements.
Site Instructions	Drawings prepared and used to make minor adjustments to a design. Site Instructions must be signed, sealed, and dated by the Registered Professional who assumes overall responsibility for the design.
Specialty Structural Element	A structural design element that is designed and Field Reviewed by a Specialty Structural Engineer providing structural engineering services as a Supporting Registered Professional. These elements, normally fabricated off-site, typically require specialized fabrication equipment or a proprietary fabrication process not usually available at the project site. Examples can include open-web steel joists, wood trusses, combination wood and metal or plywood joists, precast concrete elements, seismic dampers and base-isolation devices and anchors, and other miscellaneous prefabricated structural components of wood or metal buildings.
Specialty Structural Engineer	An Engineering Professional who designs and supervises the preparation of documents for a Specialty Structural Element while acting as a Supporting Registered Professional providing supplementary supporting structural engineering services to the Structural Engineer of Record.
Specification	A written description of the materials, standards of quality, and construction requirements for design elements of a building project.
Struct.Eng.	A designation which reflects a grade of membership granted by Engineers and Geoscientists BC to an Engineering Professional who has demonstrated to Engineers and Geoscientists BC that he or she has the requisite qualifications for that grade of membership. Some Authorities Having Jurisdiction stipulate that only a Struct.Eng. can take professional responsibility for structural engineering services on certain types of buildings.

TERM	DEFINITION
Structural Engineer of Record or Registered Professional of Record for the Primary Structural System	An Engineering Professional with general responsibility for the structural integrity of the Primary Structural System and for general conformance of Secondary Structural Elements and Specialty Structural Elements with the Primary Structural System. A Structural Engineer of Record may be required to be registered as a Struct.Eng. (see definition above). The Structural Engineer of Record takes overall responsibility as the Registered Professional of Record for all items under the structural discipline on Schedule B of the Letters of Assurance in the <i>BCBC</i> .
Subcontractor	A contractor who has a subcontract with a General Contractor to provide labour, materials, and equipment for the construction and quality control of portions of a building project.
Submittals	Documents required to be submitted by a General Contractor, such as a request for payment, progress report, shop drawing, manufacturer's literature on equipment, concrete mix design, aggregate gradation report, or work schedule. Submittals are commonly used by the Structural Engineer of Record to help determine if the work and work products conform with the intent of the Contract Documents.
Supporting Registered Professional	<p>The Registered Professional providing supplementary supporting design and/or Field Review services for structural building components, or sub-components, to the Structural Engineer of Record (e.g., Specialty Structural Elements, Secondary Structural Elements).</p> <p>It is recommended that the Registered Professional of Record obtain and retain in his or her project file any Schedules S-B and S-C from the Supporting Registered Professional, as identified in Appendix A of <i>Practice Note 16: Professional Design and Field Review By Supporting Registered Professionals</i> (Engineers and Geoscientists BC and AIBC 2017). These schedules provide assurance confirming that the plans and supporting documents relating to the supporting engineering services for a particular structural component, or sub-component, substantially comply, in all material respects, with the applicable requirements of the <i>BCBC</i>.</p>
Sustainable Goal	A goal of balancing economics, environmental issues, and social issues for a building project and/or a built environment so that they are truly sustainable. Also referred to as a “high performance” goal or “green design.”

1.0 INTRODUCTION

Engineers and Geoscientists British Columbia (the Association) is the regulatory and licensing body for the engineering and geoscience professions in British Columbia (BC). To protect the public, the Association establishes, maintains, and enforces standards for the qualifications and practice of its members and licensees.

The Association provides various practice resources to its members and licensees to assist them in meeting their professional and ethical obligations under the *Engineers and Geoscientists Act* (the *Act*). One of those resources are professional practice guidelines, which establish the standard of practice for specific professional activities. The Association works with experts in their fields to develop professional practice guidelines where additional guidance is beneficial or required.

In 1993, the Association's Council adopted the first edition of *Guidelines for Structural Engineering Services for Building Projects*. In 2007, members of the Professional Practice Committee of the Structural Engineers Association of BC (SEABC) reviewed the 1993 document and produced a new document, entitled *Professional Practice Guidelines – Structural Engineering Services for Part 3 Building Projects*, which the Association's Council subsequently formally adopted in 2008.

These guidelines were revised in 2011 to provide consistency with the designations and the Letters of Assurance used under the *BC Building Code (BCBC)*. In 2016, these guidelines were further updated to provide clarity around the limited licensee designation, refer to the Association's Bylaws for quality management, and refer to the Association's *Sustainability* guidelines (Engineers and Geoscientists BC 2016).

This current revision of these guidelines provides added clarity around the minimum design and documentation requirements for structural permit drawings.

1.1 PURPOSE OF THESE GUIDELINES

This document provides guidance on professional practice to Engineering Professionals who provide structural engineering services for building projects. Refer to **Section 1.4 Scope of the Guidelines** for information about the scope of building projects to which these guidelines apply.

These guidelines provide a common approach for carrying out a range of professional activities related to structural engineering services for buildings.

Following are the specific objectives of these guidelines:

1. Describe the standard of practice that Engineering Professionals should follow when providing professional services related to structural engineering services for Part 3 building projects.
2. Specify the tasks and/or services that Engineering Professionals should complete to meet the appropriate standard of practice and fulfill their professional obligations under the *Act*. These obligations include the Engineering Professional's primary duty to protect the safety, health, and welfare of the public and the environment.
3. Describe the roles and responsibilities of the various participants/stakeholders involved in these professional activities. The document should assist in delineating the roles and responsibilities of the various participants/stakeholders, which may include the Structural Engineer of Record, Specialty Structural Engineer, Owners, Authorities

Having Jurisdiction, Design/Build Contractor, and General Contractor.

4. Define the skill sets that are consistent with the training and experience required to carry out these professional activities.
5. Provide guidance on the use of assurance documents so the appropriate considerations have been addressed (both regulatory and technical) for the specific professional activities that were carried out.
6. Provide guidance on how to meet the quality management requirements under the *Act* and Bylaws when carrying out the professional activities identified in these professional practice guidelines.

1.2 ROLE OF ENGINEERS AND GEOSCIENTISTS BC

These guidelines were prepared by subject matter experts and reviewed at various stages by a formal review group. The final draft of these guidelines underwent a final consultation process with various committees and divisions of the Association. These guidelines and the current revision were approved by the Association's Council and, prior to publication, underwent final legal and editorial reviews. These guidelines form part of the Association's ongoing commitment to maintaining the quality of professional services that Engineering Professionals provide to their Clients and the public.

An Engineering Professional must exercise professional judgment when providing professional services; as such, application of these guidelines will vary depending on the circumstances.

The Association supports the principle that appropriate financial, professional, and technical resources should be provided (i.e., by the Client and/or the employer) to support Engineering Professionals who are responsible for carrying out professional activities, so they can comply with the standard of practice outlined in these

guidelines. These guidelines may be used to assist in the level of service and terms of reference of an agreement between an Engineering Professional and a Client.

These guidelines are intended to assist Engineering Professionals in fulfilling their professional obligations, especially regarding the first principle of the Association's Code of Ethics, which is to "hold paramount the safety, health and welfare of the public, protection of the environment and promote health and safety in the workplace." Failure to meet the intent of these guidelines could be evidence of unprofessional conduct and lead to disciplinary proceedings by the Association.

1.3 INTRODUCTION OF TERMS

For the purposes of these guidelines, the Structural Engineer of Record (SER) is an Engineering Professional with general responsibility for the structural integrity of the Primary Structural System and for general conformance of Secondary Structural Elements and Specialty Structural Elements with the Primary Structural System. An SER may be required to be registered as a Struct.Eng. The SER takes overall responsibility as the Registered Professional of Record (RPR) for all items under the structural discipline on Schedule B, Assurance of Professional Design and Commitment for Field Review, of the Letters of Assurance in the *BCBC*.

The Struct.Eng. designation reflects a grade of membership granted by Engineers and Geoscientists BC to an Engineering Professional who has demonstrated to the Association that he or she has the requisite qualifications for that grade of membership. Some Authorities Having Jurisdiction stipulate that only an Engineering Professional with a Struct.Eng. designation can take professional responsibility for structural engineering services on certain types of buildings.

A Specialty Structural Engineer is an Engineering Professional who designs and supervises the preparation of documents for a Specialty Structural

Element while acting as a Supporting Registered Professional (SRP) providing supplementary supporting structural engineering services to the SER.

See the **Defined Terms** section at the front of the document for a full list of definitions specific to these guidelines.

1.4 SCOPE OF THE GUIDELINES

These guidelines apply to the practice of structural engineering of buildings that fall under Part 3 of the *BCBC*, the City of Vancouver Building By-law (VBBL), or the *National Building Code of Canada (NBC)*, or parts of buildings governed by Part 4 of the *BCBC*, the VBBL, or the *NBC*.

These guidelines outline structural engineering services that the SER should typically provide in a building project. They specify tasks that the SER should perform to achieve designs that serve the interests of the Client and protect public safety, and are appropriately coordinated with the work of other Registered Professionals (RPs), the General Contractor, and Subcontractors associated with the building project. These guidelines are intended to assist in ensuring the integrity of the provision of structural engineering services, including where various Engineering Professionals are involved in the design process.

These guidelines also outline the responsibilities of an SRP when providing supplementary supporting structural engineering services to an SER who is acting as the RPR for the Primary Structural System, which can include the services of a Specialty Structural Engineer.

See **Appendix B: Letters of Assurance** for information about the *BCBC* and VBBL Letters of Assurance for

design and Field Reviews that an Authority Having Jurisdiction can require from an Engineering Professional.

1.5 APPLICABILITY OF THE GUIDELINES

These guidelines provide guidance on professional practice for Engineering Professionals who carry out structural engineering services for Part 3 building projects or parts of buildings governed by Part 4. These guidelines are not intended to provide systematic instructions for how to carry out these activities; rather, these guidelines outline considerations to be aware of when carrying out these activities.

An Engineering Professional's decision not to follow one or more aspects of these guidelines does not necessarily mean a failure to meet his or her professional obligations. Such judgments and decisions depend upon weighing facts and circumstances to determine whether other reasonable and prudent Engineering Professionals, in similar situations, could have conducted themselves similarly.

1.6 ACKNOWLEDGEMENTS

Engineers and Geoscientists BC would like to thank the Association of Consulting Engineering Companies of BC (ACEC-BC) and the Structural Engineers Association of BC (SEABC) for their input to this revision.

2.0 ROLES AND RESPONSIBILITIES

2.1 COMMON FORMS OF PROJECT ORGANIZATION

The organization of building projects varies according to the needs of the project and the parties involved.

Appendix A: Examples of Organizational Charts show three common scenarios for how a project can be organized, and includes the reporting relationship of various RPs.

- In **Figures A1** and **A2**, the Owner retains a Coordinating Registered Professional (CRP) to act as the prime consultant for the building project. **Figure A1** shows the SER with a contractual relationship with the Owner. **Figure A2** shows the SER with a contractual relationship with the CRP.
- In **Figure A3**, the Owner retains a Design/Build Contractor to oversee the building project and the SER has a contractual relationship with the Design/Build Contractor. Therefore, the SER's Client can be either the Owner, the CRP, or the Design/Build Contractor.

These three illustrations show how the SER interfaces with the RPs, the General Contractor, and the testing and inspection companies associated with the building project.

Regardless of how the project is organized, the various participants each have particular responsibilities, as described below.

2.2 RESPONSIBILITIES

2.2.1 OWNER

As discussed in **Section 2.1 Common Forms of Project Organization**, an Owner can also be the SER's Client.

Regardless of the contractual relationship between the Owner and the SER, to ensure the design and construction of the building project meets appropriate standards of public safety and the requirements of applicable building codes, the Owner should assume the following responsibilities. (Note: regardless of the type of RP, the Owner's responsibilities are similar).

The Owner should:

- proceed with a building project only after securing adequate financing, recognizing that a reasonable contingency should be included;
- ensure a CRP or Design/Build Contractor and appropriate RPs are retained;
- ensure required approvals, licences, and permits from the Authorities Having Jurisdiction are obtained;
- develop, along with the CRP or the Design/Build Contractor, an appropriate written description of the building project;
- ensure appropriate scopes of work and realistic schedules of work are developed for RPs;
- ensure contracts are finalized with RPs before their services are required;
- ensure the contracts with RPs are amended where necessary to include services required beyond the original scopes of work;
- recognize that designs, Design Drawings, Specifications, Contract Documents, and other documents prepared by RPs are for that building

project only and should not be used or copied for other building projects without consent of the RPs;

- recognize that some design changes may be required, including because interpretations of building codes can differ between the Authority Having Jurisdiction and RPs; and
- confirm if the SER is to apply the Association's *Sustainability* guidelines to the building project (Engineers and Geoscientists BC 2016) and the specific nature of the services to be provided.

If the Owner does not assume the above responsibilities, RPs should:

- consider recommending to the Owner in writing that he or she fulfills his or her responsibilities; or
- consider withdrawing from the building project.

2.2.2 COORDINATING REGISTERED PROFESSIONAL

The role of the CRP, as described in the Letter of Assurance, Schedule A, Confirmation of Commitment By Owner and Coordinating Registered Professional, is to coordinate the design work and Field Reviews of the RPs required for the project in order to ascertain that the design will substantially comply with *BCBC* or *VBBL*, and other applicable enactments respecting safety.

The role of the CRP is clearly defined in the *BCBC*, Note A-2.2.7.2.(1)(a) of Division C.

It is not intended that the CRP has to assume responsibility for the adequacy or accuracy of the technical design, or for subsequent Field Reviews of the RPs who provide design and Field Review services. However, the CRP does need to provide a level of administrative overview beyond simply obtaining sealed drawings and Letters of Assurance, whether or not the CRP has a contractual relationship with the RPs involved in the project.

The CRP has certain responsibilities, which may include the following, to enable RPs to perform their duties appropriately:

- Interpret the needs of the Owner so the designs will meet the intended function of the building project
- Identify and advise RPs of special design criteria, such as, in the case of the SER, equipment, loads, and span requirements
- Develop the scope of work with RPs for designs, Specifications, Contract Documents, Field Reviews, and/or contract administration
- Provide timely and appropriately detailed information to allow RPs to adequately carry out their scope of work
- Coordinate and review designs, Specifications, and Contract Documents prepared by RPs
- Coordinate communication of information between the Owner, the General Contractor, and the RPs, so the building project substantially complies in all material respects with the applicable building codes and meets the Owner's needs
- Ensure compliance with the Engineers and Geoscientists BC Bylaw 14(b)(4) regarding the completion of documented reviews of structural designs

2.2.3 DESIGN/BUILD CONTRACTOR

For design/build projects, the CRP would typically be a representative of the Design/Build Contractor, and the Design/Build Contractor would be contractually obligated to ensure that the CRP adequately discharges his or her responsibilities.

2.2.4 STRUCTURAL ENGINEER OF RECORD OR REGISTERED PROFESSIONAL OF RECORD

As discussed in **Section 2.1 Common Forms of Project Organization**, although the SER can have a contractual relationship directly with the Owner, the CRP, or the Design/Build Contractor, the SER interfaces with most other RPs, the General Contractor, and the testing and inspection companies associated with the building project.

The SER should work with the Owner, the CRP, or the Design/Build Contractor to develop a scope of work that allows the SER to provide the required designs, Specifications, Contract Documents, Field Reviews, and/or contract administration, as described in these guidelines and applicable building codes.

The SER is responsible for the integrity of the Primary Structural System of the building. This means that even though the SER can rely on other structural Engineering Professionals acting as SRPs to take responsibility for Primary Structural Elements, the SER retains responsibility for ensuring the necessary designs for the Primary Structural System meet acceptable standards overall. Where other structural Engineering Professionals are acting as SRPs, they must sign, seal, and date documents related to the structural components (either Secondary or Specialty Structural Elements) for which they are responsible.

The SER may be responsible for the design of Secondary Structural Elements, Specialty Structural Elements, or Non-Structural Elements. However, the SER remains responsible for designing the Primary Structural System to accommodate these other elements, and for allowing for their effects on the Primary Structural System. For this purpose, the SER is responsible for the review of these elements.

The SER must sign, seal, and date the appropriate *BCBC* or *VBBL* Letters of Assurance for design and Field Reviews regarding the designs and supporting documents the SER prepares. This includes taking responsibility for all structural items in the Letter of Assurance, Schedule B, Assurance of Professional Design and Commitment for Field Review, and

crossing out and initialing only items that do not apply to the project.

Any Design Drawings the SER submits to the Authority Having Jurisdiction for permitting purposes must set out a structural design that substantially complies with the *BCBC* or *VBBL*, and those Design Drawings must contain the minimum level of information required by the *BCBC* and *VBBL* (see **Section 3.3.3 Building Permitting Stage** of these guidelines). When required by the Authority Having Jurisdiction, the SER should also coordinate the preparation and submission of Final Design Drawings.

The SER should be familiar with and, where appropriate, apply the Association's *Sustainability* guidelines to the work (Engineers and Geoscientists BC 2016).

2.2.5 SPECIALTY STRUCTURAL ENGINEER OR SUPPORTING REGISTERED PROFESSIONAL

Where a Specialty Structural Engineer is engaged directly by the SER (for example, as in **Appendix A, Figure A3**), the Specialty Structural Engineer should work with the SER to clearly develop the Specialty Structural Engineer's scope of work.

The Specialty Structural Engineer is responsible for the integrity of his or her designs and must sign, seal, and date the documents prepared in his or her professional capacity or under his or her Direct Supervision.

Because the Specialty Structural Engineer acts as an SRP, providing supporting engineering services to the SER, the Specialty Structural Engineer must submit to the SER sealed, signed, and dated Schedule S-B, Assurance of Professional Design and Commitment for Field Review By Supporting Registered Professional, and Schedule S-C, Assurance of Professional Field Review and Compliance By Supporting Registered Professional, as identified in *Practice Note 16 – Professional Design and Field Review by Supporting Registered Professionals*, Appendix A (Engineers and Geoscientists BC and AIBC 2017).

2.2.6 GENERAL CONTRACTOR

A General Contractor has a contractual relationship with an Owner. This contract typically states that the General Contractor is responsible for the labour, materials, and equipment for the building project, as well as the construction methods, techniques, sequences, procedures, safety precautions, and programs associated with the construction, as set out in the Contract Documents.

The General Contractor is responsible for its own work, the supervision and coordination of the Subcontractors' work, and the inspection of the Subcontractors' work prior to Field Reviews by the SER and by the SRP, where applicable. The General Contractor is responsible for providing reasonable notice to the SER and the SRP when components are ready for Field Review.

The General Contractor must provide independent quality control.

3.0 GUIDELINES FOR PROFESSIONAL PRACTICE

3.1 OVERVIEW

The following subsections outline the services an SER should provide for a building project, and may help an SER explain his or her services to a Client, whether the Client is an Owner, a CRP, or a Design/Build Contractor.

These outlines are not intended to be exhaustive, and should not detract from other provisions of these guidelines.

3.2 SCOPE OF WORK

Before commencement of services, the SER should meet with the Client to:

- develop the scope of work for Basic Structural Engineering Services (Basic Services) and Additional Structural Engineering Services (Additional Services);
- reach agreement on fees, payment schedule, and professional liability insurance; and
- draw up a written contract (recommended standard contracts include the Association of Consulting Engineering Companies [ACEC] Documents 31 and 32) (see **Section 6.1 Related Documents**).

For a "fast-track" project, in addition to the above, the SER should:

- establish with the Client the terms and conditions under which preliminary or partially completed Contract Documents can be issued in advance, and clearly define the requirements for partially completed Contract Documents;
- advise the Client that no part of the designs, Specifications, or Field Reviews is considered complete before the Contract Documents, including those of other RPs, have been finalized; and
- ensure that scheduling will not adversely affect the quality and safety of the services of RPs.

3.3 BASIC STRUCTURAL ENGINEERING SERVICES

Following are the typical stages of Basic Services for a building project:

- Conceptual or schematic design
- Design development
- Permitting
- Contract Documents, including designs for the Primary Structural System, structural calculations, structural Design Drawings and Specifications
- Tendering
- Construction, including review of Submittals and Field Reviews

Each stage discussed below contains items that relate to the typical sequence of a building project.

3.3.1 CONCEPTUAL OR SCHEMATIC DESIGN STAGE

In the conceptual or schematic design stage, the SER may provide the following services:

- In conjunction with the Client and other RPs:
 - review functional, aesthetic, cost, and scheduling requirements;
 - review existing Design Drawings;
 - conduct a preliminary site visit;
 - review applicable building codes and restrictions and other factors affecting the design;
 - develop Sustainable Goals; and
 - prepare a preliminary design concept.
- Assist the Owner, CRP, and/or Design/Build Contractor to:
 - determine the need for specialists, such as geotechnical, materials testing, vibration analysis, and wind tunnel testing;
 - develop or review the project schedule, including milestone dates;
 - develop channels of communication;
 - assign responsibility for showing overall and detail dimensions on the Design Drawings;
 - determine design drawing standards and Specifications format; and
 - determine the timing of meetings during each stage of the project.
- With respect to the Primary Structural System:
 - establish comparative information to help select a Primary Structural System;
 - establish structural design criteria;
 - develop the structural scheme, and alternate schemes where appropriate, considering materials, systems and budgets;
 - establish the requirements for other RPs and establish the dates by which information affecting the structural design must be received from other RPs;
 - establish criteria for other RPs and review their reports;
 - describe the Primary Structural System, detailing significant Primary Structural Elements and materials;
 - report on the Primary Structural System, considering economy, performance, capital cost, compatibility with other design elements, and requirements of relevant codes and authorities;
 - provide, if required, brief outline Specifications for proposed materials;
 - explain in writing to the Client, for his or her consideration, proposed new structural construction materials or techniques and the alternatives, including the short-term and long-term advantages and disadvantages;
 - recommend the Primary Structural System; and
 - prepare a summary report that defines the selected Primary Structural System and rationalizes its selection.

A Client may assume responsibility for some or all of the foregoing conceptual or schematic design stage activities, provided:

- the responsibility for the conceptual or schematic design stage activities is clearly defined in writing and relieves the SER of responsibility for the effects of such activities on the selection of the Primary Structural System, costs, and/or scheduling;
- the SER can make appropriate decisions with regard to engineering and safety; and
- the SER can satisfy the requirements of subsequent sections of these guidelines.

3.3.2 DESIGN DEVELOPMENT STAGE

In the design development stage, the selected preliminary design is developed in sufficient detail to enable commencement of the final design and construction documents by RPs. During this stage, the SER may provide the following services:

- Attend meetings with the Client and other RPs
- Consider reviewing the Sustainable Goals and other strategies identified during the conceptual or schematic design stage
- Identify desired standards, such as deflection of slabs and beams, potential vibration, lateral drift, concrete and masonry crack control, foundation settlement, soil-structure interaction, permanent seismic movements, and deformations
- Review reports by specialists, such as geotechnical, materials testing, vibration analysis, and wind tunnel testing
- Prepare preliminary structural analysis and design calculations for typical Primary Structural Elements
- Prepare preliminary foundation Design Drawings based on recommendations by the geotechnical engineer
- Prepare preliminary framing design and Design Drawings showing layouts of typical areas
- Prepare or edit outline Specifications for structural elements
- Coordinate structural design with deflection and lateral movement criteria to meet requirements of other RPs
- Prepare design documentation for review and approval by the Client

3.3.3 BUILDING PERMITTING STAGE

If a building permit is required, Letters of Assurance in the forms set out in Schedules A and B of the *BCBC* or *VBBL* must be delivered to the Authority Having Jurisdiction.

Division C Sentence 2.2.7.3.(3) of the *BCBC* or *VBBL* requires that an Engineering Professional “place his or her professional seal or stamp on the plans submitted by him or her in support of the application for a building permit, after ascertaining that they substantially comply with the *British Columbia Building Code* and other applicable enactments respecting safety.” The Engineering Professional can, at their discretion, mark the structural drawings submitted for permitting as “Not for Construction” or add a similar note.

The requirement for structural drawings submitted for permitting purposes is outlined in Division C Sentence 2.2.4.3.(1) of the *BCBC* and *VBBL*.

Following is a summary of the minimum level of information required on structural drawings for permitting purposes, in order to meet the intent of the relevant provisions in the *BCBC* and *VBBL*:

- Name and address of the person responsible for the design
- Date of issue of the code and standards to which the design conforms
- Dimensions, location, and size of all structural members, in sufficient detail to enable the design to be reviewed to the standard set out in *Quality Management Guidelines – Documented Independent Review of Structural Designs* (Engineers and Geoscientists BC 2018a)
- Sufficient detail to enable the dead loads to be determined
- All effects and loads, other than dead loads, used for the design of the structural members and exterior cladding
- Foundation design assumptions that impact the structural design, including reference to a geotechnical report, if applicable

3.3.4 CONTRACT DOCUMENTS STAGE

This stage includes designing the Primary Structural System, preparing structural calculations to support the design, preparing structural Design Drawings, and preparing Specifications.

3.3.4.1 Primary Structural System

In conjunction with designing the Primary Structural System, the SER may complete the following activities:

- For Primary Structural Elements, such as connection details and proprietary products:
 - Determine and specify in the Contract Documents which elements will be designed by SRPs
 - Specify the types of elements, their positions within the structure, and the methods of connecting to the Primary Structural System
 - Specify loads and design criteria for use by SRPs in their design
 - Review the design of Specialty Structural Elements and Secondary Structural Elements for conformity with the Primary Structural System
- For Non-Structural Elements attached to the Primary Structural System:
 - Review the effect of the elements on the Primary Structural System
 - Design the Primary Structural System to accept and support such elements
 - Provide information regarding the supporting capability and physical attachment limitations of the Primary Structural System

The SER may have some of the above design responsibilities performed by another structural Engineering Professional acting as an SRP, or the SER may use a less-experienced Engineering Professional, an EIT, or a non-member to provide design assistance under the SER's Direct Supervision. Refer to **Section 4.1.3 Direct Supervision** for more information.

In addition the SER may:

- attend coordination meetings with the Client and other RPs;
- assist in the coordination with the Authority Having Jurisdiction;
- assist in establishing testing and inspection requirements; and
- comply with fire resistance requirements, as determined by the CRP or specialty consultants.

3.3.4.2 Structural Calculations

The SER must prepare calculations to support his or her structural designs. The structural calculations should be dated, legible, and retained in the project file. A hard copy of input and output of computer analysis should be included in the project file, along with a description of the software used.

In general, structural calculations typically will include the following information:

- Design criteria
 - Discussion and description of the design basis, including assumptions
 - Building codes referenced, with edition dates
 - List of live loads, environmental loads such as wind, snow, and seismic criteria, and special loads and provisions greater than building code requirements, as requested by the Client or otherwise used by the SER
 - Specifications for materials used
 - Geotechnical report information and design criteria
 - Deflection limitations of structural elements and systems
- Location diagrams for structural elements
- Vertical load analysis and design of roof structures, floor structures, frames or trusses, columns, walls, and foundations
- Lateral load analysis and design for seismic and wind forces
- Computer analysis and design results
- Special analysis, such as dynamic and vibration analyses

The project design file should contain a table of contents or index to the structural calculations.

Documentation of in-house checks, documentation of independent reviews of the final structural design, and documents that confirm the adequacy and appropriateness of the design must be retained. The documentation for checks and independent reviews should include the names of the designers, design checkers, and independent reviewers. See **Section 4.1.5 Documented Checks of Engineering and Geoscience Work** and **Section 4.1.7 Documented Independent Review of Structural Designs** for more information on quality management requirements.

3.3.4.3 Structural Design Drawings

Structural Design Drawings should show the locations, sizes, reinforcement, and details of Structural Elements at appropriate scales, to enable the fabrication, installation, and connection of the elements in a reasonable sequence by a reasonably competent General Contractor or Subcontractor who is familiar with the techniques of construction for the specified materials.

As a minimum, floor levels, column spacings, structural wall locations, and offsets are to be coordinated with the architectural drawings to confirm consistency of dimensions. Elevations, sections, and details should be of appropriate scale, number, and extent to portray the relationship of Structural Elements to each other and any interconnections. Care should be taken to determine that details noted as "typical" are applicable to the condition being portrayed and that their location and extent are explicit.

Structural Design Drawings should define the complete extent and detail of the work, including sufficient detail to enable determination of dead loads, effects and loads used for the design, and sufficient information to allow the design to be checked.

Design Drawings can vary, depending on the complexity of the project and the materials used, but may include the following information:

- Structural notes
 - Codes and standards, with dates of issue, to which the design conforms
 - Design criteria indicating superimposed vertical and horizontal loads (designated as unfactored loads) used in the design, including live loads, environmental loads, and dead loads (such as landscape, partition, and equipment loads) not otherwise shown on the structural Design Drawings
 - Reference to the geotechnical report on which the foundation design is based
 - Brief material Specifications
 - Absolute or relative deflection criteria for Primary Structural Elements
 - Where forces are shown, their clear identification as factored or unfactored
 - Pertinent design standards (e.g., CSA or ASTM)
 - Reference to Design Drawings and Specifications prepared by other RPs
- Typical details
- Foundation plans and schedules
 - Allowable soil-bearing capacity, pile capacities, and lateral earth pressures for retaining structures
 - Sizes, locations, dimensions, and details of foundations
 - Assumed bearing strata or elevation(s)
 - Estimated pile length(s) or source of this information
 - Location of known existing services and existing foundations that conflict with structural foundations, or reference to the source where this information can be found
 - If underpinning or temporary shoring is specified to be designed by others, indication on the Design Drawings of the areas designated to be shored or underpinned
 - If shoring or underpinning is designed by the SER, indication of details and construction sequences

- Floor and roof framing plans and details
 - General gridline dimensions and overall building dimensions
 - Sizes, locations, dimensions, and details of structural elements
 - Elevations, including slopes and depressions
 - Lateral load-resisting system
 - Governing forces, moments, shears, or torsion required for the preparation of shop and detail Design Drawings
 - Reinforcing bar sizes and details with fabrication and placing criteria
 - Locations and details of control, construction, contraction, and expansion joints
 - Locations, sizes, and reinforcement of significant openings
 - Provision for future extensions
- Schedules and details for columns, beams, and walls
 - Structural element sizes
 - Elevation of bottom of columns
 - Reinforcing steel and splice details for concrete columns
 - Splice locations for structural steel columns
 - Structural details of masonry or reinforced concrete walls, including lintels, details, and reinforcing of significant openings
 - Stiffeners, lateral bracing, and local reinforcements for steel elements
- Connections
 - Where connections are to be designed by a Specialty Structural Engineer acting as an SRP, Design Drawings should indicate required information and governing forces
 - Where connections are designed by the SER, Design Drawings should show dimensions and comprehensive connection details
 - The SER should consider design of the connections when sizing the structural elements, such as hollow structural section (HSS) truss joints and post-tensioned anchorages
 - General arrangement and details at intersections of different structural materials
- Sequence of construction, if this is critical to the functioning of the building project

3.3.4.4 Specifications

Specifications must be prepared using a format suitable for inclusion in the Contract Documents.

Specifications may include information on the following:

- Applicable standards, building codes, and/or bylaws
- Submittals required
- Quality control requirements
- Materials
- Workmanship and fabrication
- Tolerances
- Information about temporary works and erections, where necessary, to ensure the intent and integrity of the design
- Testing and inspection
- Notification by the General Contractor before significant segments of the work begin
- Warranties
- Performance criteria for design by SRPs engaged to provide supporting structural engineering services

Where appropriate, Specifications can be abbreviated and become part of the structural Design Drawings.

Specifications should state that the SER's Field Reviews and reviews of Submittals, along with testing and inspections conducted by independent companies reporting to the Client, are carried out to inform the Client of the quality of the General Contractor's performance. Specifications should also state that these reviews, tests, and inspections do not relieve the General Contractor of his or her responsibilities and are not for the benefit of the General Contractor.

3.3.5 TENDERING STAGE

The role of the SER in the tendering stage, if required by the Client, CRP, and/or Design/Build Contractor, is to assist with the following activities:

- Prepare the contract
- Prepare pre-qualification documents
- Review bidders' qualifications
- Obtain required approvals, licences, and permits
- Analyze and evaluate tenders submitted

The SER should:

- prepare the appropriate Letters of Assurance and documents required by the Authority Having Jurisdiction; and
- provide structural addenda and clarification of structural documents, as required.

3.3.6 CONSTRUCTION STAGE

Basic Services must be provided during the construction stage for systems for which the SER is responsible. The SER should provide the Basic Services; however, where practical, the SER can delegate these duties to others using Direct Supervision. See **Section 4.1.3 Direct Supervision** for more information.

Services provided by the SER during the construction stage should not be construed as relieving the General Contractor of responsibility for constructing the building in accordance with the Contract Documents, controlling the progress, providing safe working conditions, or correcting deviations from the project requirements.

Some items reviewed by the SER may also need to be reviewed by other RPs on the design team or by testing and inspection companies. Such items can include piles, anchors, precast concrete elements, structural steel, welding, proprietary products, and other Secondary Structural Elements or Specialty Structural Elements designed by SRPs.

3.3.6.1 General Services During Construction (Field Services)

General services provided during construction (field services) may include the following, but can vary depending on the complexity of the project:

- Attend construction meetings
- Confirm communication channels and procedures
- Assist in confirming, reporting, and scheduling procedures for testing and inspections
- Assist in confirming procedures for shop drawings and other Submittals
- Confirm that qualifications of fabricators meet the Specifications
- Advise the CRP, Design/Build Contractor, and/or General Contractor on the interpretation of structural Design Drawings and Specifications and, if required, issue supplementary details and instructions
- Advise the Client on the validity of charges for additions or deletions from the contract and on the issue of change orders
- Review and comment on the General Contractor's applications for progress payments
- Estimate completed work and materials on-site for payment according to the terms of the construction contract
- Review reports from the testing and inspection companies to determine if the element complies with the Contract Documents
- Conduct substantial and total performance inspections of structural elements of the project, noting deficiencies, and inspect and document completed corrections
- Coordinate the preparation and submission of Final Design Drawings to the Authority Having Jurisdiction

3.3.6.2 Review of Submittals

After the General Contractor has provided Submittals, the SER should also review them for general compliance with the Contract Documents, except for matters such as checking dimensions or quantities or reviewing the General Contractor's safety measures or methods of construction.

In addition, the SER should:

- review shop drawings for conformance with the Contract Documents and the intent of the design;
- confirm, when required by the Contract Documents, that shop drawings have been signed, sealed, and dated by the responsible Specialty Structural Engineer acting as an SRP (the Specialty Structural Engineer may be responsible for the design of Specialty Structural Elements and connections); and
- review shop drawings and other Submittals of pre-engineered or proprietary structural elements for type, position, and connection to Primary Structural Elements and for criteria and loads used for the design. For more information, see *Professional Practice Guidelines: Shop Drawings* (Engineers and Geoscientists BC 2015).

3.3.6.3 Field Reviews

Field Reviews should be carried out at intervals appropriate to the stage of construction, to observe the quality and progress of the construction of those elements the SER designed. When construction is complete, a final Field Review should also be carried out. The timing and number of Field Reviews are at the discretion of the RP taking responsibility. See **Section 4.1.6 Documented Field Reviews During Implementation or Construction** for information on quality management requirements.

At the SER's discretion, Field Reviews should also be carried out for proprietary products and connections, including Secondary Structural Elements and Specialty Structural Elements. The SRP responsible for these structural elements should carry out the Field Review of the relevant structural elements that he or she

designed at the appropriate stage of construction, and report this in writing to the SER by submitting Schedules S-B and S-C from *Practice Note 16*, Appendix A (Engineers and Geoscientists BC and AIBC 2017).

Field Review reports should be prepared after each Field Review that outline observations and deficiencies in the work and bring them to the attention of the General Contractor's site representative.

Field Review reports should be distributed to the General Contractor's site representative, the General Contractor, the CRP, and/or the Design/Build Contractor. Where the Owner directly retains the services of the SER, it is recommended that the Owner also be sent copies of the Field Review reports.

3.4 ADDITIONAL STRUCTURAL ENGINEERING SERVICES

In addition to the Basic Services described in **Section 3.3**, the SER can provide Additional Services if both the SER and the Client agree. Such an agreement should be documented in an Additional Services contract.

Additional Services are typically not considered essential to the Basic Services, and are not part of the Basic Services that the SER should provide under these guidelines. Additional Services can include design, preparation of documents, review, and Field Review.

Additional Services can be related to, but are not limited to, the following:

- Changes in scope, complexity, diversity, or magnitude of the original building project, or after selection of the Primary Structural System
- Imposed extended time schedules for design or construction
- Existing buildings and structures, including surveys
- Preparation of documents for demolition
- Filing application for and obtaining permits

- Seismic analysis beyond that required to meet the requirements of the relevant building code
- Seismic restraints for Non-Structural Elements
- Special physical model analysis, such as wind tunnel tests or shaking table tests
- Dynamic analysis beyond that required by the appropriate building codes (e.g., spectrum analysis or time-history response analysis)
- Review of designs and Specifications by other design professionals that are not included in the Basic Services, to confirm compatibility with the Primary Structural System
- Specialty Structural Elements and Non-Structural Elements that are not included in the Basic Services, such as curtain walls, building facings, cladding, antennae, elevators, storage tanks, and exterior landscape elements
- Structural fire-resistance requirements
- Alternate designs or products or substitute systems requested by the Client or the General Contractor
- Preparation or assistance with cost estimates, or reviewing cost estimates prepared by others
- Translation of Contract Documents, conversion to other units, or special preparation of Design Drawings for reduction
- Preparation of documents for tendering segregated contracts, pre-tendered contracts, or phased or fast-track construction
- Review of the General Contractor's design or installation for temporary loading, shoring, bracing, formwork or falsework for excavations and construction, underpinning adjacent structures, and erection sequence instructions
- Review of the General Contractor's methods, procedures, and construction equipment
- Changes due to construction cost over-runs outside the control of the SER
- Changes or corrections due to errors or omissions by the General Contractor
- Damage as a result of natural or human-related events
- Continuous or detailed Field Reviews during construction
- Review of additional Submittals, when required because of improper or incomplete Submittals
- Quantity take-offs and preparation of bills of materials
- Preparation of fabrication drawings, reinforcing steel bending schedules, or other types of shop drawings
- Preparation of Record Drawings (if these services are requested, the SER should refer to *Quality Management Guidelines – Use of Seal* (Engineers and Geoscientists BC 2017), Section 3.2.15 for further guidance)
- Tenant-related design services
- Services as an expert witness

3.5 FABRICATION, MANUFACTURER, AND CONSTRUCTION DRAWINGS AND DOCUMENTS

The fabricator or manufacturer should produce drawings and documents to represent the work covered under the contract with the General Contractor or Subcontractor. These drawings and documents should be prepared by the fabricator or manufacturer after reviewing the designs, Specifications, and Contract Documents supplied by the SER, and following the resolution of requested changes or errors.

Typical fabricator or manufacturer drawings and documents may include the following:

- Structural Design Drawings and documents for proprietary structural elements, such as open web steel joists
- Erection drawings and documents that specifically show the location of structural elements, connections, and components to be supplied by the fabricator
- Shop fabrication/connection drawings and documents that provide information necessary for shop personnel to fabricate and assemble the items

When these drawings and documents incorporate designs by an SRP, the Design Drawings and documents must be signed, sealed, and dated by the SRP. To clarify responsibility, the SRP can qualify the extent of his or her design work on Schedules S-B and S-C from *Practice Note 16*, Appendix A (Engineers and Geoscientists BC and AIBC 2017).

Construction Design Drawings and documents are produced by the General Contractor or Subcontractor for elements such as temporary loading, shoring, bracing, formwork or falsework for excavations and construction, underpinning adjacent structures, and erection sequence instructions. These drawings and documents must be signed, sealed, and dated by a qualified Engineering Professional.

4.0 QUALITY MANAGEMENT IN PROFESSIONAL PRACTICE

4.1 QUALITY MANAGEMENT REQUIREMENTS

Engineering Professionals must adhere to the applicable quality management requirements during all phases of the structural engineering work, in accordance with the Association's Bylaws. It is also important to be aware of whether additional quality management requirements exist from Authorities Having Jurisdiction or through service contracts.

To meet the intent of the quality management requirements, Engineering Professionals must establish and maintain documented quality management processes for the following activities:

- The application of relevant professional practice guidelines
- Authentication of professional documents by the application of the professional seal
- Direct Supervision of delegated professional engineering activities
- Retention of complete project documentation
- Regular, documented checks using a written quality control process
- Documented Field Reviews of engineering designs/recommendations during implementation or construction
- Where applicable, documented independent review of structural designs prior to construction

4.1.1 PROFESSIONAL PRACTICE GUIDELINES

In accordance with the *Act*, s.4(1) and Bylaw 11(e)(4)(h), Engineering Professionals are required to comply with the intent of any applicable professional practice guidelines related to the engineering work they undertake. One of the three objectives of the Association, as stated in the *Act* is “to establish, maintain, and enforce standards for the qualifications and practice of its members and licensees”. Practice guidelines are one means by which the Association fulfills this obligation.

These professional practice guidelines establish the standard of practice for structural engineering services for buildings that fall under Part 3 of the *BCBC*, the *VBBL*, or the *NBC*, or parts of buildings governed by Part 4 of the *BCBC*, the *VBBL*, or the *NBC*. Engineering Professionals who carry out these activities are required to meet the intent of these guidelines.

4.1.2 USE OF SEAL

In accordance with the *Act*, s.20(9), Engineering Professionals are required to seal all professional engineering documents they prepare or deliver in their professional capacity to others who will rely on the information contained in the documents. This applies to documents that Engineering Professionals have personally prepared and those that others have prepared under their Direct Supervision.

Failure to seal these engineering documents is a breach of the *Act*.

For more information, refer to *Quality Management Guidelines – Use of Seal* (Engineers and Geoscientists BC 2017).

4.1.3 DIRECT SUPERVISION

In accordance with the *Act*, s.1(1) and 20(9), Engineering Professionals are required to directly supervise any engineering work they delegate. When working under the Direct Supervision of an Engineering Professional, unlicensed persons or non-members may assist in performing engineering work, but they may not assume responsibility for it. Engineering Professionals who are limited licensees may only directly supervise work within the scope of their license.

With regard to Direct Supervision, the Engineering Professional having overall responsibility should consider:

- the complexity of the project and the nature of the risks;
- which aspects of the work should be delegated;
- the training and experience of individuals to whom work is delegated; and
- the amount of instruction, supervision, and review required.

Careful consideration must be given to delegating field reviews. Due to the complex nature of field reviews, Engineering Professionals with overall responsibility should exercise judgment when relying on delegated field observations, and should conduct a sufficient level of review to have confidence in the quality and accuracy of the field observations. See **Section 4.1.6 Documented Field Reviews During Implementation or Construction**.

For more information, refer to *Quality Management Guidelines – Direct Supervision* (Engineers and Geoscientists BC 2018b).

4.1.4 RETENTION OF PROJECT DOCUMENTATION

In accordance with Bylaw 14(b)(1), Engineering Professionals are required to establish and maintain documented quality management processes that include retaining complete project documentation for a minimum of ten (10) years after the completion of a project or ten (10) years after documentation is no longer in use.

These obligations apply to Engineering Professionals in all sectors. Project documentation in this context includes documentation related to any ongoing engineering work, which may not have a discrete start and end, and may occur in any sector.

Many Engineering Professionals are employed by organizations, which ultimately own the project documentation. Engineering Professionals are considered compliant with this quality management requirement when a complete set of project documentation is retained by the organizations that employ them using means and methods that are consistent with the Association's Bylaws and guidelines.

For more information, refer to *Quality Management Guidelines – Retention of Project Documentation* (Engineers and Geoscientists BC 2018c).

4.1.5 DOCUMENTED CHECKS OF ENGINEERING WORK

In accordance with Bylaw 14(b)(2), Engineering Professionals are required to perform a documented quality checking process for engineering work, appropriate to the risk associated with that work.

Regardless of sector, Engineering Professionals must meet this quality management requirement. In this context, 'checking' means all professional deliverables must undergo a documented quality checking process before being finalized and delivered. This process would normally involve an internal check by another Engineering Professional within the same organization. Where an appropriate internal checker is not available, an external checker (i.e., one outside the organization) must be engaged. Where an internal or external check has been carried out, this must be documented.

Engineering Professionals are responsible for ensuring that the checks being performed are appropriate to the level of risk. Considerations for the level of checking should include the type of document and the complexity of the subject matter and underlying conditions; quality and reliability of background

information, field data, and elements at risk; and the Engineering Professional's training and experience.

For more information, refer to *Quality Management Guidelines – Documented Checks of Engineering and Geoscience Work* (Engineers and Geoscientists BC 2018d).

4.1.6 DOCUMENTED FIELD REVIEWS DURING IMPLEMENTATION OR CONSTRUCTION

In accordance with Bylaw 14(b)(3), Field Reviews are reviews conducted at the site of the construction or implementation of the engineering work. They are carried out by an Engineering Professional or a subordinate acting under the Engineering Professional's Direct Supervision (see **Section 4.1.3 Direct Supervision**).

Field reviews enable the Engineering Professional to ascertain whether the construction or implementation of the work substantially complies in all material respects with the engineering concepts or intent reflected in the engineering documents prepared for the work.

As outlined in **Section 3.3.6.3 Field Reviews**, it is up to the SER to determine the appropriate stages during construction, including timing and frequency, when Field Reviews should be carried out. The SER can also require that Field Reviews be performed by the SRP on Secondary Structural Elements and Specialty Structural Elements. Field Review reports should be completed and submitted after each Field Review, and any deficiencies addressed.

For more information, refer to *Quality Management Guidelines – Documented Field Reviews during Implementation or Construction* (Engineers and Geoscientists BC 2018e).

4.1.7 DOCUMENTED INDEPENDENT REVIEW OF STRUCTURAL DESIGNS

Bylaw 14(b)(4) refers to an independent review in the context of structural engineering. An independent review is a documented evaluation of the structural design concept, details, and documentation based on a qualitative examination of the substantially complete structural design documents, which occurs before those documents are issued for construction. It is carried out by an experienced Engineering Professional qualified to practice structural engineering, who has not been involved in preparing the design.

The requirement for documented independent review of structural designs applies to all Part 3 buildings and must be completed before design documents are issued for construction. The extent and level of detail of the independent review will vary, depending on the experience of the independent reviewer and the complexity and risk associated with the project.

For more information, refer to *Quality Management Guidelines – Documented Independent Review of Structural Designs* (Engineers and Geoscientists BC 2018a).

5.0 PROFESSIONAL REGISTRATION & EDUCATION, TRAINING, AND EXPERIENCE

5.1 PROFESSIONAL REGISTRATION

It is the responsibility of Engineering Professionals to determine whether they are qualified by training and/or experience to undertake and accept responsibility for carrying out structural engineering services for Part 3 building projects (Code of Ethics Principle 2).

5.2 EDUCATION, TRAINING, AND EXPERIENCE

Structural engineering services for Part 3 building projects, as described in these guidelines, requires minimum levels of education, training, and experience in many overlapping areas of engineering. The Engineering Professional taking responsibility must adhere to the Association's Code of Ethics (to undertake and accept responsibility for professional assignments only when qualified by training or experience) and, therefore, must evaluate his or her qualifications and must possess the appropriate education, training, and experience to provide the services.

The level of education, training, and experience required of the Engineering Professional should be adequate for the complexity of the project.

Academic training can be acquired by taking formal university or college courses or through continuing professional development. There may be some overlap in courses and specific courses may not correlate to specific skill sets. An Engineering Professional should also remain current with evolving topics, through continuing professional development. Continuing professional development can include taking formal courses; attending conferences, workshops, seminars, and technical talks; reading technical publications; doing web research; and participating in field trips.

6.0 REFERENCES AND RELATED DOCUMENTS

Documents cited in the main part of these guidelines and related appendices appear in **Section 6.1 References**.

Related documents that may be of interest to users of these guidelines but are not formally cited elsewhere in this document appear in **Section 6.2 Related Documents**.

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VERSION HISTORY

VERSION NUMBER	PUBLISHED DATE	DESCRIPTION OF CHANGES
1.0	December 2008	Initial version.
2.0	February 2011	Revised to provide consistency with the designations used in the <i>British Columbia Building Code (BCBC)</i> and with the Letters of Assurance in the <i>BCBC</i> .
3.0	December 1, 2016	Updated to provide clarity around the limited licensee designation, refer to the Association's Bylaws for quality management, and refer to the Association's <i>Sustainability</i> guidelines.
4.0	January 29, 2019	Revised to provide added clarity around the minimum design and documentation requirements for structural permit drawings.

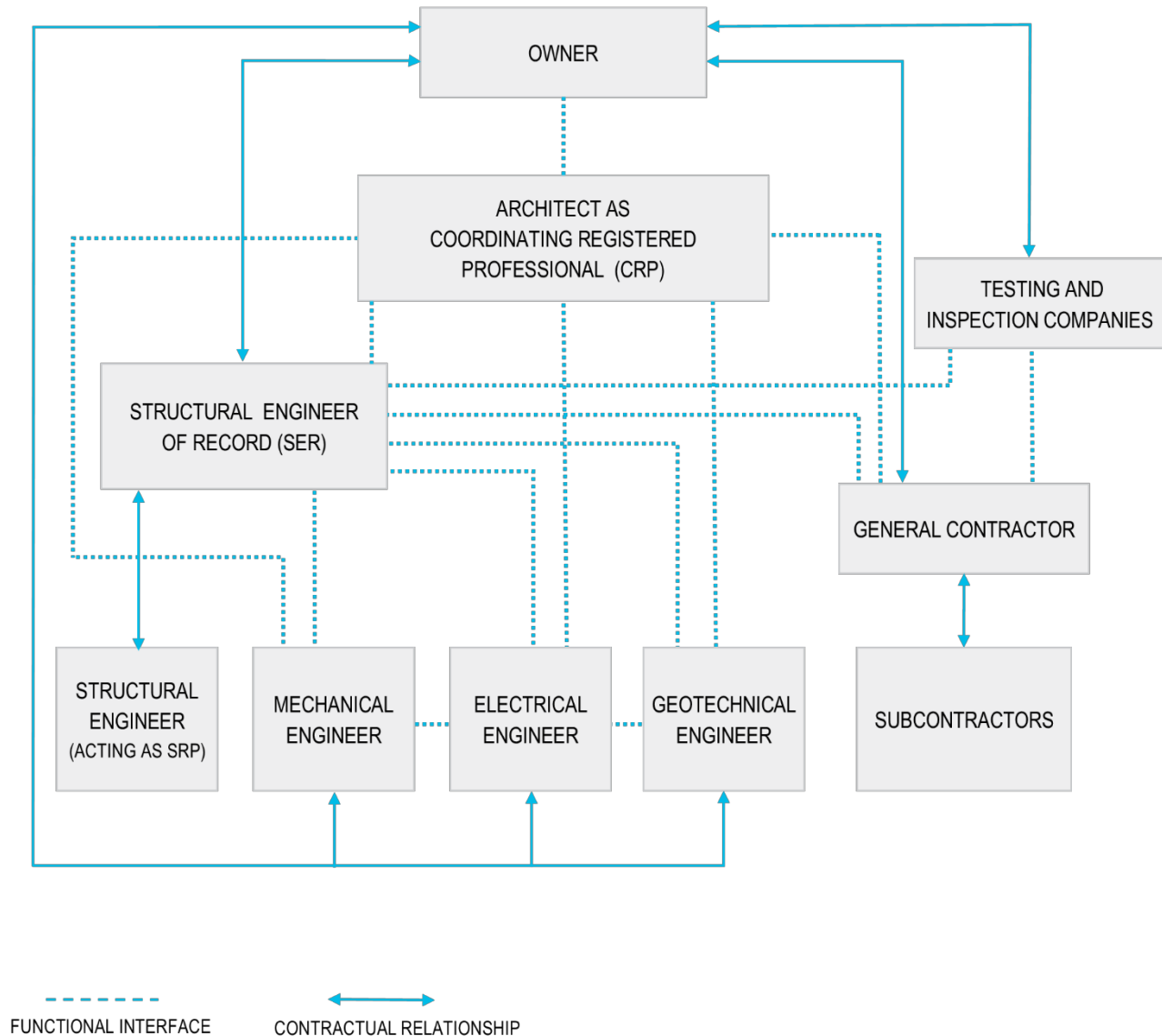
7.0 APPENDICES

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APPENDIX A: EXAMPLES OF ORGANIZATIONAL CHARTS

- Figure A1: Structural Engineer of Record Working under an Architect Acting as the Coordinating Registered Professional
- Figure A2: Design/Build Contract
- Figure A3: Structural Engineer of Record Acting as the Coordinating Registered Professional

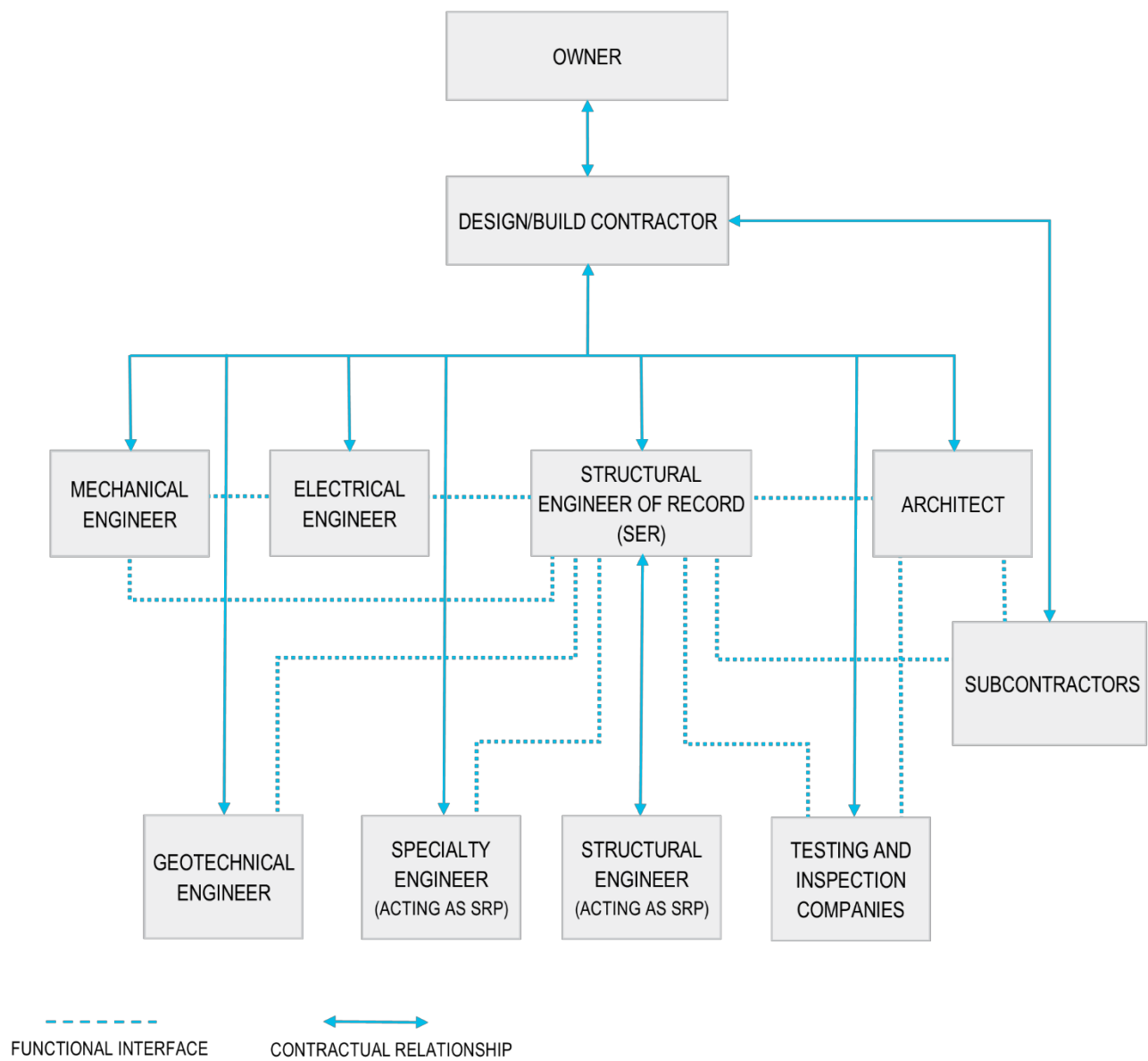
FIGURE A1: STRUCTURAL ENGINEER OF RECORD WORKING UNDER AN ARCHITECT ACTING AS THE COORDINATING REGISTERED PROFESSIONAL



NOTES:

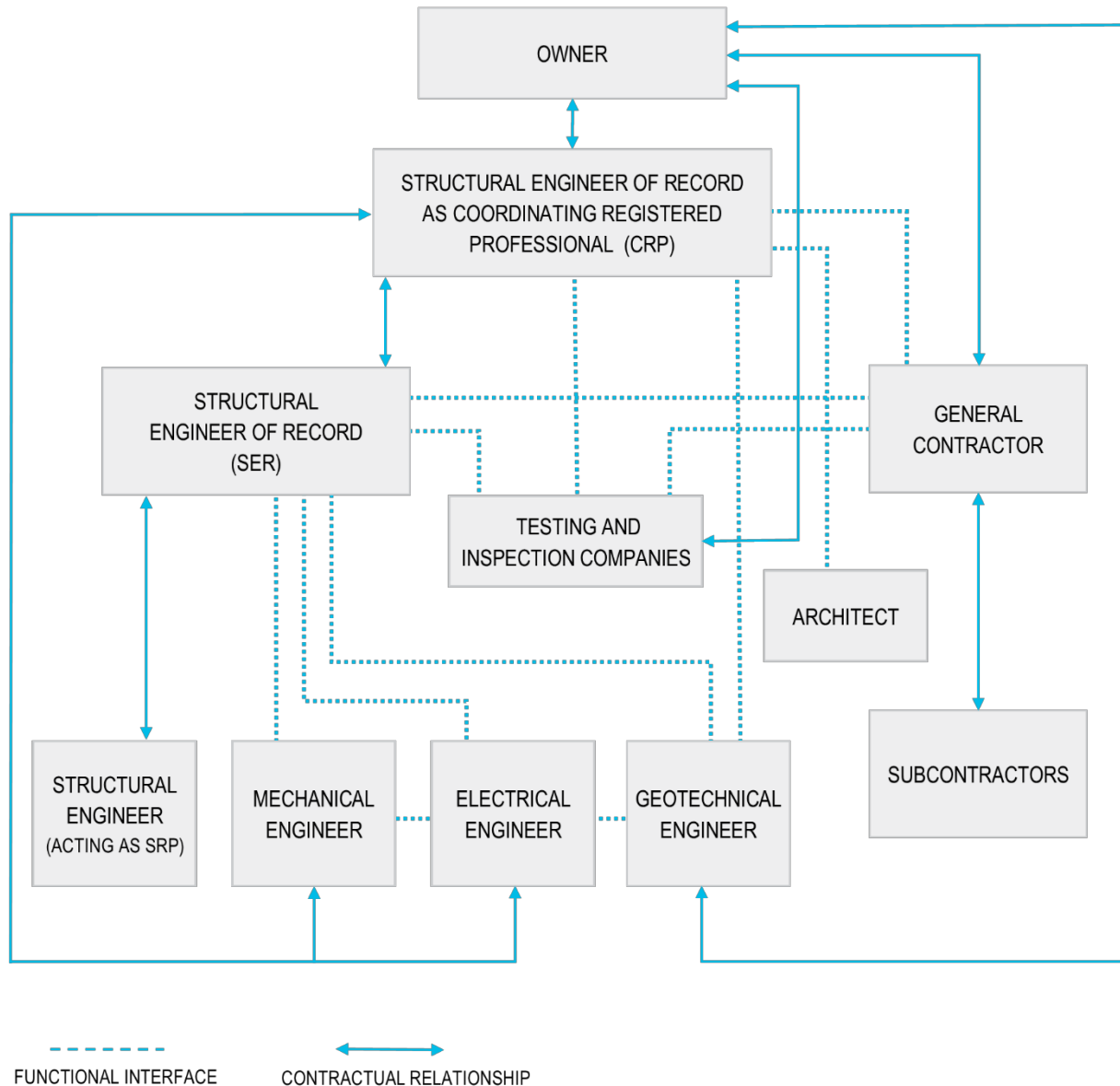
1. The Supporting Registered Professional (SRP) may be retained by the Owner, the Structural Engineer of Record (SER), the General Contractor, and/or the Subcontractor.
2. The Coordinating Registered Professional (CRP) is responsible for coordination of the other Registered Professionals engaged under the Letters of Assurance.

FIGURE A2: DESIGN/BUILD CONTRACT



- NOTE:
1. The Supporting Registered Professional (SRP) may be retained by the Owner, the Structural Engineer of Record (SER), and/or Subcontractors.

FIGURE A3: STRUCTURAL ENGINEER OF RECORD ACTING AS THE COORDINATING REGISTERED PROFESSIONAL



NOTES:

1. The Supporting Registered Professional (SRP) may be retained by the Owner, the Structural Engineer of Record (SER), the General Contractor, and/or the Subcontractor.
2. The Coordinating Registered Professional (CRP) is responsible for coordination of the other Registered Professionals engaged under the Letters of Assurance.

APPENDIX B: LETTERS OF ASSURANCE

B1 OVERVIEW

Letters of Assurance were introduced in 1990 in the Vancouver Building By-law (VBBL) and in 1992 in the *British Columbia Building Code (BCBC)*, and they continue to be referenced in the current editions of the VBBL and the *BCBC*. Letters of Assurance were developed after discussions among the City of Vancouver, the British Columbia (BC) Building Policy Branch, the Architectural Institute of BC, and Engineers and Geoscientists BC, and in close consultation with the Building Officials Association of BC.

The intent of the Letters of Assurance is to assure the Authority Having Jurisdiction that for a particular building project:

- the activities of the various Registered Professionals of Record (RPRs) are coordinated;
- the design documents submitted in support of the application for a building permit substantially comply with the *BCBC* or VBBL;
- building designs substantially comply with the requirements of the *BCBC* or VBBL; and
- the RPR will undertake, and has undertaken, the necessary Field Reviews to determine that building construction substantially complies with the *BCBC* or VBBL.

Where unanticipated conditions are observed, the Engineering Professional should provide recommendations and additional Field Reviews to achieve the design objectives. An Engineering Professional is responsible for ensuring deficiencies identified in the Field Reviews for which he or she is responsible are adequately addressed.

Where the requirements of the *BCBC* or VBBL are at variance with standard practice, there are provisions for “generally accepted design” or “established local practice” to satisfy the requirements.

B2 SUMMARY OF SCHEDULES AND GUIDANCE DOCUMENTS

B2.1 SCHEDULE B

Schedule B, Assurance of Professional Design and Commitment for Field Review identifies the various RPRs who take responsibility for their designs, and confirms that their designs substantially comply with the *BCBC* or VBBL respecting safety, except for construction safety aspects. Schedule B also provides a commitment that the RPRs will be responsible for the Field Reviews required for the project.

B2.2 SCHEDULE C-B

Schedule C-B, Assurance of Professional Field Review and Compliance confirms that the necessary Field Reviews have been completed by the RPR and the finished project substantially conforms to the design and the *BCBC* or VBBL.

B2.3 SCHEDULES S-B AND S-C

An RPR acting as the Structural Engineer of Record (SER) should only undertake design and Field Review for items identified on the Letter of Assurance for their discipline, based on their competency.

As such, an RPR or an Owner may require supplementary supporting engineering services for a particular structural component or subcomponent. When supporting engineering services are required, it is recommended that the relevant RPR obtains the appropriate assurances from the Supporting Registered Professional (SRP) (who could be engaged by the RPR, by the Owner, or by a contractor, sub-trade, or supplier) providing the supporting design service and/or field service.

After receiving assurance from an SRP that a particular component or subcomponent substantially complies, in all material respects, with the applicable requirements of the *BCBC* or *VBBL*, the RPR can complete and submit the Letter of Assurance for his or her discipline.

Refer to *Practice Note 16: Professional Design and Field Review By Supporting Registered Professionals* (Engineers and Geoscientists BC and AIBC 2017), which includes the model Schedules S-B and S-C that Engineers and Geoscientists BC and the AIBC recommend for use by a Registered Professional (RP) acting as an SRP.

B2.4 CODES, BYLAWS, AND GUIDANCE DOCUMENTS

More information on the Letters of Assurance in the *BCBC* and *VBBL* is available from the following sources (see also **Section 6.0 References and Related Documents**):

- *BC Building Code*, Letters of Assurance (BCBC 2018)
- City of Vancouver Building By-law, Letters of Assurance (City of Vancouver 2014)
- Guide to the Letters of Assurance in the BC Building Code (Province of BC 2010)
- Bulletin K: BCBC – Letters of Assurance in the BC Building Code and Due Diligence (Engineers and Geoscientists BC 2010)
- Practice Note 16: Professional Design and Field Review by a Supporting Registered Professional (Engineers and Geoscientists BC and AIBC 2017).

The following table summarizes the schedules referred to in this appendix to these guidelines.

Table B - 1: List of Letters of Assurance Related to Structural Engineering Services

SCHEDULE	PURPOSE	SOURCE
Schedule B	Letter of Assurance Form: Assurance of Professional Design and Commitment for Field Review	<i>BCBC</i> or <i>VBBL</i>
Schedule C-B	Letter of Assurance Form: Assurance of Professional Field Review and Compliance	<i>BCBC</i> or <i>VBBL</i>
Schedule S-B	Intraprofessional Form: Assurance of Professional Design and Commitment for Field Review By Supporting Registered Professional	<i>Practice Note 16: Professional Design and Field Review By Supporting Registered Professionals</i> ^a
Schedule S-C	Intraprofessional Form: Assurance of Professional Field Review and Compliance By Supporting Registered Professional	<i>Practice Note 16: Professional Design and Field Review By Supporting Registered Professionals</i> ^a

Note:

^a Engineers and Geoscientists BC and AIBC 2017

B.3.1 SCHEDULE B

The various items set out in Schedule B that relate to structural engineering practices are described below.

With respect to the items under the heading of “Structural,” the purpose is to clearly identify the RP who has overall responsibility for these items as the RPR acting as the SER.

The SER is responsible for the design and Field Review of the Primary Structural System. As well, the SER is responsible for the coordination and general conformance of the Secondary Structural Elements and/or the Specialty Structural Elements with the Primary Structural System.

Only the SER acting as the RPR for the Primary Structural System should sign off for the structural items on Schedule B.

The following sections cover the relevant structural items within Schedule B.

B.3.1.1 SER or RPR for the Primary Structural System

Note that the numbers 2.1 to 2.4 assigned to each of item below directly correspond to the numbering in Schedule B under the “Structural” heading.

2.1 Structural capacity of structural components of the building, including anchorage and seismic restraint

The SER is responsible for the design and Field Reviews of the Primary Structural Elements of the base building structure, including foundation structures, framing of the base building against gravity loading, and bracing of the base building against lateral forces.

For Secondary Structural Elements and Specialty Structural Elements, the SER is responsible for ensuring loads placed on the Primary Structural System are considered in the design of that system.

2.2 Structural aspects of deep foundations

The SER is responsible for the design and Field Reviews of the structural aspects of deep foundations that support the base building structure. The geotechnical engineer has a different responsibility, namely confirming the ability of the soil to support the imposed loads from the building and the deep foundation.

Structural Field Reviews are required for piles where the structural capacity of the shaft is dependent on the workmanship of the General Contractor or Subcontractor, such as cast-in-place reinforced concrete shafts.

2.3 Review of all applicable shop drawings

The SER is responsible for reviewing shop drawings to ensure suitable application to, and integration with, the overall Primary Structural System. This review does not include checking the design of the applicable structural sub-system. Confirming the correctness of dimensions is also excluded from such reviews; the applicable General Contractor or Subcontractor is responsible for confirming the correctness of dimensions. For more information, see *Professional Practice Guidelines: Shop Drawings* (Engineers and Geoscientists BC 2015).

2.4 Structural aspects of unbonded post-tensioned concrete design and construction

The SER is responsible for the design and Field Reviews of unbonded post-tensioned concrete systems within the base building structure. While the SER usually designs the material aspects of this system, a Specialty Structural Engineer providing services as an SRP usually designs the layout of the tendons and anchors.

A Specialty Structural Engineer acting as an SRP working on behalf of the General Contractor provides the layout of the post-tensioning tendons and anchors. Testing and inspection companies also use Specialty Structural Engineers to provide full-time Field Review of the construction workmanship. The SER is responsible for reviewing the work of both of these Specialty Structural Engineers; and by completing this item in Schedule B, the SER takes overall responsibility for this aspect of the structural design.

B.3.1.2 SRP for Other Disciplines

The following are services commonly provided by an SRP and fall under other disciplines; for example, architecture, mechanical, plumbing, fire suppression, and electrical. In such circumstances, the architect or the RPR for the relevant discipline typically initials the respective item and the SRP completes Schedules S-B and S-C for the Secondary Structural Element or Specialty Structural Element for which he or she provided design and Field Reviews. The SRP submits Schedules S-B and S-C to the SER, the architect, another RPR, and/or to the Coordinating Registered Professional (CRP), as appropriate. The SRP should ensure that the design of the Secondary Structural Element or Specialty Structural Element is coordinated with the design of the Primary Structural System.

ARCHITECTURAL

1.6 Structural capacity of architectural components, including anchorage and seismic restraint

This item applies to the structural capacity of architectural components, including anchorage and seismic restraint. Anchorage and seismic restraint pertains to the itemized architectural elements only and does not include primary structural components listed in under the “Structural” heading. This work can include guardrails and handrails, wall cladding systems, non-load-bearing block walls, exterior glazing, window systems, and signage.

The architect or CRP signs the Schedule B. The design and Field Reviews are typically carried out by an SRP, unless the SER chooses to take responsibility. The SRP or SER submits Schedules S-B and S-C to the architect or CRP.

The SRP does not take responsibility for the structural integrity of the architectural components themselves.

MECHANICAL

3.6 Structural capacity of mechanical components, including anchorage and seismic restraint

This work can include anchorages, supports, and restraints for heating, ventilation, and air conditioning mechanical units; related ventilation ducting; and elevating devices.

The mechanical RPR usually initials this item. The design and Field Reviews of the anchorage and seismic restraints of the mechanical component is typically carried out by an SRP, who submits Schedules S-B and S-C to the mechanical RPR.

Neither the mechanical RPR nor the SPR take responsibility for the structural integrity of the mechanical components themselves.

PLUMBING

4.7 Structural capacity of plumbing components, including anchorage and seismic restraint

This work can include anchorages, supports, and restraints for tanks, pumps, and related piping.

The plumbing RPR usually initials this item. The design and Field Reviews of the anchorage and seismic restraints of the plumbing component is typically carried out by an SRP, who submits Schedules S-B and S-C to the plumbing RPR.

Neither the plumbing RPR nor the SRP take responsibility for the structural integrity of the plumbing components themselves.

FIRE SUPPRESSION SYSTEMS

5.9 Structural capacity of sprinkler components, including anchorage and seismic restraint

This work can include anchorages, supports, and restraints for piping or sprinkler lines.

The RPR for the fire suppression systems usually initials this item. The design and Field Reviews of the anchorage and seismic restraints of sprinkler components is typically carried out by an SRP, who submits Schedules S-B and S-C to the RPR for fire suppression systems.

Neither the RPR for fire suppression systems nor the SRP take responsibility for the structural integrity of the sprinkler components themselves.

ELECTRICAL

6.5 Structural capacity of electrical components, including anchorage and seismic restraints

This work can include anchorages, supports, and restraints for transformers, panels, and lighting equipment.

The electrical RPR usually initials this item. The design and Field Reviews of the anchorage and seismic restraints of electrical components is typically carried out by an SRP, who submits Schedules S-B and S-C to the electrical RPR.

Neither the electrical RPR nor the SRP take responsibility for the structural integrity of the electrical components themselves.

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This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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