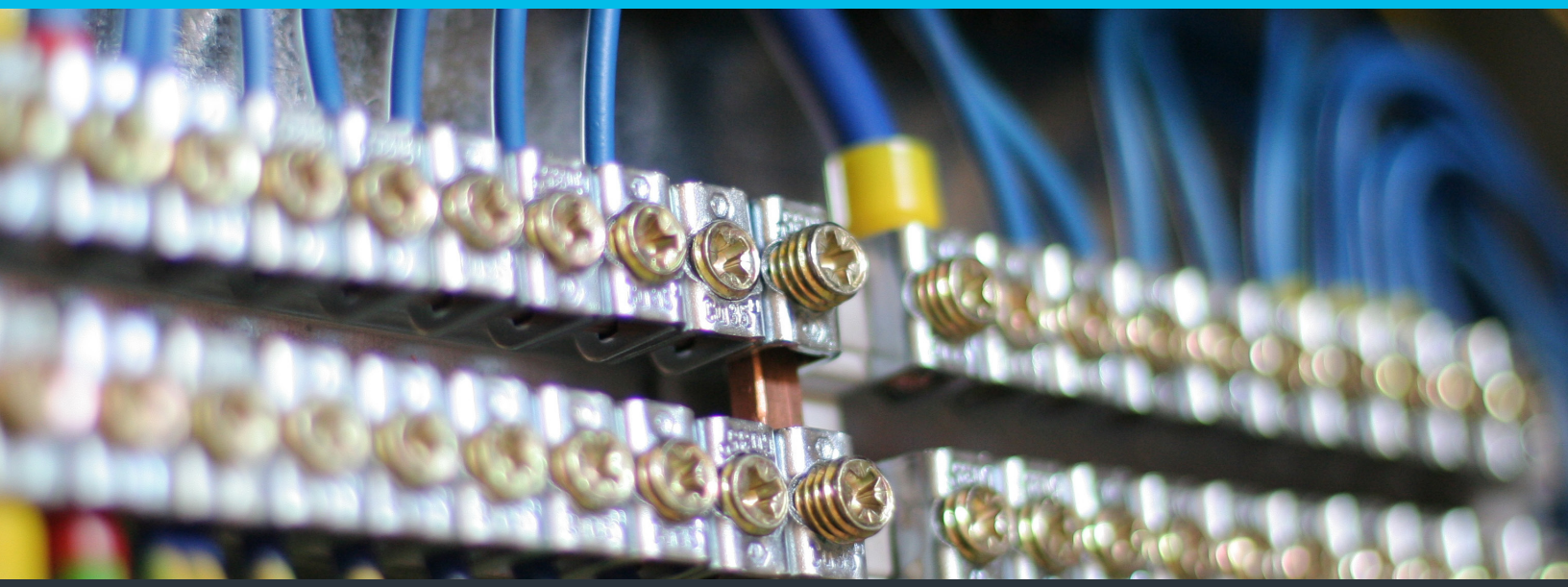
PROFESSIONAL PRACTICE GUIDELINES



BUILDINGS

ELECTRICAL ENGINEERING SERVICES FOR BUILDING PROJECTS

VERSION 2.0
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ENGINEERS &
GEOSCIENTISTS
BRITISH COLUMBIA

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PREFACE

These *Professional Practice Guidelines – Electrical Engineering Services for Building Projects* were developed by Engineers and Geoscientists British Columbia (the Association) to guide professional practice related to electrical engineering services for building projects in British Columbia (BC). These guidelines apply to the practice of electrical engineering for buildings governed by Part 3 of the *BC Building Code*, the City of Vancouver Building By-law, or the *National Building Code of Canada*.

This document was prepared for the information of Engineering Professionals, statutory decision-makers, regulators, the public, and other stakeholders who might be involved in, or have an interest in, electrical engineering services for building projects in BC. They provide a common level of expectation for various stakeholders with respect to the level of effort, due diligence, and standard of practice to be followed when carrying out these projects.

These guidelines were first published in 1993. This 2019 revision reflects current industry standards and practices.

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.

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ABBREVIATIONS

ABBREVIATION	TERM
AIBC	Architectural Institute of British Columbia
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BC	British Columbia
BCBC	*British Columbia Building Code*
CE Code	*Canadian Electrical Code*
CRP	Coordinating Registered Professional
CSA	Canadian Standards Association
EER	Electrical Engineer of Record
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
FSR	Field Safety Representative
NBC	*National Building Code of Canada*
NECB	*National Energy Code for Buildings*
RPR	Registered Professional of Record
SRP	Supporting Registered Professional
VBBL	Vancouver Building By-law

DEFINED TERMS

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

TERM	DEFINITION
Act	*Engineers and Geoscientists Act* [RSBC 1996], Chapter 116.
Architect	An individual who is registered or licensed by the Architectural Institute of British Columbia under the *Architects Act* [RSBC 1996], Chapter 17 to practice the profession of architecture and provide architectural services in British Columbia.
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 *BC Building Code* (*BCBC*), the City of Vancouver Building By-law (VBBL), the *National Building Code of Canada* (*NBC*), or a local building bylaw or code, as well as government agencies that regulate a particular function in a building (for example, Technical Safety BC as a regulatory authority with respect to electrical installations and elevating devices).
Bylaws	The Bylaws of the Association made under the *Act*.
Client	The party who engages the Electrical Engineer of Record to provide professional electrical engineering services.
Contract Documents	All documents, including the engineering and architectural drawings and Specifications, as defined in the construction contract(s) for the construction or modification of the building.
Coordinating Registered Professional	A Registered Professional retained under Clause 2.2.7.2.(1)(a) of Division C of the *BCBC* to coordinate all design and Field Reviews of the Registered Professionals who are required for a project.
Electrical Engineer of Record	The Engineering Professional with general responsibility for the electrical integrity of the electrical systems (see Section 2.0 Roles and Responsibilities), sometimes also referred to as the "Engineer of Record for the Electrical Discipline." By signing and sealing a Schedule B Letter of Assurance under the *BCBC* or VBBL, an Electrical Engineer of Record takes responsibility as the Registered Professional of Record for the design of the electrical components of the plans for a project, and for the Field Review of those components.

TERM	DEFINITION
Electrical Field Safety Representative	An individual certified by a provincial safety manager under the *Safety Standards Act* [SBC 2003], Chapter 39. An Electrical Field Safety Representative is responsible for supervising compliance of electrical work, and is authorized to make declarations on behalf of his or her employer that regulated work complies with the *Safety Standards Act* and regulations. Duties of field safety representatives are listed in Section 26 of the *Safety Standards General Regulation*. The requirements of Electrical FSR certification is available on the Technical Safety BC website under "Certification" (Technical Safety BC 2018a).
Electrical Safety Officer	An individual appointed under Section 11 of the *Safety Standards Act* and employed by Technical Safety BC or a local government to administer the *Safety Standards Act* and regulations, in order to promote safety, assess hazards, and reduce risk. Powers of safety officers are listed in Section 18 of the *Safety Standards Act*.
Engineering Professional	Professional engineers and licensees who are registered or licensed by the Association and entitled under the *Act* to engage in the practice of professional engineering in British Columbia.
Engineers and Geoscientists BC	The business name for the Association.
Field Services	Services provided by the Electrical Engineer of Record to ascertain if the electrical construction work is generally in accordance with the electrical Contract Documents (see Section 3.3.5.3 Field Reviews).
Field Review(s)	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, for the purpose of ascertaining 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. Defined in the *BCBC* as follows: "Field Review means a review of the work (a) at a building site, and (b) where applicable, at locations where building components are fabricated for use at the building 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."
Final Design Drawings	Drawings prepared by the Electrical Engineer of Record that reflect design changes made during construction and incorporate contract-related items such as addenda and change orders, but do not include as-constructed information provided by others. These drawings must be signed, sealed, and dated by the Registered Professional of Record who assumes overall responsibility for the design (see Section 4.1.2 Use of Seal).
General Contractor	See the definition for "Prime Contractor."

TERM	DEFINITION
Letters of Assurance	Uniform, mandatory documents that are intended to clearly identify the responsibilities of key individuals in a building project.
Maintenance Manual	A collection of documentation (in paper or electronic form) containing all the necessary technical information on electrical systems for the building Owner or operator to carry out maintenance and operation of the equipment installed under the contract.
Owner	The party who owns the building, or will own the building, once construction is complete.
Prime Consultant	The individual who, or firm which, is entitled to provide engineering or architectural services, and who or which has responsibility to coordinate the design and the Field Reviews of the various design professionals.
Prime Contractor	The contractor who is engaged to do substantially all of the construction work for a project, whether or not others are engaged as Subcontractors, material suppliers, or workers. The Prime Contractor is also sometimes referred to as the "General Contractor."
Record Drawings	Drawings prepared as a record of what was actually constructed. Drawings may include measurements, elevations, and sizes. These drawings are typically prepared by a General Contractor or Subcontractor, and should not be sealed by the Registered Professional of Record, unless an appropriate declaration is added (see Section 4.1.2 Use of Seal).
Registered Professional	Defined in the *BCBC* as: "a) a person who is registered or licensed to practice as an architect under the *Architects Act*, or b) a person who is registered or licensed to practice as a professional engineer under the *Engineers and Geoscientists Act*." For the purposes of the *Engineers and Geoscientists Act*, 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.
Registered Professional of Record	Defined in the *BCBC* as a Registered Professional retained to undertake design work and field review in accordance with subsection 2.2.7.3. of Division C.
Specialty Engineer	The Engineering Professional who prepares the design and supervises the preparation of documents for specific elements of the project, such as seismic restraint, fire stopping, energy modelling, and Information Management and Information Technology (IMIT). The Specialty Engineer seals specific element designs and documents prepared by or under the direct supervision of the Specialty Engineer, and takes responsibility for such elements. In some circumstances, the Specialty Engineer provides supplementary supporting engineering services to the Electrical Engineer of Record as a Supporting Registered Professional, and in this capacity would sign and seal Schedules S-B and S-C (see the definition for "Supporting Registered Professional" below).

TERM	DEFINITION
Specifications	A written description of the materials, standards of quality, and construction requirements for the items included in a building project. The Specifications are part of the Contract Documents, and include the written requirements and standards for products, systems, workmanship, quality, and services necessary for performing the work.
Subcontractor	A contractor who has a contract with the Prime Contractor to provide labour, materials, or equipment for the execution and quality control of portions of the work shown in the Contract Documents. The Subcontractor's work is generally performed under the direct supervision of the Prime Contractor.
Submittal(s)	Items required by the Contract Documents to be submitted by the Prime Contractor, such as requests for payment, progress reports, shop drawings, manufacturer's literature on equipment, and schedules. Submittals are normally used by the Electrical Engineer of Record to aid in determining if the work and work products conform to the intent of the Contract Documents.
Supporting Registered Professional	The Registered Professional providing supplementary supporting design and/or Field Review services for electrical building components, or subcomponents, to the Electrical Engineer of Record (e.g., specialty electrical elements, secondary electrical elements). It is recommended that the Electrical Engineer 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 *Practice Note 16: Professional Design and Field Review By Supporting Registered Professionals* (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 electrical component, or subcomponent, substantially comply, in all material respects, with the applicable requirements of the *BCBC*.

VERSION HISTORY

VERSION NUMBER	PUBLISHED DATE	DESCRIPTION OF CHANGES
1.0	February 4, 1993	Initial version.
2.0	September 19, 2019	Updated to reflect current industry standards and practices.

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.

These *Professional Practice Guidelines – Electrical Engineering Services for Building Projects* provide guidance on professional practice for Engineering Professionals who might be involved in, or have an interest in, providing electrical engineering services for building projects in BC.

These guidelines were first published in 1993. This 2019 revision reflects current industry standards and practices.

1.1 PURPOSE OF THESE GUIDELINES

These guidelines provide a common approach for carrying out a range of professional activities related to electrical engineering services for building projects.

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 electrical engineering for 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 Electrical Engineer of Record, Specialty Engineer, Electrical Field Safety Representative, Owners, Authorities Having Jurisdiction, and contractors.
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 as to 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

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 electrical engineering for buildings governed by Part 3 of the *BC Building Code* (*BCBC*), the City of Vancouver Building By-law (VBBL), and the *National Building Code of Canada* (*NBC*).

These guidelines outline the professional services that should generally be provided by the Electrical Engineer of Record (EER) in a building project. They specify tasks the EER should perform to achieve designs that serve the interests of the Client and protect public safety, and are properly coordinated with the work of other design, fabrication, and construction team participants. These guidelines should assist in ensuring the integrity of the provision of professional engineering services, including where various Engineering Professionals are involved in the design process.

These guidelines also take into account the assurances that Authorities Having Jurisdiction may require from Engineering Professionals by way of Letters of Assurance.

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 THESE GUIDELINES

These guidelines provide guidance on professional practice for Engineering Professionals who carry out electrical engineering services for building projects. These guidelines are not intended to provide systematic instructions for carrying out these activities; rather, these guidelines outline considerations to be aware of when carrying out these activities.

While these guidelines identify how to carry out electrical engineering for building projects in a way that reflects good professional practice, Engineering Professionals must also apply relevant technical standards issued by other organizations that apply to the services being provided for projects.

Sources for technical standards include technical societies, institutes, and standards associations, such as IEEE (Institute of Electrical and Electronics Engineers), CSA (Canadian Standards Association), *Canadian Electrical Code* (*CE Code*), IES (Illuminating Engineering Society), IEC (International Electrotechnical Commission), and ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers).

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 judgements and decisions depend upon weighing facts and circumstances to determine whether other reasonable and prudent Engineering Professionals, in similar circumstances, could have conducted themselves similarly.

1.6 ACKNOWLEDGEMENTS

This document was reviewed by a group of technical experts and various committees and divisions of the Association. Authorship and review of these guidelines does not necessarily indicate the individuals and/or their employers endorse everything in these guidelines.

This revision to these guidelines was prepared on behalf of the Association by two primary authors who are subject matter experts in this field.

The Association thanks the authors and reviewers of the original document, as well as the author and reviewers of this revision, for their time and effort in sharing their knowledge and experience.

See Appendix C: List of Contributors for a complete list of contributors.

2.0 ROLES AND RESPONSIBILITIES

2.1 COMMON FORMS OF PROJECT ORGANIZATION

Project organizations vary according to the needs of the project and the parties.

Examples of the following common project organizations are included in Appendix A: Common Organizational Structures:

- EER/Prime Consultant Contract (Figure A1)
- EER/Owner Contract (Figure A2)
- Design/Build Contract (Figure A3)

2.2 RESPONSIBILITIES

The following sections outline the responsibilities of various potential project team members.

2.2.1 OWNER

For the design and construction of the project to meet appropriate standards of public safety and requirements of applicable building regulations, the Owner, by itself or through its agents, should:

- retain or cause to be retained qualified design professionals, including a Coordinating Registered Professional (CRP) and an EER with responsibility for the design of the electrical systems of the building;
- cooperate with the EER to set out a written description of the scope of the electrical engineering services as referred to in Section 2.2.3 Electrical Engineer of Record;
- not proceed with the contemplated project without adequate financing, and provide timely and prompt payment for professional services;
- cooperate with the CRP to develop an adequate written description of the project;
- before commencement of electrical engineering services, finalize or cause to be finalized a written agreement with the EER, either directly with the Owner, the CRP, or another appropriate party (see Section 6.2 Related Documents and Resources for resources and examples of standard contracts, such as the Association of Consulting Engineering Companies [ACEC] Document 31 and the Royal Architectural Institute of Canada [RAIC] Document);
- cooperate with the CRP and EER to establish a realistic schedule for providing the electrical engineering services;
- authorize in writing any additional services that may be required beyond the scope of the EER's contract;
- ensure all required approvals, licences, and permits from the Authorities Having Jurisdiction are obtained;
- recognize that unforeseen design changes may occur, and a reasonable contingency should be included in the Owner's budget;
- recognize that drawings, Specifications, and other documents prepared by the EER are for the project, and such documents should not be used or copied for other projects without the written agreement of the EER; and
- recognize that, because code interpretation of the Authority Having Jurisdiction may differ from that of the EER, some changes may occur; however, as identified in *BCBC*, Section 1.2.1.2, the Owner of a building is in no way relieved of full responsibility for complying with this code by the Authority Having Jurisdiction granting a building permit, approving drawings or Specifications, or carrying out inspections.

2.2.2 COORDINATING REGISTERED PROFESSIONAL

To enable the EER to perform his or her duties properly, the CRP (often referred to as the Prime Consultant) should:

- interpret and define the needs of the Owner and, in doing so, define the Owner's intended functions and needs;
- identify any special design criteria, such as equipment and other requirements, and advise the EER accordingly;
- outline the scope of assignment for each design professional for design, preparation of Contract Documents, review of work during construction, and contract administration;
- keep all Registered Professionals of Record informed of budget spending and its status throughout the contract;
- provide timely information in sufficient detail as required, so the EER can adequately perform his or her duties;
- coordinate and review the designs, drawings, and other Contract Documents produced by all participants of the design team; and
- coordinate the communication of information between the Owner and the contractors and the design professionals, including the EER, so the work proceeds in a manner that complies with applicable codes and regulations and meets the Owner's needs.

2.2.3 ELECTRICAL ENGINEER OF RECORD

The EER is responsible for the integrity of the electrical systems shown on Contract Documents prepared by the EER.

The EER may rely on Specialty Engineers to be responsible for elements of the electrical and related systems, but the EER has the overall responsibility to ensure all design work is undertaken as necessary to achieve an electrical system that meets acceptable engineering standards. When relying on Specialty Engineers for such elements, the EER must require the Specialty Engineers to sign and seal the documents for the elements.

Unless otherwise noted, the EER is responsible for ensuring the design and Field Review of any seismic restraint and other specialties for electrical elements are completed. This Field Review is done by the Specialty Engineer. However, when a Specialty Engineer is retained to design the seismic restraint elements, the EER must review those design details for completeness. The EER must provide the seismic restraint information to the structural engineer of record for coordination with the building structural system.

The EER signs Schedule B, Assurance of Professional Design and Commitment for Field Review, regarding the electrical design plans and supporting documents that the EER prepares. The EER must not sign Schedule C-B, Assurance of Professional Field Review and Compliance, until the Electrical Field Safety Representative (Electrical FSR) has completed and documented the work.

Field Reviews are the responsibility of the EER but can be carried out either by the EER in his or her professional capacity or under his or her direct supervision. See *Quality Management Guidelines – Documented Field Reviews During Implementation or Construction* and *Quality Management Guidelines – Direct Supervision* (Engineers and Geoscientists BC 2018b and 2018a).

The EER, together with the Client, is responsible for setting out a written description of the scope of the electrical engineering services sufficient to enable and permit the EER to meet the design and Field Review requirements of these guidelines and applicable building regulations.

The EER is responsible for providing power to all ancillary systems relevant to the building, which are identified in Section 3.4 Additional Electrical Engineering Services.

As an Engineering Professional, the EER is responsible for complying with the Association's Code of Ethics. If the Owner fails or refuses to carry out the obligations as set out in Section 2.2.1 Owner above, the EER should:

- consider giving written notice to the Owner advising the Owner of the EER's recommendations;
- consider whether the EER can continue with the project in accordance with the EER's professional obligations, and if not, provide the Owner with written notice of the EER's inability to continue with the project; and
- consider alerting the Association and other relevant authorities if public safety issues remain unaddressed.

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

2.2.4 SPECIALTY ENGINEER OR SUPPORTING REGISTERED PROFESSIONAL

Where a Specialty Engineer is engaged directly by the EER to provide electrical engineering services (for example, as illustrated in Appendix A, Figure A1), the Specialty Engineer should work with the EER to clearly develop the Specialty Engineer's scope of work.

The Specialty Engineer is responsible for the integrity of his or her designs and must sign, seal, and date the documents prepared in the Specialty Engineer's professional capacity or under his or her direct supervision. Where a Specialty Engineer acts as a Supporting Registered Professional (SRP) (for example, by providing supporting engineering services to the EER), the Specialty Engineer must submit to the EER sealed, signed, and dated Schedules S-B and S-C (from Appendix A of *Practice Note 16: Professional Design and Field Review By Supporting Registered Professionals* [Engineers and Geoscientists BC and AIBC 2017]).

If specified by the EER, Specialty Engineers engaged by the Owner or contractor can be retained to prepare designs and drawings for specific elements of the project such as seismic restraint, fire stopping, energy modelling, and Information Management and Information Technology (IMIT).

2.2.5 PRIME CONTRACTOR

The Prime Contractor has a contract with the Owner. This contract usually states that the Prime Contractor is responsible for the labour, materials, and equipment for the work, and that the Prime Contractor is responsible for the construction methods, techniques, sequences, procedures, safety precautions, and programs associated with the construction work, as set out in the Contract Documents.

The Prime Contractor is responsible for coordinating the work of Subcontractors and for checking the Subcontractors' work prior to Field Review by the EER.

The Prime Contractor is responsible for providing reasonable notice to the EER when components are ready for Field Review and to process site queries or shop drawings.

The contractual responsibility for electrical, mechanical, and other penetrations through fire separations lies with the Prime Contractor.

At the completion of work, the Prime Contractor ensures all documents (e.g., certificates and reports) relevant to the completion of electrical engineering work are provided by Subcontractors. This allows the EER after satisfactory review to issue a Schedule C-B, Assurance of Professional Field Review and Compliance, for successful completion of construction works.

See Appendix B: Letters of Assurance for more information.

2.2.6 AUTHORITY HAVING JURISDICTION

An Authority Having Jurisdiction is responsible for enforcing the codes, policies, standards, and bylaws, or for assessing compliance with applicable codes, standards, and local bylaws.

An Authority Having Jurisdiction may perform inspections as part of its compliance assessment. Authorities Having Jurisdiction can be provincial, municipal, townships, districts, or other organizations such as Technical Safety BC.

2.2.7 ELECTRICAL FIELD SAFETY REPRESENTATIVE

An Electrical FSR is a professional and expert in electrical codes and regulations. The Electrical FSR performs an important function for public safety by assessing and declaring, on behalf of his or her employer, that electrical work is safe and complies with existing safety codes, standards, statutes, and regulations.

For new buildings, building alterations, and building modifications where a contractor is involved with the project, an Electrical FSR is required to declare that the building's electrical system is in compliance with the *BC Electrical Code* and applicable regulations. This can affect the issuance of a building's occupancy permit.

Depending on the jurisdiction where work is being performed, the processes for inspections and inspection audits will vary. Information on jurisdictions, including exceptions, is available on the Technical Safety BC website, at the "Jurisdiction Information" page (Technical Safety BC 2018b).

The Electrical FSR is responsible for:

- monitoring work performed by a licensed electrical contractor, and providing the electrical contractor with regular reports with respect to compliance of that work;
- inspecting all electrical work performed under a permit;
- ensuring work performed under a permit is within the scope of the Electrical FSR's certification and within the scope of the certification for the Electrical FSR named on the electrical contractor's licence;
- ensuring appropriate qualifications and supervision of individuals who perform electrical work under a permit;
- physically examining all work performed under a permit, and reporting to the permit holder on the status of that work, with respect to regulatory compliance;
- ensuring work is not concealed prior to obtaining authorization from the Authority Having Jurisdiction;
- ensuring electrical equipment, circuits, and systems are not connected to an electrical supply unless authorized by the Authority Having Jurisdiction;
- ensuring inspections are requested upon completion of each phase of work, and before concealment or connection to an electrical supply; and
- reporting to the Authority Having Jurisdiction any regulated product or regulated work that creates a risk of personal injury or damage to property.

It should be noted that the Electrical FSR performs the first level inspection and confirms compliance of work and equipment with requirements under the *Safety Standards Act* (including worker qualification and supervision requirements, permit, and scope of work performed under the permit, and compliance with the *BC Electrical Code*).

Upon completion of the Electrical FSR's inspection, the Electrical FSR must request a separate inspection by an Electrical Safety Officer who may physically inspect the electrical work, or waive the inspection.

2.2.8 ELECTRICAL INSPECTIONS

Electrical inspections may be carried out on electrical work requiring permits as authorized under the *Safety Standards Act* and regulations.

Technical Safety BC does not issue electrical permits or complete inspections in all municipalities in BC. Some local governments have been delegated authority to administer the *Safety Standards Act* for electrical work within their jurisdictional areas. More information on which jurisdictions carry out their own inspections is available on the Technical Safety BC website under "Jurisdiction Information" (Technical Safety BC 2018b).

If the Electrical Safety Officer identifies non-compliances in the installation, he or she informs the contractor and the contractor is responsible for ensuring the non-compliances are corrected.

Normally, if electrical inspections are carried out, this work is done after the EER signs off on Schedule C-B, Assurance of Professional Field Review and Compliance.

The electrical inspection focusses on conformance with the *BC Electrical Code*; operational or design issues are not considered.

Public utilities may require sign-off on the electrical inspections in order to provide power to the building.

3.0 GUIDELINES FOR PROFESSIONAL PRACTICE

3.1 OVERVIEW

The following sections outline the services an EER should provide for a building project. These descriptions may assist an EER in explaining services to a Client or Owner.

These outlines are not intended to be exhaustive and should not be interpreted to detract in any way from other provisions of these guidelines.

3.2 SCOPE OF SERVICES

Before commencing design services, the EER should meet with the Client, who is usually the Owner or CRP, but may also be the contractor in a design-build contract, to:

- determine the terms of reference and the scope of work for basic services and additional services (see Section 3.3 Basic Electrical Engineering Services and Section 3.4 Additional Electrical Engineering Services);
- determine and specify which electrical elements and telecommunication systems are to be designed by Specialty Engineers;
- reach agreement on fees, payment schedule, and professional liability insurance coverage; and
- reach agreement on other contractual terms and conditions.

Information on recommended contract language is available on the Association of Consulting Engineering Companies British Columbia (ACEC-BC) website under "Contract Language" (ACEC-BC 2018). (See Section 6.2 Related Documents and Resources.)

For a fast-track or construction management project, in addition to the above, the EER should:

- establish with the Client the terms and conditions under which preliminary or partially complete Contract Documents may be issued in advance, and clearly define the requirements for partially complete Contract Documents; and
- advise the Client that no part of the electrical documents can be considered complete before all Contract Documents, including architectural, structural, civil, mechanical, and electrical drawings, are completed.

3.3 BASIC ELECTRICAL ENGINEERING SERVICES

The stages of the basic services, as discussed below, are usually organized in an agreement according to the sequential stages of a typical project.

Each stage of the basic services contains items that often apply to the progress of work for that particular construction stage. However, the requirements of a specific project may require that activities for certain basic services be performed out of the normal sequence or during different stages than those described in the scope of services.

3.3.1 CONCEPTUAL OR SCHEMATIC DESIGN STAGE

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

- Attend, as required, periodic meetings with the Client and design team to:
  - obtain the Client's instructions regarding the Client's functional, aesthetic, cost, and scheduling requirements;
  - prepare a preliminary design concept; and
  - report on the electrical systems, considering economy, performance, capital cost, compatibility with other design elements, and requirements of relevant codes and authorities.
- Assist the CRP or Owner, as required, to:
  - define the need for any specialty consulting services that may be required for the project, e.g., acoustical, fire protection, code, or Certified Professional;
  - develop or review the project schedule, including any milestone dates;
  - determine channels of communication;
  - determine drawing standards, numbering and revisions system, and Specifications format; and
  - determine the number and timing of project team meetings during each stage of the project.
- Establish dates by which information affecting the electrical design must be received from other disciplines.
- Conduct Field Reviews and review existing drawings, where appropriate.
- Establish criteria for the seismic consultant and other consultants, as required, and comment on reports presented by those consultants.
- Establish electrical design criteria.
- Check applicable codes, regulations and restrictions, insurance requirements, and other factors affecting the design of the project.
- Establish service requirements by determining the allocation of suitable space for electrical vaults, electrical rooms, telecommunications rooms, generator rooms, and other major items of electrical installation.
- Determine equipment weights, sizes, seismic requirements, and other physical characteristics that must be considered in the building electrical design.
- Determine the impact of noise and vibration from the electrical systems on the Client's operational requirements, and recommend solutions by using a specialist, if necessary.
- Establish, where appropriate, comparative information to be used in selection of electrical systems for the project.
- Develop the electrical scheme for the electrical systems; develop alternate schemes where appropriate; consider materials and systems suitable for the project requirements; and consider the requirements and information needed by the other design professionals.
- Prepare a preliminary cost estimate (if it is part of the terms and conditions of the engaged scope of work) or cooperate with others responsible for preparing the estimate, as appropriate.
- Provide, if required, brief outline Specifications for proposed materials and equipment.
- Describe the major electrical system(s) and each significant component and material.
- Explain in writing to the Client all new construction materials or new techniques proposed for use in the project and their alternatives. The explanation should include a discussion of the risks, advantages, and disadvantages, over both the short and long term, so the Client can weigh the choices and make an informed decision before the EER proceeds further.
- If required, advise the Client of the recommended electrical systems and telecommunication; and review the effect of these systems on the electrical construction budget for the project.

- Prepare a summary report that defines the electrical systems selected for the project and outlines the reasons involved in the selection.
- A Client may assume responsibility for all or some of the conceptual or schematic design stage activities described above, provided:
  - the EER's ability to otherwise satisfy the requirements as set out in the subsequent stages of these guidelines is unimpaired;
  - the responsibility for such preliminary design activities is clearly defined in writing; and
  - the Client, in writing, waives the EER's responsibility for such preliminary design activities and their effect on the selection of the electrical systems.
- Submit schematic design for review and approval by the Client.
- Review fire-stopping requirements, which are impacted by electrical installation. The fire-stopping requirements must be established by the CRP (see Appendix B: Letters of Assurance, Section B3.1 Schedule B, subsection B3.1.1 EER or RPR for the Electrical System, line item 6.2).

3.3.2 DESIGN DEVELOPMENT STAGE

In the design development stage, after the selected scheme has been developed in sufficient detail to enable the preparation of the final design and construction documents by all participants of the design team, the EER may provide the following services:

- Attend meetings with the Client and design team, if required.
- Review the results of studies conducted by specialist consultants, such as geotechnical or fire protection and code.
- Prepare preliminary electrical analysis and design calculations for lighting and power (e.g., mechanical loads, owner loads, elevating/vertical transportation device loads, life-safety systems), and select appropriate equipment.
- Prepare preliminary service drawings based on information coordinated with other consultants.
- Prepare preliminary design and drawings showing layouts of typical areas.
- Prepare or edit the outline Specifications for electrical items, as required.
- Coordinate electrical design with space and servicing criteria to meet the requirements of the other design team participants. In particular, notify the mechanical engineer of record of all points of interface between the two disciplines, and determine as soon as possible the electrical characteristics and mechanical requirements of all electrical loads and potential conflicts between the electrical and mechanical riser locations.
- Submit design development documentation for review and approval by the Client.

3.3.3 CONTRACT DOCUMENT STAGE

3.3.3.1 General Services

The EER may provide the following services:

- Design the electrical systems.
- Attend periodic coordination meetings, as required.
- Coordinate with the Authority Having Jurisdiction, as required.
- Establish testing and inspection requirements.
- Comply with fire resistance requirements as determined by the CRP or specialty consultants.

3.3.3.2 Electrical Calculations

The EER must prepare electrical calculations to support all electrical designs. The electrical calculations should be legible and presentable and retained by the EER in his or her project file. The retained documents should include copies of the input and output of any computer analysis along with descriptions of the software used.

In general, the information prepared in connection with the electrical calculations include but are not limited to the following:

- Design criteria, including:
  - discussion and description of design basis, including assumptions;
  - building codes used with edition dates; and
  - a list of electrical design parameters and provisions more stringent than those in the building code and *BC Electrical Code* requirements, as requested by the Client or otherwise used by the EER.
- Location diagrams for electrical elements.
- Computer analysis and design results, if applicable.
- Special studies and analysis where required by the code.
- Equipment and cable sizing calculations.
- Short circuit analysis, protection devices coordination, and arc flash study.
- The names of the electrical design engineer(s) and design check engineer.
- Table of contents for or index to the electrical calculations.

3.3.3.3 Electrical Drawings

The EER must prepare complete drawings as per the contract. The drawings should be in the same scale as the building layout drawings, when possible, and should define the work.

- Where the scale of drawings or complexity of work make the drawings difficult to read and interpret, separate drawings should be provided for the following areas of the work:
  - Lighting and power.
  - HVAC electrical services.
  - Life-safety system requirements.
  - Single line diagram and riser diagrams.
  - Other scope of services as agreed in Section 3.2 Scope of Services above.
- Schematics and riser diagrams should be provided as required for all major systems with notes to describe the function of distribution power and functioning of communication systems.
- Site plans should be included that show electrical power and communications arrangements, connections to public utility services, and cross-sections and profiles.
- Symbol lists and typical details should be included, where required, for all equipment, accessories, and devices.
- Floor plan layouts for all electrical systems should be provided. Complete electrical feeder sizing, together with sizes, types, locations, and capacities of all panel boards, should be shown on these documents.
- Exit sign locations should be established, based on egress path as identified and laid out by an Architect or code consultant.
- To avoid conflicts, supplementary details should be provided in congested areas of electrical rooms and communication equipment rooms. For clarity, such details should be drawn in plan and elevation views at a scale of 1:50 (1/4" to the foot) or larger.
- Power distribution can be shown in single line diagrams.
- Schedules should be included to provide types and capacities of lighting fixtures, cables, panel boards, and motor equipment. Alternatively, these may be included in the Specifications.
- All drawings, as well as details, elevations, and sections, should be properly cross-referenced.

3.3.3.4 Specifications

The EER must prepare Specifications using a format suitable for inclusion with the overall Contract Documents.

- Specifications should include the following information:
  - Standards, codes, and bylaws governing work.
  - Submittals required.
  - Quality control requirements.
  - Materials.
  - Workmanship and fabrication.
  - Tolerances.

  - Information for temporary works and erection information, where necessary, to ensure the intent and integrity of the design.
  - Construction inspection, testing, and commissioning.
  - Notification by the contractor before significant segments of the work are begun.
  - Warranties.
  - Performance criteria for design by Specialty Engineers.
- Where appropriate, the Specifications may be abbreviated and become part of the drawings; this should be defined in the contract with the Client (for small-scale projects).
- The Specifications usually set out that the EER's review of Submittals and inspection of work, as well as any testing by independent agencies reporting to the Client, are undertaken to inform the Client of the quality of the contractor's performance, and that this review and testing are not for the benefit of the contractor. Contractors must provide their own independent quality control programs.

3.3.4 TENDERING STAGE

The EER may provide the following services at this stage:

- Assist in the preparation of pre-qualification documents, if required.
- Assist in reviewing bidder's qualifications, if required.
- Assist the Client in obtaining required approvals, licences, and permits; prepare and supply Letters of Assurance and documents required by the Authority Having Jurisdiction.
- Assist in analysis and evaluation of tenders submitted.
- Assist the Client in answering queries raised by the bidding contractors, and issue electrical addenda and clarification of electrical documents, as required.
- Assist in the preparation of the contract, if required.

3.3.5 CONSTRUCTION STAGE

3.3.5.1 Field Services

It is essential that Field Services be provided for all systems for which the EER is responsible, to ascertain whether or not the work is generally in accordance with the electrical Contract Documents.

Field Reviews are the responsibility of the EER but can be carried out by the EER in his or her professional capacity or under his or her direct supervision (see Section 3.3.5.3 Field Reviews below). See *Quality Management Guidelines – Documented Field Reviews During Implementation or Construction* and *Quality Management Guidelines – Direct Supervision* (Engineers and Geoscientists BC 2018b and 2018a).

Field Services provided by the EER should not be construed as relieving the contractor of the contractor's responsibility for building the project according to the Contract Documents, controlling the progress, coordinating Subcontractors for the construction logistics, providing safe working conditions, or correcting any deviations from the project requirements.

Note that some items reviewed by the EER may also require review by other members of the design team or by testing and inspection agencies. Such work may include proprietary products and electrical elements designed by others.

Field Services should include, but not necessarily be limited to, the following and may vary depending on the complexity of the job:

- Attend construction meetings, if required.
- 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 the qualifications of manufacturers meet the Specifications.

- Advise the contractor and the CRP on the interpretation of the electrical drawings and Specifications, and issue supplementary details and instructions during the construction period, as required.
- If requested, advise the Client on the validity of charges for additions to or deletions from the contract and on the issue of change orders.
- Review and comment on, if requested by the Client, the contractor's applications for progress payments. Estimate, if required, completed work and materials on site for payment according to the terms of the construction contract.
- If the Electrical FSR or municipal safety officer for the installation note any code or safety contraventions, the EER must work with the Prime Contractor to ensure contraventions are corrected before occupancy. Where there is uncertainty about the interpretation of the code, the EER should work with the Authority Having Jurisdiction to provide clear instructions to the contractor to complete the installation.
- Review reports from the testing and inspection agencies to determine if the agency has verified compliance of the reported item of work with the electrical Contract Documents. Initiate any necessary action.
- Conduct substantial and total performance Field Reviews of the electrical components of the project, note deficiencies, and inspect completed corrections.
- Submit, if required, Letters of Assurance and Record Drawings to the Authority Having Jurisdiction and/or the CRP.
- Review Record Drawings produced by the contractor, once completed. Review Maintenance Manuals before handing them over to the Client.

3.3.5.2 Submittal Reviews

Submittals should be reviewed for general compliance with the electrical Contract Documents; however, this does not include checking dimensions or quantities, or reviewing the contractor's safety measures or methods of construction.

The review of Submittals should include:

- confirming that the Submittals have been reviewed by the Prime Contractor and relevant Subcontractor before being reviewed by the EER; and
- reviewing the shop drawings and other Submittals for conformance with the Contract Documents and the intent of the design.

For the submission of shop drawings dealing with ancillary building systems (see Section 3.4 Additional Electrical Engineering Services), the EER is responsible for reviewing relevant shop drawings to confirm that the required power being supplied to the devices is consistent with the requirements in the shop drawings.

The following should be addressed when reviewing Submittals:

- When required in the Contract Documents, confirm that the shop drawings were signed and sealed by the Specialty Engineer responsible for the design of specialty systems such as seismic elements and connections. Responsibility for the detail design remains with the Specialty Engineer who signed and sealed the drawings. To clarify responsibility, the Specialty Engineer may qualify the extent of work that he or she designed.
- Review Record Drawings prepared and submitted by the contractor either electronically or by hard copy to reflect the ‘record’ condition of the project, as turned over to the Client. The Client must be advised that that the drawings were prepared by the contractor and reviewed only for general conformity to the drawing standards and intent of the design, and that the EER cannot accept responsibility for their accuracy.
- Arrange for the contractor to submit and review the operating and Maintenance Manual for the

equipment and systems supplied on the project. The data submitted should include manufacturer's recommendations for maintenance of each piece of equipment and other information that will enable the Client to assume operation of the building.

- The EER must obtain a written letter from the contractor or the vendor confirming that for all firestops, the products and materials used meet the EER's design documents (drawings and Specifications) and have been tested to confirm they meet the relevant standards.

3.3.5.3 Field Reviews

As described in Section 2.2.3 Electrical Engineer of Record, Field Reviews are the responsibility of the EER but can be carried out either by the EER in his or her professional capacity or under his or her direct supervision. See *Quality Management Guidelines – Documented Field Reviews During Implementation or Construction* and *Quality Management Guidelines – Direct Supervision* (Engineers and Geoscientists BC 2018b and 2018a).

Field Reviews should include, but not necessarily be limited to, the following:

- Visit the site at intervals appropriate to the stage of construction to observe the quality and the progress of the construction of those elements designed by the EER. At the discretion of the EER, proprietary products, connections, and other seismic restraint elements designed by Specialty Engineers should be inspected by those Specialty Engineers at the appropriate stage of construction and reported in writing to the EER.
- Prepare site visit reports outlining observations and deficiencies in the work and bring them to the attention of the contractor's site representative.
- Distribute, as required, site visit reports to the CRP and other parties such as the Prime Contractor and Owner. Where the Owner directly retains the services of the EER, it is recommended that the Owner also be sent copies of the reports.
- The EER is to exercise professional discretion in determining the required number of Field Reviews, including random checks, to ensure an adequate level of effort in completing this aspect of the Field Reviews. This will ascertain whether the work related to installing firestops for the building's electrical system substantially complies with the plans and supporting documents prepared by the EER, under which the building permit is issued.
- Conduct a final project review and advise the Client of continuing or newly observed defects or deficiencies in the project.

3.4 ADDITIONAL ELECTRICAL ENGINEERING SERVICES

In addition to the basic services, the EER may provide additional services, if the EER and the Client mutually agree to include them in the contract.

These additional services for electrical design are not considered essential for the basic services discussed in Section 3.3 Basic Electrical Engineering Services and are not part of the minimum services that the EER should provide under these guidelines, except as agreed upon in a contract.

The Client should retain the EER to provide additional services, in order to review items designed by others to confirm compatibility with the design of the electrical systems.

The following are examples of additional services:

- Services beyond the design and Field Review of the base electrical system for the building. This can include reviewing matters related to compliance with the relevant building code that are not related to the design of electrical services. Examples include reviewing the location of exit signs, exit routes, and other life-safety matters relevant to the building code. In situations like tenant improvements where the EER is Prime Consultant and an Architect is not involved, the EER must

obtain advice from a code consultant or Architect to confirm exiting routes and exit sign locations.

- Design work resulting from changes to the project as originally described and agreed to under the contract between the EER and Client, such as changes in scope, complexity, diversity, or magnitude of the project.
- Preparation of alternate electrical designs and related documentation after selection of the electrical system made during the conceptual and schematic design stages.
- The review, design, and documentation of alternate or substitute systems, if requested by the CRP (Prime Consultant), Client, or contractor for tendering to obtain competitive bids for items such as proprietary products.
- Work connected with preparing documents for tendering segregated contracts, pre-tendered contracts, or phased or fast-track construction.
- Review of alternate designs or products after completion of the Contract Documents.
- Work resulting from changes necessary because of construction cost over-runs that are beyond the control of the EER.
- Translation of Contract Documents into a second language, conversion to other units, or special preparation of drawings for reduction.
- Programming of items such as Owner's equipment and electrical systems where investigation and analysis must determine user requirements for a statement of system requirements, materials, and performance.
- Analysis of long-range plans, as defined by the CRP, and attendant preliminary sketches and reports (master planning).
- Preparation of alternative building or system designs and attendant documentation, when required by the CRP or Client either for review or for competitive tender prices.
- Travelling time outside of normal requirements.
- Construction or project management services.
- Energy analysis and value engineering (life-cycle costing) analysis, including schematics, where required by the CRP or Client.
- Preparation of designs and documentation for future implementation that are not included in construction contract.
- Preparation of bills of materials or material schedules at any time during the project.
- Providing resident engineering services during construction, or supplying resident staff on the project, to determine if the contractor is carrying out the work in accordance with the Contract Documents. If required by the CRP, resident services may include recording all details of construction for final revisions of the plans or drawings to show the work on Record Drawings. These services do not include directing persons; selecting, directing, or approving methods and equipment employed by the contractor in any phase of the construction; or placing in operation any plant or equipment.
- Preparation of drawings, Specifications, and change orders, and administration of contract additions and/or deletions initiated by the Client but either not implemented or resulting in a reduction in the contract price.
- Certification inspections and testing of life-safety systems, where required by the Authority Having Jurisdiction.
- Testing of building systems requiring confirmation of conformance with Specifications.
- Preparation of operating or Maintenance Manuals.
- Preparation of Record Drawings containing contractor information where requested, as the EER does not guarantee the accuracy of information provided to the EER by the contractor.
- Services provided after expiry of the one-year period after a certificate of substantial performance was issued.
- Complete or partial revision of design documents previously approved by the Client or in keeping with written instruction or drawings previously received from the Client.

- Commissioning of building electrical systems, including training of personnel and providing operating and maintenance assistance.
- Advisory services, which include testimony, consultation and advice, appraisals, valuations, research, or other services leading to specialized conclusions and recommendations.
- Surveys of existing electrical equipment, which include conducting elaborate surveys or measurements and evaluating existing electrical equipment (for example, securing information on special existing loadings such as unusual equipment requirements or unusual construction).
- Breaker verification and factory witness testing involving actual detailed study of the breaker and fuse reaction times to ensure a coordinated distribution system, or adjustment of the breaker times on site to respond to the coordination study results. In addition, the EER may witness factory testing of major electrical components to verify performance before shipment from the factory.
- Fast-track construction, when in order to facilitate an earlier-than-normal construction start, the CRP (Prime Consultant) or project manager requests the EER to prepare several separate bid packages instead of one package, which is the norm. In this case, complete tender documentation necessitating extra work on the part of the EER is required for each bid package.
- Site work elements beyond the property line.
- Review of seismic restraints designed by Specialty Engineers for electrical systems.
- Review of design drawings or Specifications prepared by others to determine adequacy of anchorage of seismic elements for electrical equipment.
- Preparation of or assistance with the preparation of detailed cost estimates. The EER must inform the Client of the variables inherent in the estimate and the expected degree of variation from the estimate. Where the degree of variation is critical, the Owner should have the estimate independently verified.
- Filing applications for and obtaining permits.
- Preparation of demolition documents.
- Tenant-related design services.
- Design or review of the effects of the contractor's methods, procedures, or construction equipment on the structure.
- Work resulting from corrections or revisions required because of errors or omissions in construction by the contractor.
- Work due to extended time schedules for design or construction.
- Services as an expert witness in connection with any public hearing, arbitration, or court proceedings concerning the project, including associated preparation.
- Work resulting from damage from fire, man-made disasters, or natural disasters.
- Authorized overtime work requiring premium pay.
- Additional power system studies for grounding systems, harmonics mitigation, or lightning protection; detailed coordination studies; or arc flash studies.
- Affixing arc flash study warning labels to project electrical equipment.
- Preparation of cost estimates.
- Design of on-site renewable (alternate) energy generation systems and coordination with the local utility regarding related protection and energy production monitoring. Where relevant, the EER will contact the utility authority to define the responsibilities and relationships between the power producer and local authorities. The EER is responsible for determining the electrical capacity of the electrical system and the design of the backup capacity (others may be required to determine this if it relates to the electrical capacity required to heat the whole building).
- Design and/or management of the integration of various building systems, including but not limited to building management systems (BMS), access control systems, video surveillance systems, security/communication systems, intrusion

detection systems, public address/information display systems, audio visual systems, nurse call systems, or elevating devices.

- Because heat recovery systems designed by the mechanical engineer of record need to include estimated heat gains recovered from electrical equipment, the EER may be required to determine the heat from other sources (such as transformers, computers, or racks).
- Where the EER acts as the CRP for a simple design project, for which the majority of work relates to the design of electrical systems; for example, for tenant improvements where more than one engineering discipline is involved (such as for a fire protection system and electrical system).

3.5 FABRICATION DRAWINGS AND DOCUMENTS

Fabricators or manufacturers must produce all necessary drawings and documents to represent the work covered by their contract with the contractor. These drawings and documents are prepared following a review of the drawings, Specifications, and Contract Documents supplied by the EER and following the resolution of any errors or requested changes.

Fabrication drawings and documents usually include the following:

- **Shop drawings**: Drawings produced by the fabricator and/or manufacturer to provide all information necessary for shop personnel to fabricate and assemble the items. The drawings must be signed, sealed, and dated when incorporating design by the Specialty Engineer.
- **Catalogues**: Catalogues of the project equipment, which contain details of wiring, controls, and protection devices.
- **Manuals**: Manuals for operation and maintenance of project equipment.

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 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/geoscience 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 high-risk 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 apply to the standard of practice for electrical engineering for buildings governed by Part 3 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 and guidance about additional restrictions pertaining to Record Drawings, 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 2018a).

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 engineering or geoscience 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 of 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.

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

4.1.7 DOCUMENTED INDEPENDENT REVIEW OF HIGH RISK DESIGNS

An independent review is a higher level of review beyond regular checking. It involves a documented evaluation of the design concept, details, and documentation based on a qualitative examination of the substantially complete design documents, which occurs before those documents are issued for construction. It is carried out by an experienced Engineering Professional, who has not been involved in preparing the design.

Currently, Bylaw 14(b)(4) refers to an independent review in the context of structural engineering; however, an independent review of electrical designs may be appropriate in certain circumstances, such as for the design of critical elements of the electrical system, or where there are significant life-safety implications, or when required by a code.

In these cases, Engineering Professionals should follow similar processes to those outlined in *Quality Management Guidelines – Documented Independent Review of Structural Designs* (Engineers and Geoscientists BC 2018e). The independent review must be appropriately documented, and the documentation must be retained as described in Section 4.1.4 Retention of Project Documentation.

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 electrical engineering tasks (Code of Ethics Principle 2).

5.2 EDUCATION, TRAINING, AND EXPERIENCE

Providing electrical engineering services for building projects, as described in these guidelines, requires minimum levels of education, training, and experience in many overlapping areas of engineering. The Engineering Professional acting as the EER and 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). Therefore, the EER must evaluate his or her qualifications and ensure that he or she 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.

Typical qualifications for an EER may include education and experience in the following areas:

- Electrical engineering
- Basic knowledge of mechanical and civil engineering
- Basic knowledge of architecture and sustainability

An Engineering Professional should not act as an EER unless he or she has obtained a minimum of two years of experience under the direct supervision of another EER. These two years of experience can be gained while going through the four years of training under the Engineer-in-Training (EIT) program.

The experience gained in order to practice as an EER must be relevant to the type of work and projects for which the EER will be taking responsibility.

The academic training for the above skill sets 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 guideline 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 and Resources.

6.1 REFERENCES

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Province of BC. 2010. Guide to the Letters of Assurance in the B.C. Building Code 2006. (December, 2010, Edition 5a). Victoria, BC: Building and Safety Standards Branch. [accessed: 2018 Sep 27]. http://www.bccodes.ca/2006GuideLoA.pdf.

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Technical Safety BC. 2018b. [website]. Jurisdiction Information. [accessed 2018 Sep 27]. https://www.technicalsafetybc.ca/jurisdiction-information.

6.2 RELATED DOCUMENTS AND RESOURCES

The following resources provide general information on consulting engineering practices, including selecting consultants and contract language.

Association of Consulting Engineering Companies Canada (ACEC). 2010. ACEC Document 31 - 2010 Engineering Agreement Between Client and Engineer. Ottawa, ON: ACEC. [accessed: 2019 Feb 1]. https://www.acec.ca/publications_media/shop/index.html/shopping/index/view-category/id/5

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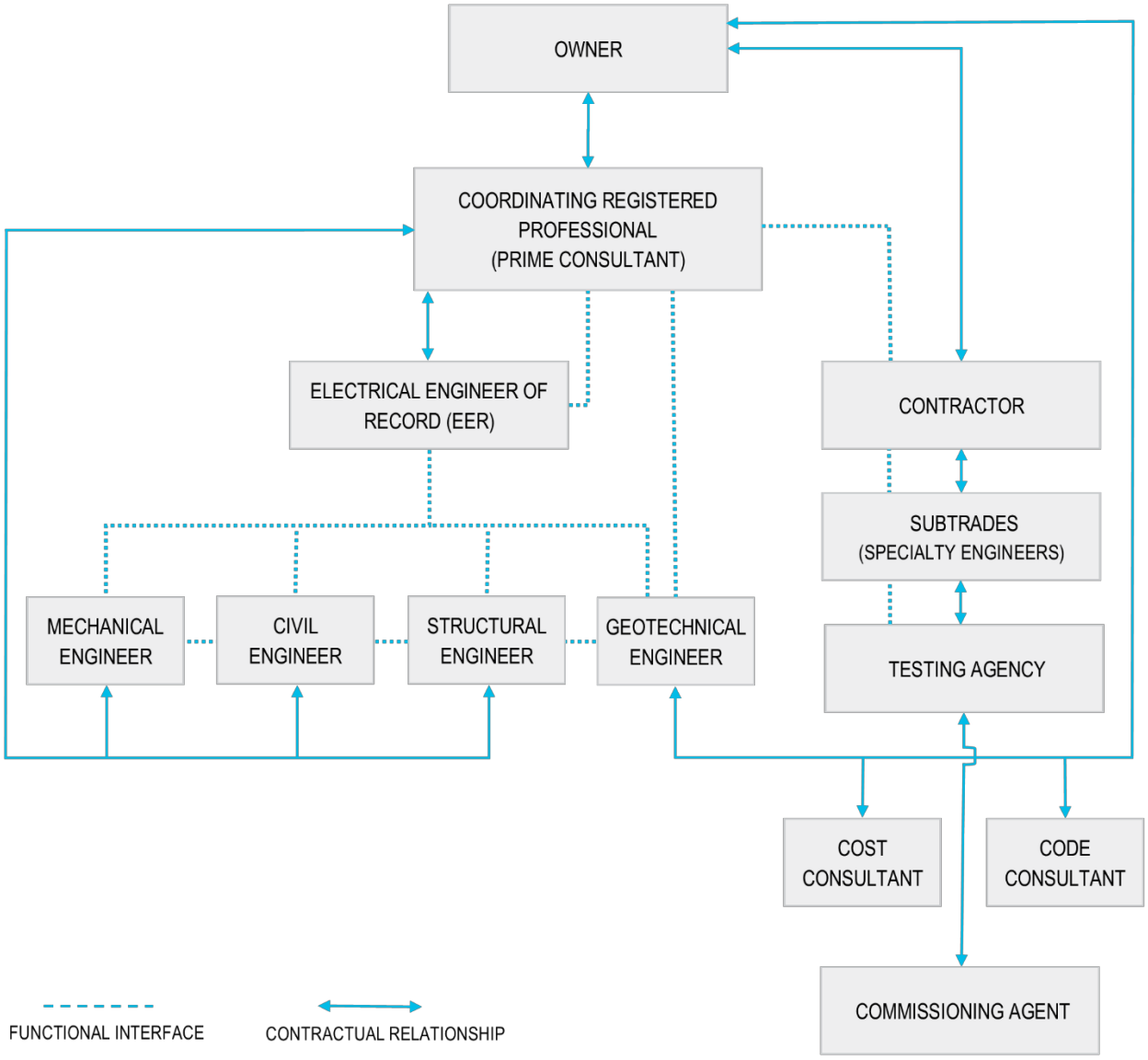
7.0 APPENDICES

APPENDIX A: COMMON ORGANIZATIONAL STRUCTURES

- Figure A1: Electrical Engineer of Record (EER)/Prime Consultant Contract
- Figure A2: Electrical Engineer of Record (EER)/Owner Contract
- Figure A3: Design/Build Contract

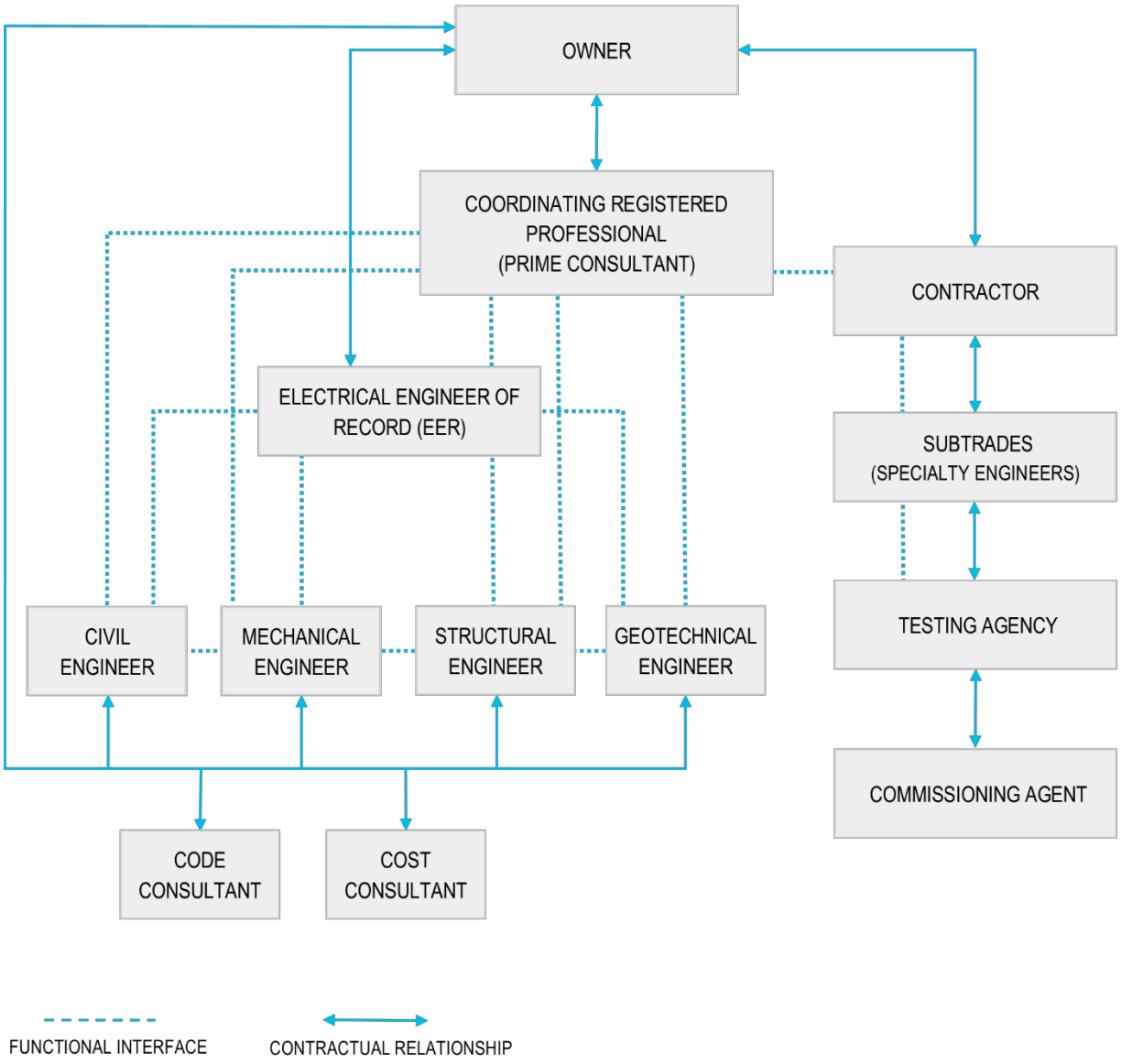
FIGURE A1: ELECTRICAL ENGINEER OF RECORD (EER)/PRIME CONSULTANT CONTRACT



NOTES:

1. The Specialty Engineer may be hired by the Owner, by the Electrical Engineer of Record (EER), or by contractors.
2. It must be noted that in some circumstances, the EER will be the Prime Consultant or will take the role of the Prime Consultant.

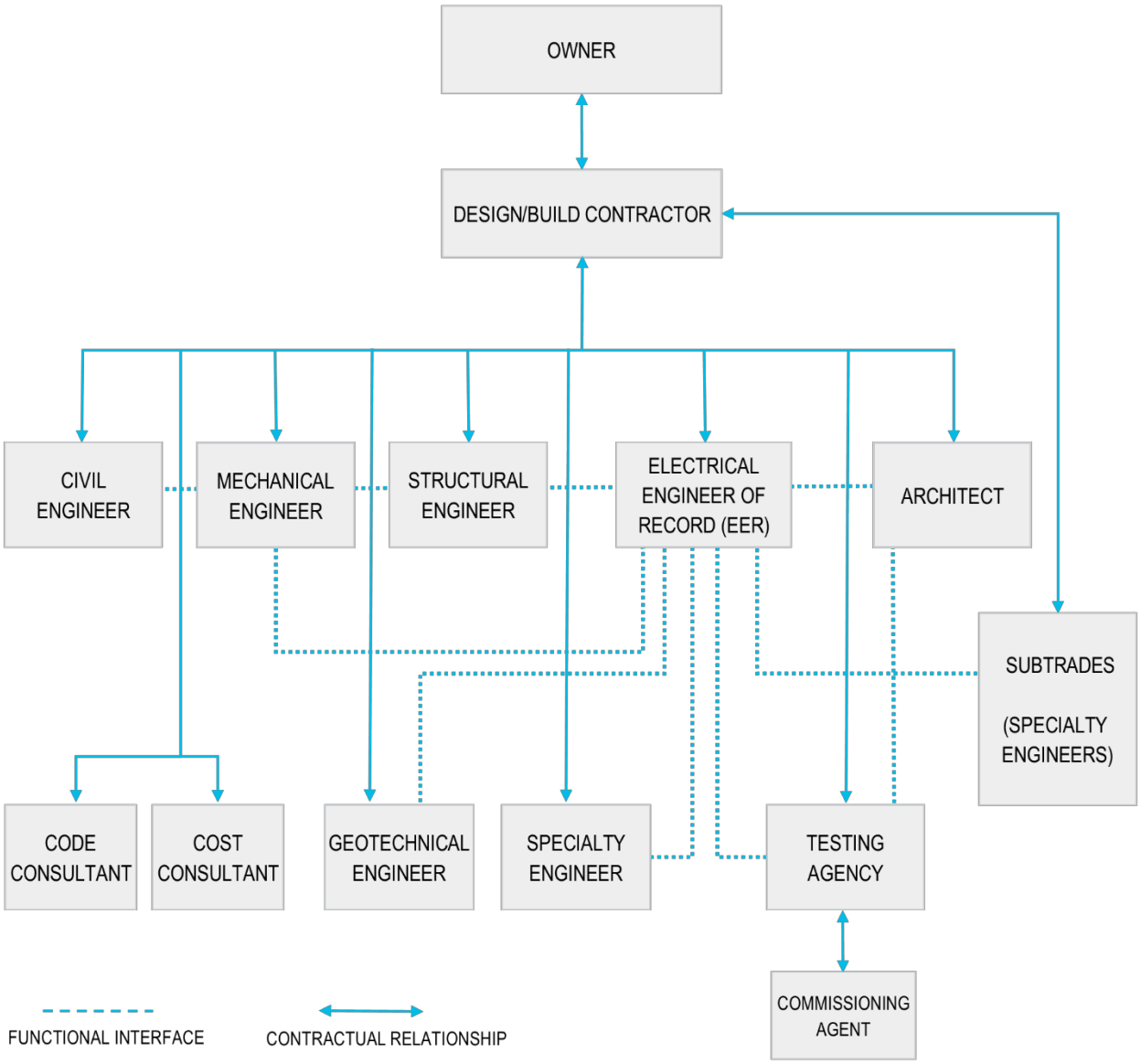
FIGURE A2: ELECTRICAL ENGINEER OF RECORD (EER)/OWNER CONTRACT



NOTES:

1. The Specialty Engineer may be hired by the Owner, by the Electrical Engineer of Record (EER), or by contractors.
2. The Coordinating Registered Professional (CRP) is responsible for coordinating the subconsultants, even when they were hired by the Owner.
3. It must be noted that in some circumstances, the EER will be the Prime Consultant or will take the role of a Prime Consultant.

FIGURE A3: DESIGN/BUILD CONTRACT



NOTES:

1. The Specialty Engineer may be hired by the Owner, by the Electrical Engineer of Record (EER), or by contractors.
2. The Coordinating Registered Professional (CRP) is responsible for coordinating the subconsultants, even when they were hired by the Owner

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 *BC Building Code* (*BCBC*). They continue to be referenced in the current editions of the VBBL and *BCBC*.

Letters of Assurance were developed after discussions among the City of Vancouver, the Government of British Columbia (BC) Building and Safety Standards Branch, the Architectural Institute of BC (AIBC), and Engineers and Geoscientists BC, and in close consultation with the Building Officials' Association of BC.

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

- activities of the various Registered Professionals of Record (RPRs) are coordinated;
- design documents submitted to support 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 undertakes the necessary Field Reviews to determine that building construction substantially complies with the *BCBC* or VBBL.

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

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, is used to identify the various RPRs taking responsibility for designs, and confirms that the 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 Field Reviews required for the project.

B2.2 SCHEDULE C-B

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

B2.3 SCHEDULES S-B AND S-C

An RPR who is acting as the Electrical Engineer of Record (EER) should only undertake design and Field Review for the items identified on the Letter of Assurance for his or her discipline and based on his or her competence in the area of practice.

An RPR or Owner may engage supplementary supporting engineering services for a particular electrical component or subcomponent.

Where supporting engineering services are required, the relevant RPR should obtain appropriate assurances from the Supporting Registered Professional (SRP) providing the supporting design service and/or Field Review service. The SRP could be engaged by the RPR, the Owner, or by a contractor, Subcontractor, or supplier.

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*, the RPR can complete and submit the Letter of Assurance for his or her discipline.

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, available from *Practice Note 16: Professional Design and Field Review By Supporting Registered Professionals* (Engineers and Geoscientists BC and AIBC 2017), are recommended for use by a Registered Professional acting as an SRP.

B2.4 CODES, BYLAWS, AND GUIDANCE DOCUMENTS

More information on 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 2018)
- 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 Supporting Registered Professionals* (Engineers and Geoscientists BC and AIBC 2017)

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

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

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

Note:

[a] Engineers and Geoscientists BC and AIBC 2017

B3 LETTERS OF ASSURANCE FOR ELECTRICAL ENGINEERING PRACTICES

B3.1 SCHEDULE B

This section describes how Schedule B, items 6.1 to 6.10 (under the 'Electrical' heading) directly relate to electrical engineering practices. The purpose is to clearly identify the Registered Professional who has the overall responsibility for these items, when acting as the RPR and the EER.

The EER is responsible for the design and Field Review of the electrical system. Only the EER acting as the RPR for the electrical system should sign off for the electrical items on Schedule B.

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

B3.1.1 EER or RPR for the Electrical System

Note that the numbers 6.1 to 6.10 assigned to each item below directly correspond to the numbering in Schedule B under the 'Electrical' heading.

The EER should only sign off on items 6.1 to 6.10 after the Electrical Field Safety Representative (Electrical FSR) has completed his or her review and confirmed the installation is safe and in compliance with the *Canadian Electrical Code* (*CEC*).

6.1 Electrical systems and devices, including high building requirements where applicable

The EER signs off on this item only after the Electrical FSR has completed his or her review and the EER has determined that there is sufficient evidence the systems and devices are in compliance with relevant standards and codes.

6.2 Continuity of fire separations at electrical penetrations

For the EER to sign off on this item, the EER needs to review listed firestop (shop drawings), and either:

- carry out reasonable field reviews (consistent with wording in Letters of Assurance) to provide assurance that the fire stopping of penetrations by electrical services at fire separations substantially complies with the code, and that the material or listed product specified has been installed in accordance with the applicable code and/or standard; or
- rely on a Supporting Registered Professional to carry out the above and submit Schedules S-B and S-C to the EER.

Note: While the EER may rely on a Supporting Registered Professional confirming that the penetrations have been satisfactorily completed together with signed and sealed Schedules S-B and S-C, the EER may provide random field reviews of the fire stopping to provide assurance that the fire stopping substantially complies with the approved documentation and applicable code and/or standards.

6.3 Functional testing of electrical related fire emergency systems and devices

The EER shall review all documentation from third parties to assure that functional testing of the fire and life safety systems have been carried out satisfactorily. The EER or someone acting under the EER's direct supervision should attend and witness appropriate coordinated tests, to demonstrate substantial compliance in accordance with the design documentation; for example, devices such as sprinkler flow switches and other devices are functionally tested and all panels/zoning and signals are operating as intended. The aim is that all devices and sub-systems operate as one integrated system.

6.4 Electrical systems and devices Maintenance Manuals

The Maintenance Manuals must contain all relevant documents for all systems and devices for the project, including shop drawings, cut sheets, and catalogues, in order for the EER to sign off this item.

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

This work can include anchorages, supports, and restraints for transformers, panels, and lighting equipment. The EER typically initials this item.

The design of the anchorage and seismic restraints of electrical components is typically carried out by an SRP who submits Schedule S-B and Schedule S-C to the EER.

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

6.6 Clearances from buildings of all electrical utility equipment

Conformance with local utility authority conditions for connections must be confirmed on the site before the EER can sign off this item.

6.7 Fire protection of wiring for emergency systems

The code compliance must be satisfied for fire protection of the emergency wiring before the EER can sign off this item.

6.8 Review of all applicable shop drawings

All relevant project shop drawings must be reviewed and signed off by the electrical contractor. The EER only reviews for conformity to the design concept and for general arrangement.

Unless a deviation in the shop drawings has been previously approved in writing by the EER, such a review by the EER does not relieve the contractor from taking responsibility for any and all errors or omissions in the shop drawings or from taking responsibility for meeting all the requirements contained in the Contract Documents.

The EER must confirm that he or she has reviewed the shop drawings, e.g., by using a stamp that confirms the shop drawings have been reviewed. The shop drawing review stamp should include appropriate wording to indicate the type of review and that the shop drawings were reviewed for general conformance only to the design concept and for general arrangement. Where variations from the design intent are identified during the review of shop drawings they must be documented and followed up.

For more information, refer to *Professional Practice Guidelines – Shop Drawings* (Engineers and Geoscientists BC 2015).

6.9 Electrical systems, Part 10 – ASHRAE, NECB, or Energy Step Code requirements

See Sections B3.1.2 and B3.1.3 below for more details.

6.10 Electrical systems, testing and/or confirmation of Part 10 requirements

The sections of Schedule B under the discipline headings 'Architectural,' 'Mechanical,' 'Plumbing,' and 'Electrical' refer to "testing and/or confirmation of Part 10 requirements."

The intention is that the RPR will provide assurance regarding the design and Field Review requirements for testing, confirmation, or both, as per the requirements of the Part 10 compliance path chosen for the building (i.e., ASHRAE 90.1-2010, *NECB* 2011, or the *BC Energy Step Code*). For example, professionals working on lighting and following the ASHRAE 90.1-2010 compliance path to confirm that the design work complies with the requirements of Section 9 should undertake a Field Review to confirm that the installed lighting complies with its design, and should prepare Submittals based on the requirements of Section 9.7 (Province of BC 2018).

B3.1.2 Schedule B and Part 10 (Energy Step Code) Aspects of the BCBC

Regardless of what energy code (e.g., *National Energy Code for Buildings* [*NECB*]) and standard (e.g., ASHRAE 90.1, *BC Energy Step Code*) is used in the project, for Part 3 new construction projects, the EER should sign off on Schedule B, items 6.9 and 6.10 of the Letters of Assurance relating to conformance with the Part 10 (Energy) aspects of the *BCBC*.

- In projects where building energy modelling is not required, the EER can sign off on the following items:
  - Item 6.9, by confirming that the electrical requirements within Sections 8 and 9 of ASHRAE 90.1, or Part 4 and Part 7 of NECB have been met.
  - Item 6.10, by specifying the testing requirements in the energy code or standard applicable to the building and by confirming that the testing will be carried out.

- In projects where building energy modelling is required, the EER can sign off on the following items:
  - Item 6.9, by confirming that the electrical discipline's inputs to the energy model have been provided per Sections 8, 9, and 10 (including mandatory requirements) of ASHRAE 90.1, or Part 8 with relevant prescriptive requirements under Part 4 of *NECB* (applies to both *NECB* and the *BC Energy Step Code*), and after confirming their design's compliance as it pertains to the model.
  - Item 6.10, by specifying the testing requirements in the energy code or standard applicable to the building, confirming that the testing will be carried out, and confirming that any changes to the electrical design that could affect the energy model will be communicated to the Coordinator (as defined in *Joint Professional Practice Guidelines – Whole Building Energy Modelling Services* [AIBC and Engineers and Geoscientists BC 2018]).

B3.1.3 Additional Notes for Building Energy Modelling Projects

In projects for which whole building energy modelling is required under Part 10 (Energy) of the *BCBC*, the following applies:

- The EER must review the pertinent sections of the *Joint Professional Practice Guidelines – Whole Building Energy Modelling Services* (AIBC and Engineers and Geoscientists BC 2018) and provide inputs to the energy model through the CRP, as it pertains to the scope of their project.
- Through the Coordinator (as defined in the *Joint Professional Practice Guidelines – Whole Building Energy Modelling Services*), the EER provides relevant inputs to the energy modeller (referred to as a qualified modeller or an energy modelling supervisor [EMS] in those guidelines) at the design process in order to confirm compliance with the energy performance objectives of the energy codes/standard (e.g., *BC Energy Step Code*). This includes providing information on building design and systems that impact building energy consumption applicable to their scope of work.
- Through communications with the Coordinator, the EER can sign off on items 6.9 and 6.10 of Schedule B regarding compliance with the Part 10 (Energy) aspects of the *BCBC*. This can be achieved by providing electrical-related model inputs to the qualified modeller or the energy modelling supervisor, and after receiving conformation from the Coordinator that the building's design meets the whole building energy performance objectives.
- Based on Field Reviews, the EER would also confirm that the electrical discipline's specific inputs provided to the energy modeller were accepted and are being utilized in the energy model based on the as-constructed condition. This should occur prior to the issuance of Schedule C-B.

Note: Except on existing buildings and projects in which commissioning or measurement and verification is involved, the energy modelling exercise is only relevant to the completed design at the time of occupancy and does not deal with energy usage once the building is operational.

B3.2 REQUIREMENTS FOR CHANGING AN EER PART WAY THROUGH A PROJECT

For more information about the allocation of responsibilities, refer to the *Guide to the Letters of Assurance in the B.C. Building Code*, Section 7 entitled "Dealing with Changes In Registered Professionals of Record After a Building Permit Is Issued" (Province of BC 2018).

B3.3 SCHEDULES S-B AND S-C

An RPR or Owner may engage supplementary supporting engineering services for a particular electrical component or subcomponent.

Where supporting engineering services are required, the relevant RPR should obtain appropriate assurances from the SRP providing the supporting design service and/or Field Review service.

As described above, refer to *Practice Note 16: Professional Design and Field Review By Supporting Registered Professionals* (Engineers and Geoscientists BC and AIBC 2017) for the Letters of Assurance Schedules S-B and S-C that the Association and AIBC recommend for use by a Registered Professional acting as an SRP. See also the list of Defined Terms at the front of these guidelines for the definition of SRP.

APPENDIX C: LIST OF CONTRIBUTORS

2019 REVISION AUTHORS

George Melo, P.Eng., WSP

Dejan Curcin, P.Eng., Stantec

2019 REVISION REVIEWERS

Ivan Lee, P.Eng., Integral Group

Gruja Blagojevic, P.Eng., City of Vancouver

Michael James Phillips, P.Eng., Integral Group

Ulrich Janisch, Safety Manager, Electrical, Technical Safety BC

Alex Riftin, M.Eng., P.Eng., P.E., LEED, OMICRON

Louis De Lange, P.Eng., Associated Engineering

Matthys (Thys) Johannes Fourie, P.Eng., Stantec

200 • 4010 REGENT STREET, BURNABY, BRITISH COLUMBIA, CANADA V5C 6N2
MAIN 604.430.8035 TOLL FREE 1.888.430.8035 EMAIL info@egbc.ca WEBSITE egbc.ca