

To: All HQ Directors: Operations, Planning and Major Projects
All Regional Directors
All District Managers Transportation
All Project Managers
All Regional Managers, Engineering
All Field Service Managers

Re: Engineer of Record and Field Review Guidelines

PURPOSE:

These guidelines have been prepared to define the roles and responsibilities of the various Professional Engineers regarding design, design coordination, and field reviews during construction on projects within Ministry rights-of-way.

BACKGROUND:

The British Columbia Building Code (BCBC) has developed Letters of Assurance that are used on building projects to clearly identify all Professional Engineers involved in the project along with their responsibilities and to provide assurance that the design and the completed project are in substantial conformance with the building code.

The Ministry, in conjunction with the Consulting Engineers of BC, and with input from the Association of Professional Engineers and Geoscientists of BC, has used this same approach to develop the attached guidelines and assurance forms

Bylaw (14b) under the Engineers and Geoscientists Act requires Professional Engineers to ensure that field reviews of their designs during construction are carried out by, or under the supervision of, a professional engineer. Field reviews are addressed in the attached guidelines.

REQUIREMENTS:

The attached *Engineer of Record and Field Review Guidelines* are applicable to all projects designed for the British Columbia Ministry of Transportation and Infrastructure and for any engineering works within Ministry rights-of-way.

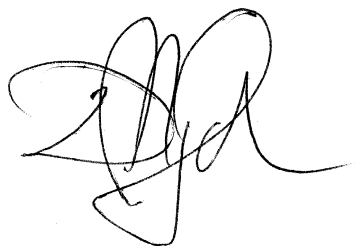
Although written for conventional engineering contracts, these guidelines and the Letters of Assurance forms may be used for Design-Build contracts and for works delivered by third parties, such as developers and municipalities, in accordance with Appendix 2.

Technical Circular T-06/09
Date: July 30, 2009

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Attachment

Supersedes T-01/23

Engineer of Record, Field Review Guidelines and Record Drawings

Ministry of Transportation and Infrastructure

Introduction

These guidelines are applicable to all projects designed for the British Columbia Ministry of Transportation and Infrastructure.

The Guidelines are only an overview of the various responsibilities and interrelationships between the parties and do not alter the responsibilities of the parties as established in their respective contracts.

Although written for conventional engineering contracts, these guidelines and the Letters of Assurance forms may be used for Design-Build contracts and for works delivered by third parties, such as developers and municipalities. Additional guidelines for such applications are included as an appendix to this document.

Living Document

The intent is to review the guidelines after a trial period and on a regular basis after that and potentially modify them, if necessary. Those utilizing these guidelines are requested to provide feedback to the Ministry for consideration in future modifications to the guidelines, with a copy to the Consulting Engineers of BC, as appropriate.

1) Abbreviations & Definitions:

- a) **CPE** = **Coordinating Professional Engineer** means the engineer responsible to sign-off the "Assurance of Coordination by Coordinating Professional Engineer" form
- b) **EOR** = **Engineer of Record** means the Professional Engineer responsible for a specific portion of the project design.
- c) **Field Review** means such reviews of the construction at the project site and/or the fabrication locations, where applicable.
- d) **FR** = **Field Reviewer** means the Professional Engineer responsible for the Field Reviews
- e) **Ministry** means the Ministry of Transportation and Infrastructure
- f) **MR** = **Ministry Representative** means the representative of the Ministry of Transportation and Infrastructure designated pursuant to the construction contract or the design contract.
- g) **Professional Engineer** means a person who is registered or licensed as a Professional Engineer under the *Engineers and Geoscientists Act*.
- h) **Record Drawings** has the meaning in Section 6 of this document.

2) Coordinating Professional Engineer[CPE]

- a) Background
 - i) Most projects involve multiple engineering disciplines.
 - ii) The Ministry requires a single-point engineer to coordinate the engineering aspects of the work, and ensure that the work has been performed by or under the direction of appropriate registered professionals and that the interrelationships between the involved engineering disciplines have been assessed and issues have been addressed or brought to the attention of the Ministry.
 - iii) A CPE is required when there is more than one EOR.

b) Role and Deliverables

- i) The CPE is responsible to ascertain that:
 - (1) Designs are performed by or under the direct supervision of a Professional Engineer;
 - (2) Designs are signed and sealed by the EOR;
 - (3) Field Reviews for the designs of each EOR are arranged, carried out, and appropriate documentation submitted to the EOR and the Ministry Representative in a timely manner;
 - (4) Record Drawings are produced, annotated with the appropriate sign-off wording, and sealed by the EOR(s) and other required signatories and the originals submitted to the Ministry in a timely manner; and that
 - (5) All registered professionals have signed and submitted their respective assurances to the CPE.
- ii) The CPE may:
 - (1) be an EOR for one or more portions of the design, may be retained by contract to the Ministry independent of any specific portion of the design, or be a Ministry Professional Engineer;
 - (2) rely upon sign-offs by individual EOR and FR; and
 - (3) rely upon the Ministry to require conformance with these guidelines by any EOR or FR employed by, or retained by contract to, the Ministry
- iii) Where part of the design is prepared by the construction contractor (e.g. a design-builder), the CPE shall not bear responsibility to provide an assurance for that portion of the design work prepared by the construction contractor, but the CPE shall collect the same information specified in 2(b)(i) from the construction contractor's EORs as well. As the CPE has no contractual relationship with a contractor's EOR, the Ministry may have to enforce construction contract provisions to get the EOR's assurance or may have to waive the CPE's responsibility to collect that information.

c) Sign-off

- i) Upon completion of construction of the work, the CPE shall execute an "Assurance of Coordination by Coordinating Professional Engineer" form H1251, specimen attached. The form is located at . <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1108>

3) **Engineer of Record [EOR]**

a) Background

- i) For any project, each component which requires an engineering design will have an EOR.
- ii) Some works are performed by other registered professionals (e.g. RP Biologist, RP Forester). Such work is not directly covered by these Guidelines, but should be captured by the professional engineer who incorporates the recommendations into an engineered design.

b) Role

- i) The EOR is responsible to ascertain that the EOR's final design (including any changes made during construction) meets applicable design standards, criteria and guidelines, and is not responsible for the quality of construction.
- ii) Electronic copies of the design (inclusive of drawings, specifications and estimates) will be printed, signed and sealed in hardcopy and the original submitted to the Ministry Representative by the EOR. A copy is to be retained by the EOR.
- iii) During construction, the EOR may receive notice of proposed design changes or of minor changes which have already been implemented in the field.
 - (1) The EOR will review any proposed changes, make appropriate revisions to the design for Ministry approval, and issue revised drawings.

- (2) For those changes already implemented in the field, the EOR shall review what has been done to confirm that the change conforms to project standards and does not affect the integrity of any other element of the design. Where the change has a negative impact, the EOR will notify the Ministry who will take appropriate measures to reverse, or mitigate where appropriate, the impact.
- iv) Where significant changed conditions are encountered on the site, the EOR will confirm the applicability of the design or make consequential design revisions, and should be afforded the opportunity to visit the site prior to making that determination.

c) Sign-off

- i) Upon completion of the final design, and prior to construction, the EOR shall execute and submit to the Ministry Representative an original of the “*Assurance of Professional Design and Commitment for Field Reviews*” form H1252, specimen attached. The form is located at <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1107>
The parties will confirm the assignment of field review responsibilities by clicking the appropriate YES / NO button on the form, next to the text “I undertake to be responsible for Field Reviews of the above referenced parts of the design in accordance with the assignments noted in the attached *Schedule A - Summary of Design and Field Review Assignments*” form H1252a.
The form is located at <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1110>
- ii) The sample *Schedule A* attached to the form may, with the Ministry’s approval, be revised or replaced by an alternate means of clearly defining the responsibilities for design and/or Field Reviews.
- iii) Upon completion of the construction, the EOR will execute an “*Assurance of Professional Design – Post Construction*” form H1253, specimen attached, <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1106>, attaching copies of any FR “*Assurance of Field Reviews and Compliance*” forms H1254, specimen attached, upon which the EOR is relying. H1254 is located at <http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1105>
- iv) Where the EOR has been retained for Field Reviews as well, the EOR will also fulfill the FR obligations specified below.

4) Field Reviewer [FR]

a) Background

- i) The FR is a Professional Engineer who is responsible to assure that the works constructed substantially comply in all material respects with the design and the construction standards, and not whether the design itself is in conformance with the project standards.

b) Role and Deliverables

- i) The FR role is distinct from any day-to-day inspections that would normally be occurring under the direction of the Ministry Representative and from any design services during construction provided by the EOR to aid in interpretation of the design or to make necessary revisions.
- ii) Field Reviews will be performed by or under the direct supervision of a Professional Engineer (as required by the *Engineers and Geoscientists Act*). The FR can be the EOR, another professional retained by the EOR or by the Ministry, or a Ministry professional.
- iii) Although Field Reviews would generally be performed under the direction of the EOR, the Ministry will determine whether the direction of the Field Reviews will be undertaken by the

applicable EOR or by another party retained by the Ministry. Where such services are not required of the EOR, the Ministry will be responsible to ensure that appropriate Field Reviews are done.

- iv) Care must be taken to ensure that Field Reviews meet the standard expected of a Professional Engineer. Where the personnel undertaking the Field Reviews are non-professionals, direct supervision by the FR should provide specific instructions on what to observe, check, confirm, test, record and report back to the FR. Where engineering decisions or judgements are required, they must be referred back to the FR, who may call upon the EOR to address the issue. [Note: Where the FR has been retained by the Ministry, to ensure appropriate contractual authority, any requests from the FR for EOR involvement must be made through the Ministry.]
- v) The FR will:
 - (1) Make periodic visits to the site to determine, on a rational sampling basis, whether or not the work is in substantial compliance with the design;
 - (2) Review, and may rely upon the reports of any inspection and testing performed by other qualified persons which pertain directly to the work being reviewed;
 - (3) Confirm that design changes required in the field have been forwarded to the EOR for review and acceptance, and to review the Ministry Representative's decisions as to whether the EOR's approval was requested prior or post-implementation.
 - (4) Record any changed conditions encountered, observations made, and deficiencies found during site visits; and
 - (5) Provide the CPE, EOR, and the Ministry Representative with a written report of the observations and deficiencies, and the standards which apply to the rectification of the deficiencies, preferably prior to leaving the site and in any event not more than 48 hours later.
- vi) The number of Field Reviews necessary will be negotiated on a contract-by-contract basis, to the satisfaction of both parties. In general, the frequency of Field Reviews will be determined on a rational sampling basis and as described below, and may require renegotiation if significant changed conditions are encountered on site. These frequencies are for a typical highway construction project that has substantially full-time site monitoring by a Ministry Representative team, expending ~\$1 million per month and are in addition to the EOR "design services during construction" during active construction, and will vary with the size of the project and complexity of construction:
 - (1) Civil – Geometric Design, including signing and pavement markings:
 - (a) The pre-construction meeting
 - (b) Up to once per month for general work procedures
 - (c) Review signing and pavement markings prior to energizing traffic signalization
 - (d) At substantial completion and/or total completion
 - (2) Civil – Other (inc. drainage, water, sewer, etc.)
 - (a) The pre-construction meeting or a specific pre-work meeting within the scope of the FR's assignment (e.g. if retained as the FR for municipal works, a meeting held with the municipal works crew would be more appropriate than the global pre-construction meeting, where municipal works would only be a minor item of discussion)
 - (b) A quality management coordination meeting
 - (c) Within the first 10% of work on a sample of a class of work items (i.e. water mains, storm sewer, sanitary sewer)
 - (d) Up to once per month for general work procedures
 - (e) At substantial completion and/or total completion

- (3) Geotechnical: [Note: There is a substantial overlap in FR and “design engineering services during construction” for geotechnical work, and the areas identified below are usually addressed through the combination of those services, with limited duplication.]
- (a) The pre-construction meeting
 - (b) A quality management coordination meeting
 - (c) Within about the first 10% of work on a sample of high risk elements. For example:
 - 1. Critical excavations, complex embankments, pile driving, bridge piers, and high or under-pinned retaining walls
 - 2. Foundation conditions, prior to commencement of embankment construction, prior to placing rebar in spread footings, and prior to construction of retaining wall footings
 - 3. For embankments, in addition to the foundation inspection, occasionally during embankment construction, with greater frequency for soft soils and preloads
 - 4. For retaining walls, in addition to the foundation inspection, occasionally during wall erection, with greater frequency for underpinned walls
 - 5. Rock slope stability assessments as needed, for scaling, bolting and other recommendations
 - (d) Up to once per month for general practices
 - (e) As required should significant changed conditions be encountered on site

- (4) Electrical
- (a) Once within the initial 10% of the work
 - (b) Up to once per month for general practices
 - (c) Prior to commissioning/energizing
 - (d) At substantial completion and/or total completion of the electrical work

- (5) Structural:
- (a) The preconstruction meeting
 - (b) Within about the first 10% of the work at the site (and fabrication facilities where applicable) for each class of structural work items
 - (c) Pre-pour for major reinforced concrete elements
 - (d) Once for each of the major structural element types
 - (e) As negotiated for elements considered critical to the design
 - (f) Once per month for general construction practices
 - (g) At substantial completion and/or total completion of the structural work items.

vii) There may be a need or desire to increase or decrease the frequency of Field Reviews from that originally negotiated in response to differing site conditions, the quality of work, the actual frequency of Ministry Representative inspections and audits, or other relevant factors. The FR shall propose any variation from previously agreed frequencies to the Ministry and the parties will negotiate a mutually acceptable reasonable revised frequency.

viii) Where negotiations on the frequency of Field Reviews are unsuccessful, the dispute shall be referred to the responsible Regional Manager, Engineering, or to another mutually agreeable party, for review.

ix) Where the parties cannot agree on a revised frequency, the Ministry will be responsible to ensure all subsequent Field Reviews are performed by someone other than the prior FR.

c) Sign-off

- i) Upon completion of construction of the work under the FR purview, the FR shall execute an “*Assurance of Field Reviews and Compliance*” form, specimen attached.
- ii) Where the FR changes, per (b)(ix) above, the original FR shall execute a form for the work done prior to the change; the replacement FR will execute a form for all subsequent work.

5) Ministry Representative [MR]

a) Role

- i) The MR is responsible for the day-to-day quality assurance of the construction contractor's work and coordination of any changes to the design.
- ii) Specific tasks include:
 - (1) Identifying any required or desired changes to the design and following internal Ministry approval policies associated with those proposed changes.
 - (2) Any change, which has received Ministry approval to be advanced, that falls within the scope of "the practice of Professional Engineering or professional geoscience", as defined in the [Engineers and Geoscientists Act](#), must be referred to the EOR. [The EOR, FR, or a Ministry engineer with appropriate experience in the discipline in question may provide additional advice to the MR as to whether an issue is an "engineering" decision or a field one.]
 - (3) Communicating those proposed engineering changes to the EOR
 - (a) Whenever practical, and certainly for major changes, prior to the construction being undertaken. A major design change is where a design element, structural integrity or design liability is potentially affected or costs to revise later are high. (e.g. alignment changes, significant changed conditions, geotechnical slope angles, bad foundation conditions, laning revisions, substitution of components, changes to structural components, etc.).
 - (b) For minor changes, as is reasonably practical after the fact. In judging whether a change is "minor", whether involving deferment, elimination, or simplification or just cost saving, the MR should consider that the importance of a design feature may not be readily apparent on site. The EOR can provide background and rationale and early consultation can considerably reduce risks.
 - (4) Tracking and reporting all changes to the EOR and FR and recording them on a set of red-line markup drawings for the production of Record Drawings
 - (5) Attesting that the Record Drawings reflect all significant changes from the original design.

b) Sign-off

- i) Sign-off of Record Drawings, as noted below.

6) Record Drawings

- a) Record Drawings will record the final design (i.e. the original design as amended by any significant variations during construction), with the intent that the EOR may rely upon them as being a substantially accurate representation of what was constructed.
- b) Compilation of information
 - i) Information is collected by the Ministry Representative, through field staff who are on-site for a significant portion of the work – typically contractor layout crew, quality management staff, MR and other Ministry staff.
 - ii) Record Drawings are based on the original design, with changes made and noted per Ministry drafting standards, and are prepared either by Ministry Representatives staff or by the EOR based on the information collected and provided to the drafter by the Ministry Representative. Refer to Technical Circular **T-07/09**

<http://www.th.gov.bc.ca/publications/Circulars/lister.asp?set=Current&circ=T&year=2009>)
for more detailed information on drafting and deliverables.

- c) Record Drawings are annotated and signed as follows:
 - i) Sign-off by Ministry Representative:
 - (1) Where the Ministry staff performed the drafting: *These drawings accurately record all significant design changes known to me, having exercised due diligence in monitoring the construction of the work.*
 - (2) Where the EOR's staff performed the drafting: *I have provided the EOR with records of all significant design changes known to me, having exercised due diligence in monitoring the construction of the work.*
 - ii) Signing and Sealing by the EOR:
 - (1) Where the EOR staff performed the drafting: *These drawings accurately record all significant design changes as provided to me by the Ministry Representative and the design as represented by these Record Drawings substantially conforms with the design intent and sound engineering practice.*
 - (2) Where the Ministry performed the drafting: *The design as represented by these Record Drawings substantially conforms with the design intent and sound engineering practice.*
 - iii) Note regarding sealing by the FR: No sign-off is required by the FR, as the Record Drawings only reflect design changes and the MR is responsible to track and record all changes. If an FR signed and sealed the drawing as having done quality assurance on the MR's work, he or she could be seen as taking on responsibility for any errors or omissions in the MR's work. As the FR is unlikely to have knowledge of ALL changes unless the MR informs him or her, such a liability is misdirected.

7) **Electronic Seals**

Where any document is required to be signed and sealed, use of the electronic seal technology approved by the Association of Professional Engineers and Geoscientists of the Province of BC is acceptable to the Ministry.

APPENDIX 1: Additional Information

- The ***Bylaws of the Association of Professional Engineers and Geoscientists*** of BC require the design engineer to ensure Field Reviews are done.

Quality Management

14 (b) Members and licensees shall establish quality management processes for their practices which shall include, as a minimum;

(4) field reviews, by members or licensees, of their projects during construction.

Link:

<http://www.apeg.bc.ca/resource/publications/governancepolicies/documents/apegbcbylaws.pdf>

- In accordance with the ***Engineers and Geoscientists Act***, the FR may be assisted by other persons acceptable to them consistent with the Act.

Exemptions

2 (6) Nothing in this Act prevents a person from assisting in the performance of any professional service or work of the kind described in the definition of "practice of Professional Engineering" in section 1 (1) if a Professional Engineer directly supervises and assumes full responsibility for the service or work. [Emphasis added]

Definitions

1 (1) "direct supervision" means the responsibility for the control and conduct of the engineering or geoscience work of a subordinate;

Link: http://www.qp.gov.bc.ca/statreg/stat/E/96116_01.htm

- The requirement for sealing arises in the ***Engineers and Geoscientists Act***:

Certificate and seal

20 (9) A member or licensee receiving a seal or stamp under this section must use it, with signature and date, to seal or stamp estimates, specifications, reports, documents, plans or things that have been prepared and delivered by the member or licensee in the member's or licensee's professional capacity or that have been prepared and delivered under the member's or licensee's direct supervision.

Link: http://www.qp.gov.bc.ca/statreg/stat/E/96116_01.htm#section20

- APEGBC information with respect to electronic seal technology:
Members and licensees can obtain a digital signature and seal from Notarius, APEGBC's only recognized provider, by visiting their web site at www.notarius.com/en/clientele_APEGBC.html. Digital signatures and electronic seals must be used in accordance with the [APEGBC Bulletin: Use of Seal](#), which can be found on the APEGBC website.

Links:

Digital Seal Technology: <http://www.apeg.bc.ca/ppractice/digitalsignature.html>

Use of Seal: <http://www.apeg.bc.ca/ppractice/ppdocs.html>

Digital Seal Provider: http://www.notarius.com/en/clientele_APEGBC.html

APPENDIX 2: For Design-Build and 3rd Party Delivered Projects:

Any works within the Ministry right-of-way that fall within the scope of “engineering” under the *Engineers and Geoscientists Act* will be performed by a Professional Engineer, and shall comply with these guidelines, amended as the Ministry may so direct for the specific circumstances.

“Lead” when used below means:

- a) the Design Build Contractor retained by the Ministry; or
- b) the municipality, developer, or other 3rd party responsible for delivery of the Project.

- The Lead will be responsible to ensure that these guidelines are followed.
- Land development projects subject to Ministry review require identification of a CPE before any engineering work is carried out. If this requirement is waived by the Ministry, the proponent shall identify a CPE before the site design is completed.
- The Ministry will have a full right of reliance on any Assurance forms issued by the Lead, the CPE, an EOR, or an FR.
- At the option of each individual EOR, the FR for that EOR’s work will be, or be retained by, the EOR or be a member of the Lead’s team (including any engineers or contractors retained by them) acceptable to the EOR. FR and inspection staff shall comply with the instructions of the EOR.
- The site presence of the CPE and EORs shall be negotiated within the framework of the design build or third party agreements and be documented within quality management plans.
- For design build Projects where the Ministry is a party to the contract, any deficiencies noted by the FR will be reported to the Ministry, as well as any parties named in accordance with the Lead’s quality management plan.
- The role of “Ministry Representative” in performing QA will be undertaken by a member of the Lead’s team.
- Changes to the design will be dealt with in accordance with the design build contract or in accordance with the Lead’s quality management requirements.
- Field changes: The EOR shall be responsible for instituting a quality management system that will ensure that any significant changes during construction are identified and reflected on the Record Drawings.
- The EOR sign-off on the Record Drawings shall be:
These drawings accurately record all significant design changes known to me, having exercised due diligence in monitoring the construction of the work, and the design, as represented herein, substantially conforms with the design intent and sound engineering practice.
- The Ministry will be granted full access to all quality management records, from any party, related to the design or construction of the project and may decline to accept the product if the records are insufficient, inaccurate, or misleading or if they demonstrate a product that does not comply with Ministry standards.
- In some circumstances, larger design build or P3 projects may have their own certificates. The form and content of such certificates must be pre-approved by the Ministry’s Chief Engineer.

APPENDIX 3: Letters of Assurance Forms

The wording on the forms shall not be changed, except as permitted in the Guidelines.

COORDINATING PROFESSIONAL ENGINEER

- Assurance of Coordination by Coordinating Professional Engineer (**H1251**)
<http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1108>

ENGINEER OF RECORD

- Assurance of Professional Design & Commitment to Field Reviews, inc. Schedule A– Summary of Design & Field Review Assignments (**H1252**)
<http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1107>

Note: Schedule A may be changed to accommodate project specific issues (H1252a)
<http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1110>

- Assurance of Professional Design – Post Construction (**H1253**)
<http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1106>

FIELD REVIEWER

- Assurance of Field Reviews and Compliance (**H1254**)
<http://www.th.gov.bc.ca/forms/getForm.aspx?formId=1105>