



GUIDE TO THE STANDARD FOR DOCUMENTED RISK ASSESSMENTS

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**ENGINEERS &
GEOSCIENTISTS**
BRITISH COLUMBIA

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PREFACE

This *Guide to the Standard for Documented Risk Assessments* (the “Guide”) was developed by Engineers and Geoscientists British Columbia to explain the standards of practice, conduct, and competence related to documented Risk Assessments of professional engineering or professional geoscience activities or work expected of Professional Registrants and Registrant Firms.

This Guide provides Engineers and Geoscientists BC’s interpretation of Section 7.3.9 of the Bylaws. Professional Registrants and Registrant Firms are required to meet this standard by having regard for the information included in this Guide. Professional Registrants are required to exercise their professional judgment when applying this standard in their practice. Registrant Firms are required to have documented policies and procedures in their Professional Practice Management Plan (PPMP) to meet this standard. This Guide is a living Document that is to be revised and updated as required to reflect the developing state of practice.

ABBREVIATIONS

ABBREVIATION	TERM
AI	Artificial Intelligence
BC	British Columbia
EGBC	Engineers and Geoscientists BC
PPMP	Professional Practice Management Plan

DEFINED TERMS

The following definitions are specific to this Guide. These words and terms are capitalized throughout the document:

TERM	DEFINITION
Act	The <i>Professional Governance Act</i> , S.B.C. 2018, c. 47.
Bylaws	The Bylaws of Engineers and Geoscientists BC made under the <i>Act</i> .
Check (and derivatives)	A documented process to confirm the professional engineering or professional geoscience work is complete, meets all input requirements, and is suitable for its intended use or purpose. This encompasses all of the various Checks that occur or ought to occur throughout the development, presentation, production, and performance of any Regulated Practice work in any sector.
Consequence	An outcome of an event or sequence of events that culminates in: 1. harm, injury, illness, or death to one or more persons; or 2. damage to the environment.
Delegate (and derivatives)	A Subordinate being directed to undertake certain activities, work, or decisions related to Regulated Practice on behalf of a Professional Registrant who takes professional responsibility for the work of the Subordinate.
Direct Supervision (and derivatives)	The responsibility for the control and conduct of the activities, work, or decisions related to the Regulated Practice that have been Delegated to a Subordinate.
Document(s)	Includes any physical or electronic Record, including but not limited to a report, certificate, memo, specification, drawing, map, or plan, that conveys a design, direction, estimate, calculation, opinion, interpretation, observation, model, or simulation that relates to the Regulated Practice.
Documentation	See the definition for “Record.”
Engineers and Geoscientists BC	The Association of Professional Engineers and Geoscientists of the Province of British Columbia, operating as Engineers and Geoscientists BC.
Field Reviews	Reviews conducted by Professional Registrants, or by Subordinates acting under Professional Registrants’ Direct Supervision, at the site of the implementation or construction of professional engineering or professional geoscience work, that Professional Registrants in their professional discretion consider necessary to ascertain whether the implementation or construction of work substantially complies in all material respects with professional engineering or professional geoscience concepts or intent reflected in the Documents prepared for such work.
Firm	As defined in the <i>Act</i> : “(a) a government registrant; (b) a legal entity or a combination of legal entities that is engaged in a regulated practice, whether the practice occurs solely within the firm or in the provision of services to a person or entity outside the firm, unless the legal entity or combination of legal entities is exempted from this Act by regulation of the Lieutenant Governor in Council;”.
Guide	A guide to a program or regulatory topic, published by Engineers and Geoscientists BC. These include Guides to quality management standards that in accordance with the <i>Act</i> and Bylaws define professional obligations related to specific processes and explain the minimum standards of practice, conduct, and competence expected from Professional Registrants and Registrant Firms.
Hazard	A set of conditions or an operational situation that might lead to a Consequence.

TERM	DEFINITION
Independent Review	A documented evaluation of the concept, details, and Documentation based on a qualitative examination of Documents containing all relevant and material information before the professional engineering or professional geoscience activities or work is submitted to those who will be relying on it, and where the evaluation is performed in accordance with the Bylaws and this Guide by an appropriately qualified and experienced Professional Registrant who has not been involved in the professional engineering or professional geoscience activities or work. There are two types of Independent Review: • Type 1 Independent Review is an Independent Review carried out by an appropriately qualified and experienced Professional Registrant who has not been previously involved in the professional engineering or professional geoscience activities or work and is employed at the same Registrant Firm as the Professional of Record; and • Type 2 Independent Review is an Independent Review carried out by an appropriately qualified and experienced Professional Registrant who has not been previously involved in the professional engineering or professional geoscience activities or work and is not employed at the same Registrant Firm as the Professional of Record.
Permit to Practice	A certificate bearing a Permit to Practice number that is issued to a Registrant Firm by Engineers and Geoscientists BC and confirms the Registrant Firm is entitled to engage in the Reserved Practice in BC, subject to any suspensions, limitations, conditions, or restrictions on the Registrant Firm's registration.
Professional of Record	The Professional Registrant who is professionally responsible for activities, work, or Documents related to the Regulated Practice.
Professional Practice Management Plan	A Document developed and maintained by a Registrant Firm, which must meet the requirements set out in Section 7.7.3 of the Bylaws.
Professional Registrant	A Registrant of Engineers and Geoscientists BC who is registered in one of the following categories of Registrants: (a) professional engineer; (b) professional geoscientist; (c) professional licensee engineering; (d) professional licensee geoscience; (e) life member prior to 1998; (f) honorary life member.
Record (Documentation)	Any Document that is evidence of Regulated Practice activities, events, or transactions, or is evidence that a Professional Registrant has met their professional and contractual obligations.
Registrant	As defined in the <i>Act</i>: “(a) a professional engineer, (b) a professional geoscientist, (c) a firm that is registered with the regulatory body under this Act, if firms may be registered in respect of that regulatory body, or (d) an individual or firm, as applicable, that is registered with the regulatory body as another category or subcategory of registrant in accordance with the bylaws of the regulatory body”.
Registrant Firm	A Firm that is registered with Engineers and Geoscientists BC as a Registrant and is a holder of a Permit to Practice.
Regulated Practice	As defined in the <i>Act</i> and the <i>Regulation</i> , the carrying on of a profession by a registrant of a regulatory body, which for the purposes of this Guide means the practice of professional engineering or the practice of professional geoscience.

TERM	DEFINITION
Regulation	The <i>Engineers and Geoscientists Regulation</i> , OIC 2021/037.
Reserved Practice	As defined in the <i>Act</i> and the <i>Regulation</i> , a Regulated Practice for which the right to practice is reserved for registrants of a regulatory body.
Residual Risk	The Risk remaining after mitigation measures that are proposed and/or implemented have been accounted for.
Risk	A combination of two factors: 1. the severity of the anticipated Consequence resulting from a Hazard; and 2. the likelihood of a Hazard occurring and leading to a Consequence.
Risk Assessment	A documented process involving: 1. identifying Hazards (Hazard identification); 2. evaluating the identified Hazards based on the severity of potential Consequences and the likelihood of those Consequences (Risk analysis); and 3. comparing the Risk level determined in the Risk analysis with Risk-tolerance criteria to determine whether the Risks can be avoided, mitigated, transferred, or accepted (Risk treatment).
Subordinate	Any individual who engages in the Regulated Practice under the Direct Supervision of a Professional Registrant.

VERSION HISTORY

VERSION NUMBER	PUBLISHED DATE	DESCRIPTION OF CHANGES
1.0	September 1, 2026	Initial version.

1.0 INTRODUCTION

1.1 OVERVIEW

- 1.1.1 Engineers and Geoscientists BC is the regulatory and licensing body for the engineering and geoscience professions in British Columbia (BC). To protect the public interest, Engineers and Geoscientists BC establishes, monitors, and enforces standards for the qualifications and practice of Professional Registrants and Registrant Firms.
- 1.1.2 Engineers and Geoscientists BC provides practice resources to Professional Registrants and Registrant Firms to assist them in meeting their professional and ethical obligations under the *Act* and Bylaws. One category of these practice resources is Guides to quality management standards, which explain the standards of practice, conduct, and competence for quality management in professional activities.
- 1.1.3 This Guide explains the standards of practice, conduct, and competence expected of Professional Registrants who are involved in Risk Assessments of professional engineering or professional geoscience activities or work. It explains how Professional Registrants should uphold their professional obligations by assessing the Risk related to activities or work they undertake.
- 1.1.4 This Guide provides Engineers and Geoscientists BC's interpretation of the standard described in Section 7.3.9 of

the Bylaws. Professional Registrants and Registrant Firms are required to meet the standard by having regard for the information included in this Guide. Professional Registrants are required to exercise their professional judgment when applying the standard in their practice. There may be limited circumstances where, in a Professional Registrant's professional judgment, there are sound technical or ethical reasons to depart from the interpretation in this Guide. In those circumstances, Professional Registrants should record the technical or ethical reasons for the departure and use their professional judgment to make sure the resulting work still meets the intent of the standards in the Bylaws. Any opinion, analysis or other Document containing technical or ethical reasons for the departure is inherently related to the Regulated Practice and therefore constitutes a Record which must be maintained. When departing from the interpretation in this Guide, Professional Registrants remain responsible to exercise their professional judgment to conduct their practice in a manner that meets the intent of the standards in the Bylaws.

1.2 PURPOSE OF THIS GUIDE

- 1.2.1 Conducting Risk Assessments has always been an important part of the practice of professional engineering and professional geoscience, and Professional Registrants are already required to conduct documented

Risk Assessments as referenced in Sections 7.3.3, 7.3.4, 7.3.5, and 7.3.6 of the Bylaws (see [Table 1](#)). However, based on investigations, practice reviews, audits, and practice questions, Engineers and Geoscientists BC determined a need to further clarify how Professional Registrants must meet the Risk Assessment requirement in their practice. The Bylaws under the *Act* state the various requirements for documented Risk Assessments, and this Guide has been created to support Professional Registrants in meeting the standard established in the Bylaws.

1.2.2 This Guide provides a common approach applicable to all Professional Registrants who are involved in assessing the Risk of activities and work they undertake as part of their professional activities or work.

1.2.3 For Professional Registrants, this Guide is intended to:

- describe the minimum standards and purpose of carrying out Risk Assessments of professional engineering or professional geoscience activities or work;
- assist Professional Registrants in establishing and maintaining documented quality management procedures for assessing Risk of their professional engineering or professional geoscience activities or work to comply with the requirements of Section 7.3.9 of the Bylaws;
- assist Professional Registrants in understanding how the level of Risk determined by the Risk Assessment can be utilized to meet other Bylaw requirements;

- describe the characteristics and elements necessary to ensure that Risk Assessments are useful, reliable, and protect the safety, health, and welfare of the public, including protecting the environment and health and safety in the workplace;
- explain what types of Records must be retained when conducting Risk Assessments;
- provide guidance on the qualifications required for Professional Registrants who are conducting Risk Assessments; and
- provide guidance on how to meet the quality management requirements under the *Act* and Bylaws when involved in assessing the Risk of professional engineering or professional geoscience activities or work.

1.2.4 For Registrant Firms, this Guide details the requirements governing documented Risk Assessments of professional engineering or professional geoscience activities or work. The principal obligation of the Registrant Firm is to establish and maintain documented policies and procedures detailing their approach to documented Risk Assessments. The Registrant Firm must also ensure Professional Registrants employed by or under contract with the Registrant Firm follow these policies and procedures so Risk Assessments are adequately undertaken and appropriately applied.

1.3 ROLE OF ENGINEERS AND GEOSCIENTISTS BC

- 1.3.1 This Guide was developed under the direction of Engineers and Geoscientists BC's Board and, prior to publication, underwent final legal and editorial reviews. This Guide forms part of Engineers and Geoscientists BC's continuing commitment to establishing and monitoring the quality of professional services Registrants provide to their clients and to the public.
- 1.3.2 The timely and proper completion of Risk Assessments of professional engineering or professional geoscience activities or work are critical for Professional Registrants in fulfilling their professional obligations, including holding paramount the safety, health, and welfare of the public. Risk Assessments are essential for Professional Registrants to utilize Risk level to make decisions about, and assess the extent of application of, other quality management standards.

1.4 SCOPE

- 1.4.1 Documented Risk Assessments are fundamental to upholding the *Act* and Bylaws, including the Code of Ethics in Schedule A of the Bylaws, which require all Professional Registrants hold paramount the safety, health, and welfare of the public, including the protection of the environment, and the promotion of health and safety within the workplace.
- 1.4.2 As required by the Bylaws, Professional Registrants must conduct Risk Assessments for all professional engineering or professional geoscience activities or work for which they are responsible, and must use the resulting level of Risk in application to other quality management standards as outlined in [Table 1](#). These applications are expanded upon in [Section 3.3](#) of this Guide.
- 1.4.3 This Guide is intended to assist Professional Registrants in establishing and maintaining a documented quality management procedure for Risk

Table 1: Required Use of Risk Assessment Results

BYLAW NUMBER	BYLAW TOPIC	PURPOSE OR USE OF DOCUMENTED RISK ASSESSMENT	APPLICABLE QUALITY MANAGEMENT GUIDE
7.3.3	Standard for Documented Field Reviews	Determine the number, extent, frequency, and timing of Field Reviews, and whether Delegation of Field Reviews is appropriate.	<i>Guide to the Standard for Documented Field Reviews</i>
7.3.4	Standard for Documented Checks	Determine the type, extent, and frequency of Checking, as well as the appropriate qualifications of the checker.	<i>Guide to the Standard for Documented Checks of Engineering and Geoscience Work</i>
7.3.5	Standard for Independent Review(s) of Structural Designs	Determine the type (Type 1 or Type 2) and frequency of mandatory Independent Reviews of structural designs.	<i>Guide to the Standard for Documented Independent Review of Structural Designs</i>
7.3.6	Standard for Independent Review(s) of High-Risk Professional Activities or Work	Determine whether the work is high-risk and therefore requiring an Independent Review, and, if so, determine the type (Type 1 or Type 2) and frequency of Independent Review required.	<i>Guide to the Standard for Independent Review of High-Risk Professional Activities or Work</i>

	Assessments of professional engineering or professional geoscience activities or work that complies with the requirements of the <i>Act</i> and of the Bylaws by addressing:		
	- the purpose of Risk Assessments; - application of Risk Assessments; - what Risk Assessments should include; - when Risk Assessments should occur; - what types of Risk Assessments are appropriate; - who is responsible for Risk Assessments; and - what Records are required for Risk Assessments.		
1.4.4	This Guide is intended to assist Registrant Firms in ensuring: - documented policies and procedures are contained within their PPMP for their Professional Registrants to follow in order to meet the intent of this Guide; - the applicable sections of their PPMP are communicated to and followed by all individuals employed by or under contract with the Registrant Firm; and - reasonable steps are taken to assist Professional Registrants in meeting their obligations as set out in the Bylaws and in this Guide.		
1.4.5	If a Professional Registrant is working for a Firm that does not have a Permit to Practice, the Professional Registrant still has the obligation to carry out documented Risk Assessments if they are engaging in the Regulated Practice. In this case, the Professional Registrant must ensure a documented policy and procedure is in place for documented Risk Assessments.		
		1.4.6	Risk Assessment obligations apply to Professional Registrants acting in their professional capacity in all industries and to all forms of professional engineering or professional geoscience activities or work, including: - ongoing or time-limited activities or work; - temporary or permanent activities or work; - products, services, and operations requiring professional application of activities or work; - construction or implementation performed by the Professional Registrant, the Registrant Firm, or others; or - activities or work carried out for internal or external use.
		1.4.7	Terminology used within an industry may not match the terminology used in this Guide (especially for concepts such as Risk, Hazard, and Consequence). However, the obligations of Professional Registrants and Registrant Firms in all industries remain the same: to ensure a Risk Assessment is conducted that has regard for and meets the intent of the <i>Act</i>, the Bylaws, and this Guide.
		1.4.8	Professional Registrants who are involved directly in professional engineering or professional geoscience activities or work are best positioned to evaluate the Risk associated with their practice. It is recognized that Risk Assessments are subjective and may not be uniform among Professional Registrants, even those engaging in substantially similar work. All Professional Registrants should be aware of the obligation to conduct

	Risk Assessments and should use their professional judgment to determine how to uphold that obligation in their practice.	requirements, the environmental effects associated with emissions that remain within those requirements have been assessed and authorized through the applicable regulatory process. For the purposes of this Guide, those authorized effects should be treated as part of the approved baseline, rather than as “damage to the environment” that would be considered a Consequence. However, if the release goes over the targeted value or is not reported, the resulting unapproved or unassessed impact to the environment should be considered a Consequence.
1.4.9	Many engineering and geoscience activities and work inevitably impact the environment; governments have created assessment and permitting processes to weigh the associated economic benefits and environmental impacts of the project or the work. When evaluating the potential Consequences of a particular activity, Professional Registrants should interpret “damage to the environment” as damage to the environment that has not been explicitly considered and approved by a regulatory body through a permitting process. For example: • If a mine has been granted a waste discharge authorization for specific concentrations of chemicals over a defined period, the environmental effects associated with discharges that remain within the authorization’s limits and conditions have been assessed and authorized through the permitting process. For the purposes of this Guide, those authorized effects should be treated as part of the approved baseline, rather than as “damage to the environment” that would be considered a Consequence. However, if the discharges exceed permitted amounts, include unauthorized chemicals, or persist beyond the duration of the authorization, those discharges might create unforeseen damage to the environment and should be considered a Consequence. • If an industry has been permitted to release greenhouse gas emissions subject to specified limits, conditions, and monitoring and reporting	1.4.10 This Guide addresses Hazards that could jeopardize the health and welfare of the public and the environment, as well as impact the health and safety of the workplace. There are numerous negative outcomes from poorly executed practices that are outside the scope of this Guide as they do not directly affect the health and welfare of the public or cause damage to the environment. Among these negative outcomes are financial impact to the Registrant Firm or client, or to the public; negative repercussions to the commercial reputation of the Professional Registrant and the Registrant Firm; and legal liability. Professional Registrants may find it prudent to consider these types of negative outcomes and to assess their severity and likelihood while conducting Risk Assessments; however, these types of outcomes are outside the scope of this Guide and the standard of practice, conduct, and competence set by the <i>Act</i> and Bylaws. 1.4.11 This Guide is intended for general applicability in diverse industries and areas of practice. Professional Registrants must be aware of and have regard for all

- professional practice guidelines related to their industry and area of practice, per Section 7.3.1 of the Bylaws. Refer to the *Guide to the Standard for the Use of Professional Practice Guidelines* (Engineers and Geoscientists BC 2026a) for more information. Also refer to applicable professional practice guideline(s) for areas of practice and industry-specific information on Risk Assessments of professional engineering or professional geoscience activities or work.
- 1.4.12 Professional Registrants must be aware of, and use, all applicable codes and standards that apply to their specific industry or area of practice. Where codes or standards applicable to a specific industry or area of practice establish an approach to Risk or Risk Assessments, and that approach provides an equal or higher level of protection of the public and the environment as in this Guide, Professional Registrants should follow the industry-specific codes or standards to the extent that they deviate from this Guide.
- 1.4.13 This Guide must be read in conjunction with the other requirements of the Bylaws, and the various Guides to Standards where assessing the Risk of professional engineering or professional geoscience activities or work is specified:
- *Guide to the Standard for Documented Checks of Engineering and Geoscience Work* (Engineers and Geoscientists BC 2026b).
 - *Guide to the Standard for Documented Independent Review of Structural Design* (Engineers and Geoscientists BC 2026c).
 - *Guide to the Standard for Documented Independent Review of High-Risk Professional Activities and Work* (Engineers and Geoscientists BC 2026d).
 - *Guide to the Standard for Documented Field Reviews During Implementation or Construction* (Engineers and Geoscientists BC 2026e).

2.0 REGULATORY FRAMEWORK

- 2.1 Section 57(1) of the *Act*, Standards of conduct and competence, states that:
- “(1) Subject to subsection (2) and (3), the board of each regulatory body must make bylaws establishing the following:
- (a) standards of professional and ethical conduct for registrants, which standards may be different for different categories or subcategories of registrants;
 - (b) standards of competence for registrants, which standards may be different for different categories or subcategories of registrants or different areas of practices;
- ...”
- 2.2 Section 7.3.9 of the Bylaws, Standard for Documented Risk Assessments, states:
- “(1) A Professional Registrant must conduct a documented risk assessment to determine the level of risk of the activities or work related to the Regulated Practice prior to the initiation of the activities or work related to the Regulated Practice and at appropriate intervals.
- (2) A Professional Registrant must use the assessed risk level pursuant to subsection (1) to determine the following:
- (a) the number, extent, frequency, and timing of documented field reviews and whether Delegation of documented field reviews is appropriate pursuant to section 7.3.3 of the Bylaws [*Standard for Documented Field Reviews*];
 - (b) the type, extent, and frequency of documented checks as well as the appropriate qualifications of the checker pursuant to section 7.3.4 of the Bylaws [*Standard for Documented Checks*];
 - (c) the type and frequency of independent reviews of structural designs pursuant to section 7.3.5 of the Bylaws [*Standard for Independent Review(s) of Structural Designs*]; and
 - (d) the need for, type, and frequency of independent reviews for activities or work pursuant to section 7.3.6 of the Bylaws [*Standard for the Independent Review(s) of High-Risk Professional Activities or Work*].
- (3) A Registrant Firm must establish, maintain, and follow documented procedures for documented risk assessments of the Registrant Firm’s activities or work related to the Regulated Practice to ensure compliance with the documented risk assessment requirements throughout section 7.3 of the Bylaws

- [*Standards of Competence – Quality Management Requirements*].
- (4) A Professional Registrant must establish, maintain, and follow documented procedures for documented risk assessments of activities or work related to the Regulated Practice to ensure compliance with the documented risk assessment requirements throughout section 7.3 of the Bylaws [*Standards of Competence – Quality Management Requirements*].
 - (5) A Professional Registrant who is employed by or under contract with a Registrant Firm may satisfy the Professional Registrant's obligations pursuant to subsection (4) by following the documented procedures of that Registrant Firm established pursuant to subsection (3).
 - (6) While a documented risk assessment of each instance of repetitive activities or work related to the Regulated Practice is not required, the documented procedures required pursuant to subsections (3) and (4) must identify the criteria used to determine what types of activities or work are considered repetitive and the appropriate frequency for conducting documented risk assessments of repetitive activities or work to ensure the risk level is current.
- (7) The document record produced through
 - (a) the initial documented risk assessments,
 - (b) any documented risk assessments at intervals if applicable, and
 - (c) the documented procedures required pursuant to this section
 must be retained and preserved for a minimum of 10 years after the last use of the activity or work related to the Regulated Practice and made available to any person undertaking the activity or work related to the Regulated Practice in accordance with section 7.3.2(3) of the Bylaws [*Standard for Retention and Preservation of Complete Project Documentation*].”

2.3

This Guide is intended to assist Registrants in understanding the standard of practice and in fulfilling their professional obligations in accordance with Section 7.3.9 of the Bylaws. This Guide may be used by Engineers and Geoscientists BC in disciplinary proceedings as evidence of professional standards, and of the conduct expected of a Registrant in particular circumstances, in support of allegations of conduct unbecoming a Registrant, incompetence, or professional misconduct.

3.0 STANDARDS FOR PRACTICE

3.1 INTRODUCTION TO RISK ASSESSMENTS

3.1.1 Professional engineering or professional geoscience activities or work inherently includes potential Hazards. Professional Registrants are responsible for identifying Hazards and Consequences that contribute to Risk, and for assessing and mitigating any Risks they identify.

3.1.2 A Risk is present when a Hazard exists. The level of Risk is determined based on the likelihood and severity of Consequences that arise from Hazards. Classifications of Hazards and Risk will vary across industries and areas of practice, and the process of Risk Assessment is subjective, so identified Risks may not be uniform among Professional Registrants.

3.1.3. A Risk Assessment has three steps, which are further expanded upon in [Section 3.4](#) of this Guide:

1. Hazard Identification
2. Risk Analysis
3. Risk Treatment

3.1.4 Professional Registrants are required to hold paramount the safety, health, and welfare of the public, including the protection of the environment and the promotion of health and safety within the workplace; however, they are not required to determine what constitutes an acceptable level of Risk to the public, the environment, the client, or the government. The acceptable level of Risk is

usually defined in industry-specific codes, standards, regulations and organizations. Professional Registrants are required only to determine the Risk associated with their professional practice and mitigate it accordingly, and to produce professional engineering or professional geoscience activities or work that meets applicable codes, standards, and other requirements.

3.1.5 In some cases, where an acceptable level of Risk has not been defined, Professional Registrants may be asked to exercise their professional judgments regarding safety and environmental protection. In doing so, Professional Registrants may determine the level of safety and/or environmental protection required to meet their ethical obligation to protect the public. Such judgments must be supported by clearly documented assumptions and rationale. Professional Registrants should communicate to parties relying on these judgments the assumptions, rationale, and any limitations associated with their use. However, Professional Registrants may decline to make judgments regarding safety and environmental protection if they believe they are unable to reasonably do so and must document this decision along with the supporting rationale.

3.1.6 When conducting Risk Assessments, Professional Registrants should consider the specific environments, workplaces, and public that are likely to interact with, or be impacted by, professional engineering or professional geoscience activities or work.

3.2 PURPOSE OF RISK ASSESSMENTS

- 3.2.1 Professional Registrants who engage in professional engineering or professional geoscience activities or work have a professional obligation to undertake Risk Assessments to determine the level of Risk associated with those activities or work. Once the level of Risk is determined, mitigative measures can be applied which may reduce the Risk level to a lower level known as the Residual Risk.
- 3.2.2 Risk Assessments serve many purposes and are a mandatory requirement for all Professional Registrants carrying out Regulated Practice.
- 3.2.3 The level of Risk determined from a Risk Assessment is applied to other Bylaw requirements as shown in [Table 1](#) and described in more detail in [Section 3.3](#) of this Guide. Application of Risk Assessments may also be required by Engineers and Geoscientists BC Professional Practice Guidelines and other legislation.
- 3.2.4 To comply with the Bylaws, Professional Registrants must have established, or have access to through the Registrant Firm's PPMP, documented quality management procedures that include undertaking Risk Assessments of all professional engineering or professional geoscience activities or work as carried out in their Regulated Practice.
- 3.2.5 A documented quality management procedure may be captured in a written procedure, process flowchart, set of checklists, forms to record Risk Assessments, or other Documentation developed to suit the nature of the work undertaken by Professional Registrants.

3.3 APPLICATION OF RISK ASSESSMENTS

- 3.3.1 The application of Risk Assessments to Engineers and Geoscientists BC Bylaw requirements are described below and shown in [Figure 1](#).
- 3.3.1.1 **Documented Field Reviews:** Professional judgment must be exercised to determine the Field Reviews that are deemed necessary to ascertain whether the implementation or construction of work substantially complies in all material respects with the professional engineering or professional geoscience concepts or intent reflected in the Documents prepared for the work. Risk Assessments are utilized to appraise the nature, complexity, unknown conditions, and duration of the implementation or construction in order to determine the number, extent, frequency, and timing of Field Reviews. Risk Assessments are also used to determine if Field Reviews are appropriate for Delegation and if Delegating Field Reviews to a particular Subordinate is appropriate (Bylaw Section 7.3.3).
- 3.3.1.2 **Documented Checks:** The nature and extent of Checking of professional engineering or professional geoscience activities or work can vary widely based on the nature of the work and the expertise of the individual doing the Checking. Risk Assessments are utilized to determine the type of Checking required, the extent of what those Checks will cover, the frequency of Checks to be conducted, and the appropriate qualifications of the individual doing the Checking (Bylaw Section 7.3.4).

3.3.1.3 **Independent Review of Structural Designs:** All structural designs are considered high-risk by their nature and, as such, must be Independently Reviewed with limited exceptions for single and two-family homes designed under Part 9 of the *National Building Code of Canada*, *BC Building Code* and *Vancouver Building By-law*. Risk Assessments are utilized to determine the type of Independent Review required (Type 1 or Type 2) and the frequency at which Independent Reviews should occur (Bylaw Section 7.3.5).

and to determine if a Type 1 or Type 2 Independent Review is required, as well as the frequency at which Independent Reviews should occur (Bylaw Section 7.3.6).

3.3.2 Professional Registrants should be aware that there may be other applications for Risk Assessments that are outlined in Engineers and Geoscientists BC Professional Practice Guidelines as well as by legislation, regulations, codes, standards, or other regulatory requirements.

3.3.1.4 **Independent Review of High-Risk Professional Activities and Work:** Any professional engineering or professional geoscience activities or work that is assessed as high-risk must be Independently Reviewed. Risk Assessments are utilized to reach this decision

3.4 WHAT IS INCLUDED IN RISK ASSESSMENTS

3.4.1 All Professional Registrants and Registrant Firms must establish documented

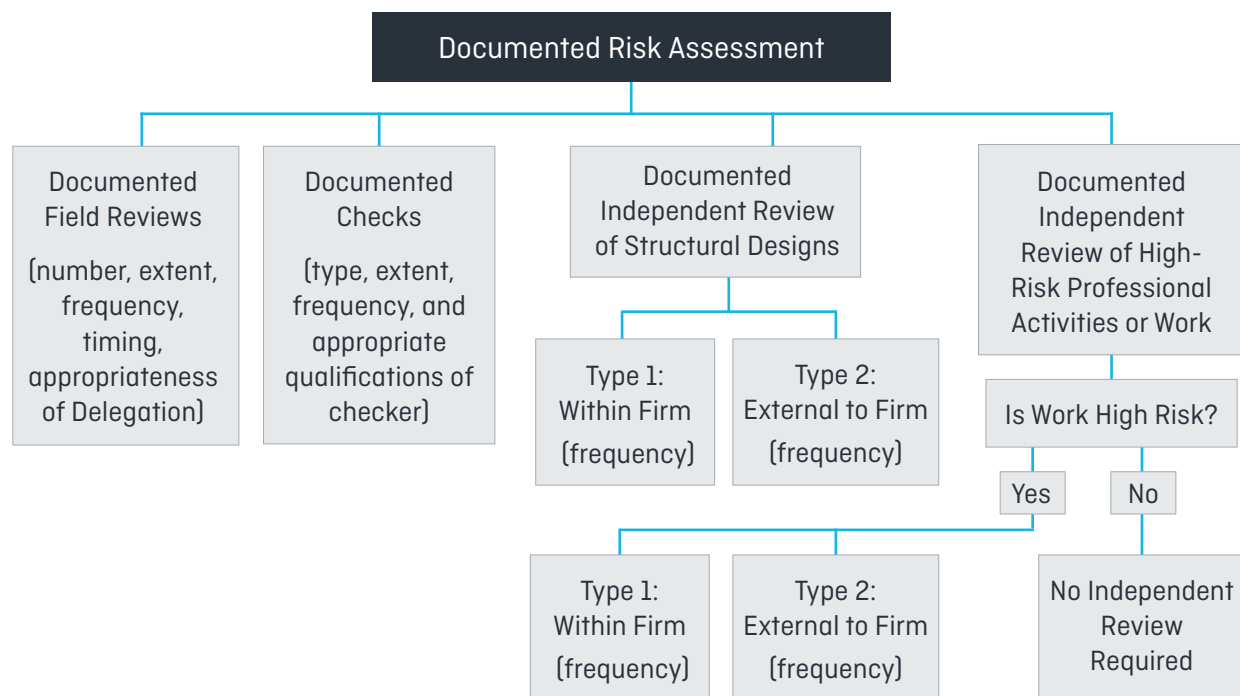


Figure 1: Flowchart showing application of documented Risk Assessments to other regulatory requirements.

procedures for conducting Risk Assessments and retain the Documents generated from them as Records. Resources for conducting and documenting Risk Assessments can be found in [Appendix A: Process for Assessing Risk](#) and [Appendix B: Documented Risk Assessment Template](#).

3.4.2 A Risk Assessment has three steps:

1. **Hazard identification** begins by identifying any Hazards associated with the professional engineering or professional geoscience activities or work, including the Consequences each Hazard might create. In this step, Professional Registrants use their professional judgment to identify Hazards inherently associated with their work and determine how the unique scope and requirements of their work could add or remove Hazards.
2. **Risk analysis** involves evaluating the identified Hazards based on a combination of the severity of Consequences and the likelihood of those Consequences occurring in order to determine the Risk level. A Risk matrix can be a useful tool for Risk analysis. See [Appendix A: Process for Assessing Risk, A-5 Determining Risk](#) for an example Risk matrix.
3. **Risk treatment** requires Professional Registrants to compare the Risk level determined in the Risk analysis with Risk-tolerance criteria (defined by codes, standards, and other requirements) to determine whether the Risk can be avoided, mitigated, transferred, or accepted. It also serves to determine how

specific mitigation measures would affect the Risk associated with the professional engineering or professional geoscience activities or work. Risk treatment can be an iterative process. If done properly, each additional mitigation measure will lower the Risk level associated with the professional engineering or professional geoscience activities or work. Once all mitigation measures have been applied, the resulting Risk level is the Residual Risk. Registrants may use the Residual Risk, to guide their decisions related to other Bylaw requirements and applicable Quality Management Guides (see [Table 1](#)).

3.4.3 The standard of practice expected for a Risk Assessment is that it considers:

- Hazards associated with the professional engineering or professional geoscience activities or work;
- severity of Consequences;
- likelihood of Consequences;
- complexity of the professional engineering or professional geoscience activities or work;
- lifecycle or lifetime of professional engineering or professional geoscience activities or work;
- how errors or incompleteness in the professional engineering or professional geoscience activities or work, including during implementation or construction, may cause or affect Hazards;
- nature of the assumptions made during the course of the work (i.e., degree of conservatism when there is limited or variable information);

	• additional Hazards from incorporating components, artifacts, or inputs developed or provided by others; • uniqueness of the work, such as innovation or deviation from previous practice; • expertise and experience of Professional of Record and of supporting team; and • real or perceived conflicts of interest.	
3.4.4	Risk Assessments should include: • the date the Risk Assessment was undertaken; • identification of the engineering or geoscience activity, project, or scope of work being undertaken; • the name of the Professional Registrant who is acting as the Professional of Record; • the name and Permit to Practice number of the Registrant Firm to which the Professional of Record belongs; • the type of Risk Assessment that is being applied; • identification of Hazards that could result in Consequences; • evaluation of the severity and likelihood of the Consequence associated with each Hazard; • level of Risk associated with each Hazard; • where relevant, mitigation measures associated with each Hazard; and • where relevant, identification of level of Residual Risk.	3.4.6 Professional Registrants should recognize the use of artificial intelligence (AI)-based systems in producing work may affect the appropriate scope, depth, and focus of the Risk Assessment required. Professional Registrants should not use or rely on AI outputs for projects involving safety or environmental risks unless they understand the underlying processes and reasoning behind the AI system's output. Professional Registrants must understand the risks when using AI in their professional practice and mitigate those risks, where applicable, in their professional activities. Regardless of how or by whom AI is used, Professional Registrants remain professionally responsible for the final work product. 3.4.7 Refer to the practice advisory <i>Use of Artificial Intelligence in Professional Work</i> (Engineers and Geoscientists BC 2024) for guidance on using AI appropriately in professional activities or work. As this is a rapidly evolving context, professional judgment should be applied to the specific circumstances, recognizing that the published guidance may not keep pace with technological change.
3.4.5	A Risk Assessment that meets Engineers and Geoscientists BC expected standard	

3.5 WHEN SHOULD RISK ASSESSMENTS OCCUR

3.5.1 GENERAL

- 3.5.1.1 Professional Registrants are required to undertake a Risk Assessment of their professional engineering or professional

- geoscience activities or work prior to the initiation of those professional engineering or professional geoscience activities or work.
- 3.5.1.2 Risk Assessments should be considered living Documents that require periodic review. Professional Registrants should review documented Risks and mitigative measures, recognising that they are tools that provide valuable input throughout the duration of professional engineering or professional geoscience activities or work. Appropriate intervals between initial and subsequent Risk Assessments should be determined and documented. Parameters to consider regarding the need to revisit a Risk Assessment include, but are not limited to:
- the scale and complexity of the activities or work;
 - the duration of time expected until construction or implementation;
 - updates to assessment inputs;
 - uncertainty associated with Hazards or Consequences;
 - identification of new safety concerns;
 - changes to the scope of work;
 - static or dynamic nature of the activities or work;
 - updates to codes or standards;
 - updates to mitigation measures; and
 - change of Professional of Record and associated experience and/or expertise.
- 3.5.1.3 If Risk Assessments are developed with any assumptions or limitations, Professional Registrants should document these and provide clear instructions regarding thresholds beyond which Risk Assessments should be revisited.
- 3.5.1.4 Following are some examples that illustrate when it may be appropriate to revisit Risk Assessments:
- Professional Registrants should redo or update Risk Assessments when previously unknown information becomes available related to the activities or work.
 - Professional Registrants should reassess the Risk level once mitigative measures have been implemented to analyze whether those measures have been effective in lowering the Risk level to a Residual Risk that is within the prescribed Risk tolerance.
 - Periodically throughout the project or work, Professional Registrants should revisit the Risk Assessments to consider if any of the inputs have changed with the project or work evolution.
 - The completion of each phase of a project or work provides more visibility about potential Hazards. Professional Registrants should revisit their Risk Assessments prior to each new project or work phase. Has the evolution of the work reduced Risk, or has it created new Hazards? What is now known about the upcoming phase that was not known at the time of the previous Risk Assessment?
 - Risk Assessments should be revisited prior to commencing construction, manufacturing, fabrication, implementation, testing, or commissioning activities of work related to the Regulated Practice. These activities may expose new Hazards.
 - Professional Registrants should consider revisiting the Risk Assessment when updated climate

projections, revised flood or wildfire Hazard information, or new information indicates that future conditions over the design life may differ materially from the assumptions used in the Risk Assessment.

- 3.5.1.5 Professional Registrants and Registrant Firms must create a documented procedure to establish parameters around appropriate intervals for completing Risk Assessments. The Registrant must retain the Documents describing this procedure and the Documents from each Risk Assessment. For further guidance about retaining project Documentation, see the *Guide to the Standard for Retention of Project Documentation* (Engineers and Geoscientists BC 2026f).

3.5.2 REPETITIVE AND ITERATIVE ACTIVITIES OR WORK

- 3.5.2.1 The Bylaw exempts “each instance of repetitive activities or work” from requiring a Risk Assessment. However, to confirm the maintenance of quality, the Bylaw requires a Risk Assessment prior to initiation of the activities or work, with subsequent Risk Assessments conducted at an appropriate frequency to ensure the Risk level is current.
- 3.5.2.2 The appropriate scope and intervals of Risk Assessments of repetitive activities or work are a matter of professional judgment, but should include, at minimum, any changes since the last Risk Assessment and the potential impact of those changes on the existing (unchanged) components of the activity.
- 3.5.2.3 Some industries and areas of practice use iterative processes for professional

engineering or professional geoscience activities or work, which involve regular upgrades to products or processes, often based on continual monitoring, analysis, or testing after implementation. Professional Registrants should treat iterative processes similarly to repetitive processes.

- 3.5.2.4 For repetitive and iterative professional engineering or professional geoscience activities or work, the Registrant must create a documented process to identify what criteria are used to define a certain activity as being repetitive, as well as the intervals at which Risk Assessments will be conducted so that the Risk level will be current. The Registrant must retain the Documents describing this process and the Documents from each Risk Assessment.

3.6. TYPES OF RISK ASSESSMENTS

3.6.1 GENERAL

- 3.6.1.1 There are many approaches to undertaking Risk Assessments. This section outlines two types that meet the Bylaw requirements. This section also includes considerations around when each is suitable. The two types of Risk Assessments are:
- activity-based Risk Assessments; and
 - global Risk Assessments.
- 3.6.1.2 Professional Registrants and Registrant Firms must establish, maintain, and follow documented procedures regarding what types of Risk Assessments will be utilized for the professional engineering or professional geoscience activities or work being undertaken, as well as considerations around appropriate intervals in which

Risk Assessments will be revisited.
Documentation must also be retained of each Risk Assessment, including application of global Risk Assessments.

3.6.2 ACTIVITY-BASED RISK ASSESSMENTS

3.6.2.1 An activity-based Risk Assessment is one that focuses on a specific activity or scope of work. It could be narrow, such as a discrete action, or broad, such as an entire project.

3.6.2.2 An activity-based Risk Assessment is unique to the specific parameters of the activity, applies to a specific point in time when it is undertaken, and is completed by the Professional of Record responsible for the activity. Activity-based Risk Assessments typically cannot be used for any future activities or purposes.

3.6.2.3 Professionals of Record must use professional judgment to determine the appropriate scope and boundaries for an activity to which an activity-based Risk Assessment will be applied.

3.6.2.4 Registrants incorporating activity-based Risk Assessments into their practice must consider and document whether an activity-based Risk Assessment should be repeated periodically, and if so at what interval (see [Section 3.5](#) of this Guide).

3.6.3 GLOBAL RISK ASSESSMENTS

3.6.3.1 A global Risk Assessment looks at the various areas or types of professional engineering or professional geoscience activities or work that constitutes regular practice, allowing Registrants to sort their practice into categories. These categories could be organized, for example, into

disciplines of practice, types of activities, or types of projects. A global Risk Assessment can be differentiated from an activity-based Risk Assessment by the fact that it does not apply to a specific activity at a specific point in time but instead sets broader parameters of professional engineering or professional geoscience activities or work to which the Risk Assessment applies.

3.6.3.2 If utilizing global Risk Assessments, Registrants must create a documented process to identify what defines professional engineering or professional geoscience activities or work as being inherently low, medium, high, or variable Risk. This allows each global Risk Assessment to be defined according to these levels of Risk by identifying the types of Hazards, Consequences, and Risk associated with each area or type of activity or work, and determining what factors are more likely to cause them to fall into each category.

3.6.3.3 A global Risk Assessment must clearly and explicitly define the bounds of application and document all types of professional engineering or professional geoscience activities or work that fall under it, including a rationale for inclusion. It is not appropriate to state that all work done by a Professional Registrant or a Registrant Firm is captured within a single global Risk Assessment.

3.6.3.4 Global Risk Assessments must be documented in such a way that anyone not involved in their preparation could easily interpret their application and boundaries.

3.6.3.5 Professionals of Record must use professional judgment to determine the

appropriate application of a global Risk Assessment to a specific professional engineering or professional geoscience activity or work. The rationale for application must be documented, and a copy of the global Risk Assessment must be kept within the files associated with that work.

3.6.3.6 Where a global Risk Assessment has indicated a variable level of Risk depending on the specifics of each activity or work, the Professional of Record cannot rely on the global Risk Assessment and must undertake a specific activity-based Risk Assessment for each activity or work.

3.6.3.7 Registrants incorporating global Risk Assessments into their practice should be periodically revisiting the global Risk Assessments at appropriate intervals, and documenting the rationale for the intervals chosen (see [Section 3.5](#) of this Guide).

3.7. WHO IS RESPONSIBLE FOR RISK ASSESSMENTS

3.7.1 Professional Registrants undertake certain professional engineering or professional geoscience activities or work based on their competency to effectively carry out that work. Accordingly, when a Professional Registrant is acting as a Professional of Record on a scope of work, they are responsible for carrying out an activity-based or global Risk Assessment of their work, or for applying an existing global Risk Assessment to their work.

3.7.2 When a global Risk Assessment is being utilized, this requires the Professional of Record, who may or may not have been

involved in the development of the global Risk Assessment, to understand and interpret the boundaries of the global Risk Assessment and to use their professional judgment to use it appropriately.

The rationale for using a global Risk Assessment for a specific professional engineering or professional geoscience activity or work must be documented and kept within the files associated with that work, including a copy of the global Risk Assessment itself. The appropriate use of a global Risk Assessment is the responsibility of the Professional of Record responsible for the work. If the Professional of Record determines that the global Risk Assessment is inadequate for their professional engineering or professional geoscience activities or work, they must conduct an activity-based Risk Assessment.

3.7.3 Professional Registrants who developed global Risk Assessments retain professional responsibility for those Risk Assessments. As such, the bounds and applicability of global Risk Assessments should be clearly documented to the degree that someone who has not been previously involved in the Risk Assessment process can clearly understand and apply them.

3.7.4 While the Professional of Record is responsible for development of an activity-based Risk Assessment or application of a global Risk Assessment, they are encouraged to seek advice and input from other subject matter experts, specialists, or Subordinates in order to guide them in their Risk Assessment.

3.7.5 The Professional of Record must ensure that a Risk Assessment of work they are

responsible for is developed (activity-based) or applied (global) prior to initiation of that work, and they must also determine appropriate intervals at which the Risk Assessment should be revisited (see [Section 3.5](#) of this Guide).

3.7.6 The Professional of Record is responsible for applying the results of the Risk Assessment appropriately to the various facets of their work, including application to the Engineers and Geoscientists BC Bylaw requirements (see [Section 3.3](#) of this Guide).

3.7.7 To carry out Risk Assessments of professional engineering or professional geoscience activities or work, Professional Registrants should consider whether they:

- have current expertise in the discipline and type of professional engineering or professional geoscience activity or work being carried out;
- are sufficiently experienced and have the required knowledge to identify Hazards related to the work and the potential Consequences if those Hazards occur;
- understand how to assess the severity of Consequences for identified Hazards, the likelihood of those Hazards occurring and how to use the severity and likelihood to determine the level of Risk;
- have knowledge of codes, standards, guidelines, and regulations in order to understand the prescribed Risk tolerance levels that are acceptable for the work being carried out;
- are able to use their professional judgment and experience to determine appropriate mitigation measures for each Hazard; and

- are aware of and are following the procedures for assessing and documenting Risk in place by the Registrant Firm under which the work is taking place.

3.8. WHAT RECORDS OF RISK ASSESSMENTS SHOULD BE CREATED AND RETAINED

3.8.1 The Professional of Record and the Registrant Firm each have responsibilities to retain Records of the documented Risk Assessments that apply to all professional engineering or professional geoscience activities or work undertaken. An example of a Risk Assessment Template that may be used as is or adapted is included in [Appendix B](#).

3.8.2 An initial Risk Assessment, which must be completed prior to the initiation of the professional engineering or professional geoscience activities or work, must be dated, labelled as initial, and retained as a Record. Any subsequent or periodic Risk Assessment must be documented and retained as a Record, including the rationale for why the Risk Assessment is being revisited.

3.8.3 Where global Risk Assessments are being utilized, the Professional of Record and the Registrant Firm must develop documented processes regarding the use of global Risk Assessments and keep these as Records. Each global Risk Assessment must include all assumptions and boundaries of application, including an appropriate interval to revisit the global Risk Assessment. Anytime a global Risk Assessment is utilized, a copy of the global

- Risk Assessment must be included as a Record in the project or work file to which it is being applied.
- 3.8.4 Where repetitive or iterative Risk Assessments are being utilized, the Professional of Record and the Registrant Firm must develop documented processes regarding the use of repetitive or iterative Risk Assessments and keep these as Records. These documented processes must include criteria used to determine what types of activities or work are considered repetitive or iterative, along with the determined appropriate frequency for conducting Risk Assessments of repetitive or iterative activities or work so that the Risk level is current. Anytime a repetitive or iterative Risk Assessment is utilized, a copy of the repetitive or iterative Risk Assessment must be included as a Record in the project or work file to which it is being applied.
- 3.8.5 The application of a Risk Assessment to another Bylaw requirement constitutes professional practice and therefore any resulting Records must be retained, including how the outcome of the Risk Assessment is being utilized to determine:
- the number, extent, frequency, and timing of Field Reviews and whether Delegation of Field Reviews is appropriate;
 - the type, extent, and frequency of Checking, as well as the appropriate qualifications of the checker;
 - the type and frequency of Independent Reviews of structural designs; and
 - the need for, type, and frequency of Independent Reviews of high-risk professional engineering or professional geoscience activities or work.
- 3.8.6 All Records of Risk Assessments must be retained appropriately. For further guidance about retaining project Documentation, see the [*Guide to the Standard for Retention of Project Documentation*](#) (Engineers and Geoscientists BC 2026f).

4.0 REFERENCES AND RELATED DOCUMENTS

It is not possible to create a comprehensive list of applicable laws, regulations, codes, standards, and other requirements that apply to conducting Risk Assessments in British Columbia.

While the *Act* and Engineers and Geoscientists BC Documents offer broad guidance that applies to engineering and geoscience practice, each industry and area of practice may have its own set of related Documents that should guide how documented Risk Assessments are conducted.

Professional Registrants should be familiar with the laws, regulations, codes, standards, and other requirements that cover their industry and area of practice.

Related Documents that may be of interest to users of this Guide but are not formally cited elsewhere in this Document appear in [Section 4.3](#).

4.1 LEGISLATION

Engineers and Geoscientists Regulation, OIC 2021/037.

Professional Governance Act, S.B.C. 2018, c. 47.

4.2 CITED WORKS

Engineers and Geoscientists BC. 2026a. Quality Management Guides – Guide to the Standard for the Use of Professional Practice Guidelines. Version 3.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2026 August 18]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

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Engineers and Geoscientists BC. 2026c. Quality Management Guides – Guide to the Standard for Documented Independent Review of Structural Designs. Version 4.0. Burnaby, BC: Engineers and Geoscientists [accessed: 2026 August 18]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

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4.3 RELATED DOCUMENTS

GUIDELINES

Association of Professional Engineers and Geoscientists of Alberta (APEGA). 2006. Guideline for Management of Risk in Professional Practice. V1.0 (September 2006). Edmonton, AB: APEGA. [accessed: 2026 August 18]. <https://www.apega.ca/about-apega/publications/standards-guidelines>.

Engineers and Geoscientists BC. 2023. Professional Practice Guidelines – Landslide Assessments in British Columbia. Version 4.1. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2026 August 18]. <https://tools.egbc.ca/Registrants/Practice-Resources/Guidelines-Advisories>.

Engineers and Geoscientists BC. 2020. Professional Practice Guidelines – Development of Safety-Critical Software. Version 1.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2026 August 18]. <https://tools.egbc.ca/Registrants/Practice-Resources/Guidelines-Advisories>.

Engineers and Geoscientists BC. 2018. Professional Practice Guidelines – Legislated Flood Assessments in a Changing Climate in BC. Version 2.1. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2026 August 18]. <https://tools.egbc.ca/Registrants/Practice-Resources/Guidelines-Advisories>.

CODES AND STANDARDS

IEC 31010:2019, Risk Management – Risk Assessment Techniques

IEC 61508:2010 series – Functional Safety

ISO Guide 73:2009, Risk Management – Vocabulary

ISO 9001:2015, Quality Management Systems – Requirements

ISO 12100:2010, Safety of Machinery – General Principles for Design – Risk Assessment and Risk Reduction

ISO 13485:2016, Medical Devices – Quality Management Systems – Requirements for Regulatory Purposes

ISO 14971:2019, Medical Devices – Application of Risk Management to Medical Devices

ISO 26262:2018 series – Road Vehicles – Functional Safety

ISO 31000:2018, Risk Management – Guidelines

ISO 14091:2021, Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment.

5.0 APPENDIX

Appendix A: Process for Assessing Risk	A-1
Appendix B: Documented Risk Assessment Template	B-1

APPENDIX A: PROCESS FOR ASSESSING RISK

A-1 INTRODUCTION

Professional Registrants may find the following tools for assessing severity, likelihood and Risk level useful either in themselves or as templates to adapt for their own practices. These tools are intended to be resources, not mandatory formats. Professional Registrants and Registrant Firms should adapt or create tools that work best with their own practices.

Risk is classified based on the severity and likelihood of the Consequence associated with a Hazard. A documented Risk Assessment begins with identifying the Hazards associated with the professional engineering or professional geoscience activities or work and the Consequences should those Hazards occur.

A-2 IDENTIFYING HAZARDS

Professional Registrants should use their professional judgment to identify Hazards inherently associated with the professional engineering or professional geoscience activities or work and determine how the unique scope and requirements of the professional engineering or professional geoscience activities or work could add or remove Hazards.

Hazard identification techniques exist in many forms, from personal observation and formal techniques to professional analysis of near-miss failures of similar professional engineering or professional geoscience activities or work. Some examples of formal techniques include failure modes and effects analysis (FMEA), fault tree analysis (FTA), event tree analysis (ETA), hazard and operability study (HAZOP), system theoretic process and analysis (STPA), and structured what-if technique (SWIFT). It is the Professional Registrant's responsibility to determine the appropriate Hazard identification

technique using industry-specific guidance, as available and appropriate.

A-3 SEVERITY OF CONSEQUENCE

Once the Hazards and their Consequences are identified, Professional Registrants should determine the severity of each Consequence if those Hazards were to occur. There are no universally accepted definitions of categories such as insignificant severity or catastrophic severity. Each Professional Registrant must exercise their own professional and ethical judgment.

Professional Registrants may consider using a set of categories with broad coverage and clear ranking to classify Hazards according to the severity of the associated Consequence. [Table A-1: Examples of Definitions for Severity of Consequence](#) provides five categories for defining the severity of Consequences associated with Hazards: insignificant, minor, moderate, critical, and catastrophic. [Table A-1](#) is intended as an example; Professional Registrants may find it useful in itself, or as a template to adapt for their own practice.

Each severity category can manifest in different forms. For example, an airplane crash resulting in the instantaneous loss of hundreds of lives would clearly be considered catastrophic. Likewise, a slow leak of contaminants into drinking water that poisons a population over multiple decades and causes more deaths than the airplane crash would also be considered catastrophic even though the Consequences occur over a much longer time scale.

Therefore, it is critical that Professional Registrants consider both immediate and long-term effects of their professional engineering or professional geoscience activities or work when determining the severity of Consequences.

Table A-1: Examples of Definitions for Severity of Consequence

SEVERITY OF CONSEQUENCE	PROTECTION OF THE PUBLIC/LIFE SAFETY	PROTECTION OF THE ENVIRONMENT
Insignificant	No harm or negligible harm to persons	No harm or negligible harm to the environment, including fish or wildlife habitat
Minor	Minor injury or recoverable bodily harm to persons	Minor damage or recoverable harm to the environment, including fish or wildlife habitat
Moderate	Major injury or permanent bodily harm to persons	Moderate damage or lasting harm to the environment, including fish or wildlife habitat
Critical	Loss of life	Significant damage to or loss of vulnerable ecosystems
Catastrophic	Loss of multiple lives	- Irreparable damage to or loss of vulnerable ecosystems - Destruction or major contamination of the environment

A-4 LIKELIHOOD OF CONSEQUENCE (PROBABILITY)

After assessing the severity, Professional Registrants must assess the likelihood of the identified Consequences occurring. The likelihood of Consequence could be related to the return period or expected lifecycle of the professional engineering or professional geoscience activities or work, or it could be related to the complexity of the project. Note, however, that return periods typically assume static conditions when, in fact, conditions often are dynamic (e.g., due to climate change-related trends). As such, Professional Registrants should consider whether forward-looking information is needed to assess likelihood over the expected lifecycle, and document the assumptions and limitations used.

Professional Registrants may find it useful to use a set of categories with broad coverage and clear ranking, such as improbable, remote, occasional, probable, and frequent, and should define the different levels to best suit their practice and the specific professional engineering or professional geoscience activities or work. See [Table A-2: Examples of Definitions for](#)

[Likelihood of Consequence](#) for examples to help define the likelihood of Consequence. [Table A-2](#) is intended as an example; Professional Registrants may find it useful in itself, or as a template to adapt for their own practice.

It is essential that Professional Registrants incorporate project-specific context into their analyses of Consequence likelihood. It is equally important that Professional Registrants fully understand the relationship between the likelihood and the severity of Consequence when determining the level of Risk of professional engineering or professional geoscience activities or work.

The following examples illustrate different scenarios where likelihood should be considered in the context of severity.

EXAMPLE 1: Determining Likelihood Considering Code-based and Project Lifetime Requirements

The building code requires that structures be designed to resist seismic loading with a 2% chance of exceedance in 50 years (i.e., a 1-in-2,475-year

return period). Based on the example definitions in [Table A-2](#), the likelihood of that Consequence would be categorized as improbable.

This might be true for the design-level seismic event, but it would be a reasonable corollary assumption that a moderate seismic event of some (likely smaller) scale will occur within the lifetime of the structure; the likelihood of that Consequence would be categorized as occasional.

For the design-level seismic event, the likelihood of Consequence would be improbable, but the severity of Consequence would be catastrophic. For a moderate seismic event, likely to occur over the lifetime of the structure, the likelihood of Consequence would be occasional, and severity of Consequence might be moderate. Referring to [Table A-3: Risk Matrix](#), structures in both scenarios would be considered moderate Risk.

However, this assessment assumes that there are no errors or omissions in the work, and the design and construction complies in full with the building code, material standards, and best practice. Given the scale and severity of life-safety Consequences associated with structure failure, Independent Review of structural design has been a longstanding requirement of practice in BC. The requirement for Independent Review of structural designs does not depend on the determinations of a Risk Assessment, but is prescriptively set by Engineers and Geoscientists BC's Bylaws as a recognition that Independent Review is a key mitigating measure in structural design to minimize the chance of errors and omissions and reduce the Residual Risk.

EXAMPLE 2: Determining Likelihood Considering Number of Users

Another example of the importance of understanding and adapting the classification likelihood of Consequence to suit the Professional Registrant's practice is that a one-in-a-million likelihood of

Consequence of operator injury represents a higher overall Risk when considering a product with 100,000 annual users than one with 100 annual users.

EXAMPLE 3: Determining Likelihood Considering Hours of Operation

Similarly, for a Professional Registrant working in the software industry, the likelihood of Consequence may be in the form of Hazards per hour of operation, which may be different for an in-house application versus an industry-wide application.

EXAMPLE 4: Determining Likelihood Considering Flood Assessment Contexts

Professional Registrants who work with natural Hazards will need to define likelihood, severity of Consequence, and Risk as it relates to flood Hazards. For floodplain mapping and development decisions in BC, the 200 year event is commonly used as a standard for many fluvial flood assessments. Based on that return period alone, the likelihood of Consequence would typically be categorized as remote.

This may be appropriate for purely fluvial flooding in many river systems. However, for small creeks subject to debris floods or debris flows, higher return periods may be warranted. Where those Hazards present a credible Risk to life, higher return periods may need to be considered, reflecting the rapid onset and severity of Consequences of such events.

Similarly, where flooding may be influenced by geological Hazards such as landslide dam breaches, higher return period scenarios, such as 1,000 year or 2,500 year events, may be warranted. In all cases, climate change and future conditions may mean that what was once considered an adequate design flood or level is no longer sufficient over the life of the work.

Table A-2: Examples of Definitions for Likelihood of Consequence

LIKELIHOOD OF CONSEQUENCE	RETURN PERIOD ^{a, b}	COMPLEXITY OF PROJECT AND RESOURCES AVAILABLE
Improbable	• 1 in 500 years • Expected not to happen in lifetime of project	• Design to prescriptive code (i.e., Canadian Electrical Code) or in a highly regulated area of practice (i.e., ship building)
Remote	• 1 in 200 years • Could happen in lifetime of project	• Varies with respect to area of practice
Occasional	• 1 in 50 years • Expected to happen in lifetime of project	• Varies with respect to area of practice
Probable	• 1 in 10 years • Expected to happen multiple times in lifetime of project	• Varies with respect to area of practice
Frequent	• 1 in 1 year or less • Expected to happen regularly in lifetime of project	• Varies with respect to area of practice and may include innovative design in an emerging area of practice

Notes:

^a The quantification of return period will vary among industries and areas of practice, both for applicability and acceptability.

^b Professional Registrants are responsible for complying with the requirements of all applicable codes, standards, and other requirements. The return period used to conduct a Risk Assessment for professional engineering or professional geoscience activities or work may not align with the Risk tolerance associated with the work, as defined by the codes, standards, and regulations before mitigation measures are implemented. See the examples in [Section A-4](#).

A-5 DETERMINING RISK

Once the severity and likelihood of Consequence of the Hazard are determined, Professional Registrants can determine the Risk of the professional engineering or professional geoscience activities or work.

[Table A-3](#) is an example Risk matrix relating the severity of Consequence to the likelihood of Consequence. Professional Registrants may find the table useful in itself, or as a template to adapt for their own practice.

The association between numerical values, colours, likelihood labels, and severity labels in [Table A-3](#) is presented as an example of how Professional Registrants can approach this exercise. It is not intended to be used as a universally applicable tool, or as an approach that could apply to all professional engineering or professional geoscience activities or

work. The suggested determination of extreme Risk, high Risk, moderate Risk, low Risk, and minimal Risk in this table may not be appropriate for all professional engineering or professional geoscience activities or work.

[Table A-3](#) may be used as a guide, or Professional Registrants can create their own or use methodologies and tools provided by their Firm; regardless, Professional Registrants must determine whether the result is suitable for their professional engineering or professional geoscience activities or work.

A-6 MITIGATING RISK

Professional Registrants are responsible for mitigating the Risk inherent in their professional engineering or professional geoscience activities or work. In some cases, the nature of Hazards and the severity of the associated Consequences will generally be constant

Table A-3: Risk Matrix

Likelihood of Consequence	5	Frequent	5	10	15	20	25
	4	Probable	4	8	12	16	20
	3	Occasional	3	6	9	12	15
	2	Remote	2	4	6	8	10
	1	Improbable	1	2	3	4	5
Legend Extreme Risk High Risk Moderate Risk Low Risk Minimal Risk			Insignificant	Minor	Moderate	Critical	Catastrophic
			1	2	3	4	5
			Severity of Consequence				

for specific professional engineering or professional geoscience activities or work. In other cases, Risk-mitigation measures can remove or alter identified Hazards (e.g., altering a manufacturing process to replace a material associated with occupational diseases in workers subject to prolonged or repeated exposure with a benign material).

The likelihood of Consequence is more variable, and Professional Registrants can decrease (or increase) the Risk of professional engineering or professional geoscience activities or work by introducing mitigation measures that affect the likelihood of Consequence. Some examples of mitigation measures that can be used directly or indirectly (to inform decisions) to decrease the overall Risk, including Risk associated with error or omission, include, but are not limited to:

- preventing or avoiding the creation of the Hazard (e.g., changing the materials or process);
- reducing the amount of Hazard created (e.g., changing the materials or process);

- separating the Hazard from what is being protected;
- conducting a sensitivity analysis by varying inputs in order to reduce Hazard likelihood;
- including or increasing safety factors in designs;
- including redundant mechanisms to limit the effect of a component failure;
- using robust error-detection mechanisms;
- implementing ongoing monitoring strategies;
- running analyses and simulations to explore tolerable load on a system;
- conducting tests;
- simplifying system designs with less dependencies;
- compartmentalization to avoid cascading failure;
- robustification to shift the designed threshold for failure;
- increased maintenance schedules;

- designing improvement that enhances durability;
- seeking input and/or review from a senior or experienced Professional Registrant;
- having an Independent Review undertaken regardless of whether it is required or not; and/or
- applying a “lessons learned” approach to the professional practice.

Professional Registrants should reassess the Risk after implementing each mitigation measure, and should implement as many mitigation measures as required to bring the Risk to a level for which they are willing to accept professional responsibility.

Where codes, standards, and regulations prescribe levels of Risk tolerance, Professional Registrants may consider more conservative and lower-Risk approaches in accordance with their professional and ethical judgement. Professional Registrants must meet the regulatory requirements and may add additional Risk mitigation measures as they see fit, to protect the public and the environment as well as their professional practice.

Some professional engineering or professional geoscience activities or work will be high-risk, regardless of how many mitigating measures are put in place, due to the inherent severity of the Consequences. Professional Registrants must re-evaluate and document the Risk after implementing all mitigation measures as part of the Risk Assessment.

It is not possible to eliminate all Risk from professional engineering or professional geoscience activities or work; the Risk remaining after identifying and implementing mitigation measures is referred to as Residual Risk. This Residual Risk, as well as the mitigation measures, should be continually monitored and managed for efficacy throughout the course of the professional engineering or professional geoscience activities or work.

A-7 REVIEWING DOCUMENTED RISKS AND MITIGATIVE MEASURES

Risk Assessments of professional engineering or professional geoscience activities or work should not be considered “one and done.” They are tools that provide valuable input throughout a project or work. For considerations about when it might be appropriate to revisit a Risk Assessment, see [Section 3.5](#) of this Guide.

APPENDIX B: DOCUMENTED RISK ASSESSMENT TEMPLATE

DOCUMENTED RISK ASSESSMENT TEMPLATE

[Print clearly and legibly]

RE:

Name of project, activity, or work

Address of project, activity, or work

PROFESSIONAL OF RECORD

Name of professional and designation
(P.Eng., P.Geo., P.L.Eng., or P.L.Geo.)

Firm Name

Permit to Practice number

Address of Firm

Table B-1: Type of Risk Assessment

Type of Risk Assessment	
Activity-based ☐	Global ☐

Does this Risk Assessment apply to repetitive or iterative activities or work?

Yes ☐

No ☐

Table B-2: Timing of Risk Assessment

WHEN WAS THIS RISK ASSESSMENT UNDERTAKEN?		
	Check which applies	Provide brief rationale for initiating subsequent Risk Assessment ^a
Initial Risk Assessment	☐	N/A
Subsequent Risk Assessment	☐	

^a Some examples include a project complexity, duration of project, scope changes, updates to inputs, new safety concerns, changes to codes or standards, uncertainty associated with Hazards or Consequences, updates to mitigation measures, or change of professional.

Table B-3: Considerations for Risk Assessment

CONSIDERATIONS FOR RISK ASSESSMENT	REMARKS (INITIAL CONDITION)
Expertise of Professional of Record	
Experience of Subordinates	
Previous experience with similar projects	
Nature of assumptions	
Potential for errors or incompleteness	
Impact of lifecycle or lifetime of work	
Level of complexity	
Innovative features	
Departures from previous practice	
Applicable codes, standards, and regulations that define Risk tolerance	
Formal Hazard identification techniques used (i.e., FMEA, FTA, ETA, HAZOP, STPA, SWIFT)	

Table B-4: Hazard Identification

HAZARD NUMBER	HAZARD IDENTIFICATION	CONSEQUENCE	SEVERITY OF CONSEQUENCE ^a	LIKELIHOOD OF CONSEQUENCE ^b	LEVEL OF RISK ^c
1					
2					
3					
4					
5					
6					

^a See Appendix A, [Section A-3](#) of the *Guide to the Standard for Documented Risk Assessments*, and [Table B-5](#) of this template.

^b See Appendix A, [Section A-4](#) of the *Guide to the Standard for Documented Risk Assessments*, and [Table B-5](#) of this template.

^c See Appendix A, [Section A-5](#) of the *Guide to the Standard for Documented Risk Assessments*, and [Table B-5](#) of this template.

Table B-5: Individual Hazard and Overall Risk Assessment

Likelihood of Consequence	5	Frequent	5	10	15	20	25
	4	Probable	4	8	12	16	20
	3	Occasional	3	6	9	12	15
	2	Remote	2	4	6	8	10
	1	Improbable	1	2	3	4	5
Legend Extreme Risk High Risk Moderate Risk Low Risk Minimal Risk			Insignificant	Minor	Moderate	Critical	Catastrophic
			1	2	3	4	5
			Severity of Consequence ^a				

^a As described in [Appendix A](#) of the *Guide to the Standard for Documented Risk Assessments*, and the tables and Risk matrix set out there, or based on another procedure developed by the Registrant.

Table B-6: Applying Mitigation Measures

HAZARD NUMBER ^a	MITIGATION MEASURES PROPOSED/IMPLEMENTED	REMARKS/JUSTIFICATION	LEVEL OF RESIDUAL RISK ^b
1			
2			
3			
4			
5			
6			

^a See [Table B-4](#) of this template.

^b See [Appendix A](#), [Section A-6](#) of the *Guide to the Standard for Documented Risk Assessments*, and [Table B-4](#) of this template.

Table B-7: Overall Residual Risk

Overall Residual Risk	
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Table B-8: Application of Risk Assessment to Checking Requirements

CHECKING OF ENGINEERING OR GEOSCIENCE WORK REQUIRED			
Type of Checking	Checker Name	Checker Qualifications	
Self-Checking			
Check by Others			
Extent		Frequency	

Table B-9: Application of Risk Assessment to Independent Review Requirements

TYPE OF INDEPENDENT REVIEW REQUIRED		
None ^a ☐	Type 1 ☐	Type 2 ☐
Frequency		

^aThis is not an option for the design of structures.

Table B-10: Application of Risk Assessment to Field Reviews Requirements

FIELD REVIEWS FOR ENGINEERING OR GEOSCIENCE WORK REQUIRED			
Field Review by (check only one): Professional of Record: ☐ Subordinate Under Professional of Record's Direct Supervision: ☐ Both: ☐			
Number		Extent	
Frequency		Timing	

Table B-11: Final Remarks

FINAL REMARKS
(For example, identify timing and/or intervals for Independent Review or subsequent Risk Assessments; list supporting Documents used for Hazard identification or Risk Assessment)

Date: (yy/mm/dd)

Signature

