



GUIDE TO THE STANDARD FOR DOCUMENTED INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK

VERSION 2.0
PUBLISHED JUNE 15, 2023



**ENGINEERS &
GEOSCIENTISTS**
BRITISH COLUMBIA

REVISED: VERSION 2.0, JUNE 15, 2023
FIRST PUBLISHED: VERSION 1.0 APRIL 27, 2021
©2023 ENGINEERS AND GEOSCIENTISTS BRITISH COLUMBIA.
ALL RIGHTS RESERVED.

COVER PHOTOGRAPH © JAMES GABBART/SHUTTERSTOCK

TABLE OF CONTENTS

PREFACE	iii	3.4.3 High-Risk Professional Activities or Work Requiring Periodic Independent Review	15
ABBREVIATIONS	iv	3.4.4 Third-Party Components and Artifacts	17
DEFINITIONS	v	3.5 AT WHAT STAGE SHOULD INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK OCCUR	17
VERSION HISTORY	viii	3.6 WHAT DO INDEPENDENT REVIEWS OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK INCLUDE	18
1.0 INTRODUCTION	1	3.7 HOW DOES CHECKING COMPARE WITH AN INDEPENDENT REVIEW	20
1.1 OVERVIEW	1	3.8 WHAT DOCUMENTS ARE REQUIRED FOR AN INDEPENDENT REVIEW	21
1.2 PURPOSE OF THIS GUIDE	2	3.9 WHO IS RESPONSIBLE FOR ENSURING THAT AN INDEPENDENT REVIEW OCCURS	22
1.3 ROLE OF ENGINEERS AND GEOSCIENTISTS BC	3	3.10 WHO IS QUALIFIED TO CARRY OUT AN INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK	22
1.4 SCOPE	3	3.11 HOW SHOULD ISSUES IDENTIFIED IN AN INDEPENDENT REVIEW BE ADDRESSED	23
2.0 REGULATORY FRAMEWORK	7	3.12 WHAT RECORDS OF AN INDEPENDENT REVIEW SHOULD BE CREATED AND RETAINED	24
3.0 STANDARDS FOR PRACTICE	11	4.0 REFERENCES AND RELATED DOCUMENTS	26
3.1 WHAT IS INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK	11	4.1 LEGISLATION	26
3.2 PURPOSE AND REQUIREMENTS OF INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK	11	4.2 REFERENCES	26
3.3 WHEN AND WHAT TYPE OF INDEPENDENT REVIEW IS REQUIRED	12	4.3 RELATED DOCUMENTS	27
3.4 SPECIAL CASES AND ALTERNATIVE APPROACHES	15	5.0 APPENDICES	28
3.4.1 General	15		
3.4.2 High-Risk Professional Activities or Work Not Requiring Independent Review	15		

LIST OF APPENDICES

<u>Appendix A: Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work</u>	<u>A-1</u>
<u>Appendix B: Determining Risk Level for Professional Activities or Work</u>	<u>B-1</u>
<u>Appendix C: Documented Risk Assessment Template</u>	<u>C-1</u>

LIST OF TABLES

<u>Table B - 1: Examples of Definitions for Severity of Consequence</u>	<u>B-3</u>
<u>Table B - 2: Examples of Definitions for Likelihood of Consequence</u>	<u>B-4</u>
<u>Table B – 3: Risk Matrix</u>	<u>B-5</u>

PREFACE

This *Guide to the Standard for Documented Independent Review of High-Risk Professional Activities or Work* (the “Guide”) was developed by Engineers and Geoscientists British Columbia to explain the standards of practice, conduct, and competence related to High-Risk Professional Activities or Work expected of Professional Registrants.

This current revision was undertaken to provide clarity in guidance to Professional Registrants in accordance with the scheme and requirements of the *Professional Governance Act* and the Engineers and Geoscientists BC Bylaws.

This Guide provides Engineers and Geoscientists BC’s interpretation of section 7.3.6, Standard for Independent Review(s) of High-Risk Professional Activities or Work, of the Bylaws. Professional Registrants are required to meet that standard by having regard for the information included in this Guide, and by exercising their professional judgment when applying that standard in their practice. This is a living Document that is to be revised and updated as required in the future, to reflect the developing state of practice.

ABBREVIATIONS

ABBREVIATION	TERM
BC	British Columbia
EGBC	Engineers and Geoscientists BC
HRPAW	High-Risk Professional Activities or Work
PPMP	Professional Practice Management Plan

DEFINITIONS

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

TERM	DEFINITION
<i>Act</i>	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> .
Consequence	An event or sequence of events that culminates in: <ol style="list-style-type: none"> 1. harm, injury, illness, or death to one or more persons; or 2. damage to the environment.
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 of “Record”.
Engineers and Geoscientists BC	The Association of Professional Engineers and Geoscientists of the Province of British Columbia, also operating as Engineers and Geoscientists BC.
Firm	As defined in the <i>Act</i> : <p>“(a) a legal entity or combination of legal entities engaged in providing services in respect of a Regulated Practice, or</p> <p>(b) a ministry or agency of the government that the Lieutenant Governor in Board may prescribe by regulation,</p> <p>but does not include a legal entity or combination of legal entities that may be exempted from this <i>Act</i> by regulation of the Lieutenant Governor in Board.”</p>
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 Firms.
Hazard	A set of conditions or an operational situation that might lead to a Consequence.
High-Risk Professional Activities or Work (HRPAW)	Professional Activities or Work that involve the potential for significant Consequences.

TERM	DEFINITION
Independent Review	<p>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 Activity 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 Activity or Work.</p> <p>There are two types of Independent Review:</p> <ul style="list-style-type: none"> • 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 Activities or Work and is employed at the same 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 Activities or Work and is not employed at the same Firm as the Professional of Record.
Independent Reviewer	The Professional Registrant who is responsible for conducting and completing an Independent Review.
Professional Activities or Work	Tasks or projects involving Regulated Practice by a Professional Registrant or registrant Firm.
Professional of Record	The Professional Registrant who is professionally responsible for work, activities, or Documents related to the Regulated Practice.
Professional Practice Management Plan	A Document developed and maintained by a Firm, which must meet the requirements set out in section 7.7.3 of the Bylaws.
Professional Registrant	<p>A registrant of Engineers and Geoscientists BC who is registered in one of the following categories of registrants:</p> <ol style="list-style-type: none"> professional engineer; professional geoscientist; professional licensee engineering; professional licensee geoscience; life member prior to 1998; 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.
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.
<i>Regulation</i>	The <i>Engineers and Geoscientists Regulation</i> , OIC 2021/037.

TERM	DEFINITION
Risk	<p>A combination of two factors:</p> <ol style="list-style-type: none"> 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	<p>A documented process involving:</p> <ol style="list-style-type: none"> 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 excluded, avoided, or mitigated (Risk evaluation).

VERSION HISTORY

VERSION NUMBER	PUBLISHED DATE	DESCRIPTION OF CHANGES
2.0	June 15, 2023	Updated content to conform with the <i>Professional Governance Act</i> and updated Bylaws; addition of guidance for multi-disciplinary High-Risk Professional Activities or Work; minor editorial corrections.
1.0	April 27, 2021	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, Engineers and Geoscientists BC establishes, monitors, and enforces standards for the qualifications and practice of Professional Registrants.
- 1.1.2 Engineers and Geoscientists BC provides practice resources to Professional Registrants 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 to the Standard for Documented Independent Review of High-Risk Professional Activities or Work* (the “Guide”) explains the standard of practice, conduct, and competence for Professional Registrants related to Independent Reviews of High-Risk Professional Activities or Work (HRPAW) as carried out in their Regulated Practice. It explains how Professional Registrants should uphold their professional obligations while involved in HRPAW and while conducting Independent Reviews of HRPAW.
- 1.1.4 This current revision was undertaken to provide clarity in guidance to Professional

Registrants, in accordance with the scheme and requirements of the *Act* and the current Bylaws, and to assist Professional Registrants in upholding their professional obligations under the *Act* and Bylaws.

- 1.1.5 This Guide provides Engineers and Geoscientists BC’s interpretation of the standard described in section 7.3.6, Standard for Independent Review(s) of High-Risk Professional Activities or Work, of the Bylaws. Professional Registrants are required to meet that standard by having regard for the information included in this Guide and by exercising their professional judgment when applying that standard in their practice. By following this Guide, Professional Registrants will be meeting the intent of the requirements in the Bylaw and appropriately upholding their professional responsibilities under section 7.3.6. 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 must record the technical or ethical reasons for the departure and must use their professional judgment to make sure the resulting work still meets the intent of the standards in the Bylaws, as well as the Professional Registrant’s broader professional and ethical obligations.

The Record of these decisions must be retained according to the requirements of section 7.3.2 of the Bylaws.

1.2 PURPOSE OF THIS GUIDE

- 1.2.1 Professional Registrants have been required to conduct documented checks of engineering and geoscience work using a written quality control process appropriate to the Risk associated with the work for many years (Engineers and Geoscientists BC 2022a). However, based on the outcomes of investigations, practice reviews, and audits, as well as questions to practice advisors, Engineers and Geoscientists BC determined a need to further clarify how Professional Registrants must meet those requirements in their practices. The Bylaws under the *Act* state the elements of the requirements for documented checks of engineering and geoscience work and for Independent Review of HRPAAW, and this Guide has been created to support Professional Registrants in meeting the latter standard established in the Bylaws.
- 1.2.2 This Document explains the standards of practice, conduct, and competence expected of Professional Registrants who are involved in HRPAAW or involved in Independent Reviews of HRPAAW. This Guide provides a common approach applicable to all Professional Registrants who engage in HRPAAW or the Independent Review of HRPAAW as part of their professional activities.
- 1.2.3 Specifically, this Guide sets out the expectations for professional practice that Professional Registrants must follow and

meet when their practices involve HRPAAW or the Independent Review of HRPAAW.

- 1.2.4 This Guide is specific to individual Professional Registrants. For requirements of Registrant Firms, refer to the *Regulation of Firms Permit to Practice Manual* (Engineers and Geoscientists BC, 2021)
- 1.2.5 The specific objectives of this Guide are to:
- provide guidance to help Professional Registrants determine when an Independent Review of HRPAAW is required;
 - describe the minimum standards for an Independent Review;
 - assist Professional Registrants in establishing and maintaining documented quality management processes and procedures for initiating, conducting, and retaining Records of Independent Reviews;
 - describe the qualities and processes necessary to ensure that Independent Reviews 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 the difference between checking and an Independent Review;
 - provide guidance on the qualifications required for Professional Registrants who are conducting Independent Reviews;
 - provide guidance on how Professional Registrants should identify and address issues during the course of Independent Reviews; and

- provide guidance on how to meet the quality management requirements under the *Act* and Bylaws when involved in HRPAAW or Independent Reviews of HRPAAW.

1.3 ROLE OF ENGINEERS AND GEOSCIENTISTS BC

- 1.3.1 This Guide and the current revision were 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 that Professional Registrants provide to their clients and to the public.
- 1.3.2 The timely and proper completion of Independent Reviews are critical for Professional Registrants in fulfilling their professional obligations, including holding paramount the safety, health, and welfare of the public. The appropriate type of Independent Reviews (i.e., Type 1 or Type 2) varies, depending on the nature and extent of the Risk associated with the Professional Activity or Work. This Guide explains the requirements for professional practice in broad terms based on the minimum standard of practice, conduct, and competence expected of Professional Registrants.

1.4 SCOPE

- 1.4.1 Proper and appropriate Independent Reviews of HRPAAW are fundamental to upholding the *Act* and Bylaws, including the Code of Ethics in Schedule A of the

Bylaws, which require that 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 involved in any HRPAAW must meet the requirement of having an Independent Review of the HRPAAW carried out by another appropriately qualified and experienced Professional Registrant before the HRPAAW is submitted to those who will be relying on it. Such submissions include Documentation issued for construction or implementation. Section 7.3.6 of the Bylaws provides the standard of professional and ethical conduct for Professional Registrants involved in HRPAAW.

- 1.4.3 This Guide is intended to assist Professional Registrants in establishing and maintaining a documented quality management procedure for Independent Reviews of HRPAAW that complies with the requirements of the *Act* and of the Bylaws by addressing:

- the process of an Independent Review;
- the purpose of an Independent Review;
- the required extent of an Independent Review;
- what should be Independently Reviewed;
- when an Independent Review should occur;
- what an Independent Review includes;
- how checking differs from Independent Review;

- the Documents required for an Independent Review;
- responsibility for ensuring an Independent Review occurs;
- qualifications required to carry out an Independent Review;
- how to identify and address issues in the course of an Independent Review; and
- ensuring that Records of an Independent Review are appropriately prepared and retained.

1.4.4 These obligations apply to Professional Registrants acting in their professional capacities in all industries where HRPaw may be carried out, and when their work involves, among other things:

- ongoing Professional Activities or Work;
- Professional Activities or Work with a defined start and finish;
- permanent or temporary Professional Activities or Work, including those related to construction;
- construction or implementation carried out by the Professional Registrant or the Firm of the Professional Registrant;
- construction or implementation carried out by others based on the work produced by the Professional Registrant or the Firm of the Professional Registrant;
- Professional Activities or Work carried out for use internally by the Professional Registrant's Firm; and
- Professional Activities or Work carried out for others.

1.4.5 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 in all industries remain the same: to ensure that any HRPaw not specifically exempted receives an Independent Review that has regard for the *Act*, the Bylaws, and this Guide.

1.4.6 HRPaw are aspects of Regulated Practice that a Professional of Record has identified through a documented Risk Assessment as involving the potential for significant Consequences.

1.4.7 No single Guide is able to categorize all types of Professional Activities or Work based on level of Risk. Professional Registrants themselves, who are involved directly in each type of Professional Activity or Work, are best positioned to evaluate the Risk associated with their practices. It is recognized that Risk Assessments are subjective and may not be uniform among Professional Registrants, even those engaging in substantially similar Professional Activities or Work. All Professional Registrants should be aware of the obligation to have Independent Reviews of HRPaw, and should use their professional judgment to determine how to uphold that obligation in their practice.¹

¹ Engineering professionals involved in structural design should consult the Engineers and Geoscientists BC Guide to the Standard for Documented Independent Review of Structural Designs (Engineers and Geoscientists BC 2023a).

- 1.4.8 In this Guide, “damage to the environment” is impact that has not been approved by a regulatory body through a permitting process. Many Professional Activities or 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 Professional Activities or Work. When evaluating the potential Consequences of a Professional Activity or Work, 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 time period, those permitted discharges do not create 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 would create damage to the environment and should be considered a Consequence.
- 1.4.9 This Guide addresses Hazards that could jeopardize the health and welfare of the public, as well as the environment and health and safety in the workplace. There are numerous negative outcomes from poorly executed practices that are outside the scope of this Guide, as they do not affect the health and welfare of the public or cause damage to the environment. Among these negative outcomes are
- financial impact to the Professional Registrant’s Firm or client, or to the public; negative repercussions to the commercial reputation of the Professional Registrant and their 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 *Act* and Bylaws.
- 1.4.10 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, 2023b) for more information. Also refer to the quality management section of the applicable professional practice guideline(s) for areas of practice and industry-specific information on Independent Reviews and, in some cases, Risk Assessments of HRPAAW.
- 1.4.11 Professional Registrants must be aware of, and use, all applicable codes and standards that apply to their specific industry or area of practice (including those published by the Canadian Standards Association and referenced in professional practice guidelines and/or quality management Guides published by Engineers and Geoscientists BC). Where codes or standards applicable to a specific industry or area of practice establish an approach to HRPAAW,

and that approach is equally or more protective 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.

1.4.12 This Guide must be read in conjunction with the other requirements of the Bylaws, and the *Guide to the Standard for Documented Checks of Engineering and Geoscience Work* (Engineers and Geoscientists BC, 2023c).

2.0 REGULATORY FRAMEWORK

- 2.1 Section 57(1) of the *Act*, Standards of conduct and competence, states that:
- “Subject to subsections (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 7.3.6 of the Bylaws, Standard for Independent Review(s) of High-Risk Professional Activities or Work, states that:
- “(1) A professional activity or work that has been identified by a Professional of Record as high-risk through a documented risk-assessment requires documented Independent Review(s) before the professional activity or work is submitted to those who will be relying on it.
- (2) Despite subsection (1), EGBC may establish criteria for professional activities or work, or identify specific professional activities or work, that
- (a) do not require documented Independent Review(s), or
 - (b) require documented Independent Review(s), even if the professional activities or work are not identified by a Professional of Record as high-risk through a documented risk-assessment.
- (3) A Professional of Record must do all of the following:
- (a) complete a documented risk-assessment prior to the initiation of a professional activity or work to determine the following:
 - (i) whether a professional activity or work is high-risk;
 - (ii) if documented Independent Review(s) of the professional activity or work is required, the appropriate frequency for the required documented Independent Review(s);
 - (iii) if documented Independent Review(s) of the professional activity or work is required, whether the required documented Independent Review(s) must be conducted by
 - (A) an appropriately qualified and experienced Professional Registrant who has not been previously involved

- in the professional activity or work and is employed by the same Firm employing the Professional of Record, or
- (B) an appropriately qualified and experienced Professional Registrant who has not been previously involved in the professional activity or work and is employed by a Firm other than the Firm employing the Professional of Record;
- (b) record their rationale for the determinations made pursuant to subsections (a)(i), (ii), and (iii);
- (c) document actions taken or not taken, along with the rationale for that decision, as a result of the Independent Review(s), including any actions taken or not taken as a result of information received pursuant to subsection (7)(d);
- (d) communicate the actions and rationale documented pursuant to subsection (c) to the Professional Registrant tasked with completing the documented Independent Review in an appropriately timely manner;
- (e) obtain a copy of the documented Record of the Independent Review from the Professional Registrant tasked with completing the Independent Review;
- (f) provide a copy of the documented Record of the Independent Review to the authority having jurisdiction, if requested;
- (g) retain and preserve the documentation related to the Independent Review for a period of 10 years in accordance with section 7.3.2(3) of the Bylaws *[Standard for Retention and Preservation of Complete Project Documentation]*.
- (4) Despite subsection (3)(c)(iii), EGBC may identify specific professional activities or work for which required documented Independent Reviews must be conducted by an appropriately experienced Professional Registrant who has not been previously involved in the professional activity or work and is employed by a Firm other than the Firm employing the Professional of Record.
- (5) Documented Independent Review(s) of a professional activity or work must not replace the regular, documented checks required pursuant to section 7.3.4 of the Bylaws *[Standard for Checks]*.
- (6) If applicable pursuant to subsection (1) or (2)(b) and not exempted pursuant to subsection (2)(a), a Professional Registrant must establish, maintain, and follow documented procedures for documented Independent Review(s) of a professional activity or work.
- (7) A Professional Registrant tasked with completing a documented Independent Review of a professional activity or work must

- (a) have appropriate experience in the type and scale of the professional activity or work subject to the documented Independent Review,
 - (b) determine the extent of the documented Independent Review based on the progressive findings of the documented Independent Review and record the rationale for this determination,
 - (c) evaluate any Documents related to the professional activity or work to determine if they are complete, consistent and in general compliance with applicable codes, standards, and other requirements,
 - (d) communicate any issues found during the Independent Review(s) to the Professional of Record in an appropriately timely manner;
 - (e) complete a documented Record of the documented Independent Review that meets the intent of the documented Independent Review sign off form issued by EGBC; and
 - (i) provide this documented Record to
 - (A) the Professional of Record, and
 - (B) the authority having jurisdiction, if requested, and
 - (ii) retain and preserve this documented Record for a period of 10 years, in accordance with section 7.3.2(3) of the Bylaws *[Standard for Retention and Preservation of Complete Project Documentation]*.
- (8) While a documented Risk assessment and a documented Independent Review of each instance of repetitive professional activities or work is not required,
 - (a) the maintenance of activity or work quality must be confirmed through
 - (i) an initial documented Risk assessment and documented Independent Review, and
 - (ii) documented Risk assessments and documented Independent Reviews at intervals,
 - (b) a documented process must be in place that identifies the criteria used to determine what types of professional activities or work are considered repetitive and the interval frequency for maintaining the activity or work quality, and
 - (c) the documented Record produced through
 - (i) the initial documented Risk assessment and documented Independent Review, and
 - (ii) documented Risk assessments and documented Independent Reviews at intervals
- must be retained and preserved for a minimum of 10 years after the last use of the repetitive

professional activity or work and made available to any person undertaking the professional activity or work.

- 2.3 This Guide is intended to assist Professional Registrants in understanding the standard of practice and in fulfilling their professional obligations in accordance with section 7.3.6 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 Professional Registrant in particular circumstances, in support of allegations of conduct unbecoming a registrant, incompetence, or professional misconduct in accordance with section 7.3.2(3) of the Bylaws [Standard of Retention and Preservation of Completed Project Documentation].

3.0 STANDARDS FOR PRACTICE

3.1 WHAT IS INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK

- 3.1.1 An Independent Review is a documented evaluation—conducted by an experienced Professional Registrant who has not been involved in the HRP AW—of the concept, details, and Documentation based on a qualitative examination of the substantially complete Documents containing all relevant and material information before the Professional Activity or Work is submitted to those who will be relying on it. The submissions may include, among other things, Documentation issued for construction or implementation. The specifics of an Independent Review will vary depending on the nature of the HRP AW.
- 3.1.2 Independent Reviews are not the same as checks of engineering and geoscience work. For information about checking, refer to the *Guide to the Standard for Documented Checks of Engineering and Geoscience Work* (Engineers and Geoscientists BC, 2023c).
- 3.1.3 Section 7.3.6 of the Bylaws and this Guide apply to all Professional Activities or Work; however, Independent Reviews of structural designs are specifically covered by section 7.3.5 of the Bylaws and the *Guide to the Standard for Independent Review of Structural Designs* (Engineers and Geoscientists BC, 2023a). Section

7.3.6 of the Bylaws expands on the requirement to use “a written quality control process appropriate to the Risk associated with the work” that appeared in the prior version of the Bylaws. The current version of the Bylaws preserves the requirement for documented checks, as described in the *Guide to the Standard for Documented Checks of Engineering and Geoscience Work* (Engineers and Geoscientists BC, 2023c), but expands the requirement for mandatory Independent Reviews of structural designs to apply more generally to Independent Reviews of HRP AW.

3.2 PURPOSE AND REQUIREMENTS OF INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK

- 3.2.1 Professional Registrants who engage in HRP AW have a professional obligation to complete their work in a manner that minimizes the Risk to the public and the environment. All Professional Activities or Work involve Risk. Professional Registrants must evaluate the Risk created by the Hazards associated with their practice through documented Risk Assessments. Independent Reviews are required when the Professional Activity or Work involves the potential for significant Consequences.

3.2.2 The determination of whether a project includes HRPAAW and requires an Independent Review is based on the Risk level before mitigation measures have been incorporated into the Professional Activities or Work. Reviewing the mitigation measures, including both implementation and adequacy, should be part of the scope of the Independent Review.

3.2.3 The Independent Review process is intended to produce a professional assessment of the adequacy of the concept, approach, execution, and Documentation of the HRPAAW. It evaluates the associated Documents to determine whether the Professional Activities or Work appear complete, consistent, and in general compliance with applicable codes, standards, and other requirements. The Independent Review may be part of, but is not intended to replace, the regular checks of Regulated Practice required by the Bylaws.

3.2.4 Professional Registrants have diverse practices. Some Professional Registrants will rarely or never engage in HRPAAW, while others will do so exclusively. The purpose of requiring Independent Reviews of HRPAAW is to protect the public and the environment, not to create additional administrative work for Professional Registrants. See [Section 3.4 Special Cases and Alternative Approaches](#) of this Guide for guidance on types of HRPAAW that do not require Independent Review, and strategies that can simplify the Risk Assessment and Independent Review processes.

3.2.5 To comply with the Bylaws, Professional Registrants must have established, or

have access to through their Firm's Professional Practice Management Plan (PPMP), documented quality management procedures that include having HRPAAW independently reviewed by another qualified Professional Registrant before the HRPAAW is submitted to those who will be relying on it.

3.2.6 A documented quality management procedure is one that has been thought out and reduced to writing in a suitable form. The process may be captured in a written procedure, process flowchart, set of checklists, forms to record Independent Reviews, or other Documentation developed to suit the nature of the work undertaken by Professional Registrants.

3.3 WHEN AND WHAT TYPE OF INDEPENDENT REVIEW IS REQUIRED

3.3.1 Section 7.3.6(3) of the Bylaws requires that, prior to the initiation of a Professional Activity or Work, a Professional of Record must complete a documented Risk Assessment that determines whether the Professional Activity or Work is considered high Risk. If the Professional Activity or Work is considered high Risk (i.e., HRPAAW), the Professional of Record must determine the appropriate type of review (i.e., Type 1 or Type 2) and the appropriate frequency of documented Independent Review to be conducted.

3.3.2 An Independent Review is not required if the Professional of Record has

determined through a documented Risk Assessment that the Professional Activities or Work are either low Risk or medium Risk (i.e., not HRPBW). However, it is permissible for Independent Reviews to still be conducted for Professional Activities or Work that are either low Risk or medium Risk. The Professional of Record may request an Independent Review at any time with the goal of lowering the Risk associated with their Professional Activity or Work. The guidance provided in this Guide can be applied to Independent Reviews of all types of Professional Activities or Work, not only HRPBW.

3.3.3 All Professional Registrants and Firms, including those involved in HRPBW, must establish documented procedures for conducting Risk Assessments and retain the Documents generated from them. Resources for conducting and documenting Risk Assessments can be found in [Appendix B: Determining Risk Level for Professional Activities or Work](#) and [Appendix C: Documented Risk Assessment Template](#).

3.3.4 The documented Risk Assessment must consider,

- Hazards associated with the Professional Activities or Work;
- severity of Consequences;
- likelihood of Consequences;
- complexity of the Professional Activities or Work;
- how errors or incompleteness in the Professional Activities or Work, including implementation or

construction, may cause or affect Hazards;

- nature of the assumptions made during the Professional Activities or Work;
- uniqueness of the Professional Activities or Work, such as innovation or deviation from previous practice;
- real or perceived conflicts of interest;
- whether the specific Professional Activities or Work have been designated by Engineers and Geoscientists BC (e.g., in relevant professional practice guidelines), the government, or relevant statutes as requiring that a certain type of Independent Review be carried out; and
- whether a substantially similar Professional Activity or Work performed by the same Professional of Record was subject to a Type 2 Independent Review within a reasonable amount of time.

3.3.5 Professionals of Record for Professional Activities or Work must document the considerations addressed, and how they support the type of Independent Review they have recommended.

3.3.6 A key question in determining the appropriate type of Independent Review is whether the potential Risk identified by the Risk Assessment is significant enough that a Type 2 Independent Review should be conducted. Where the Risk Assessment does not require a Type 2 Independent Review, a Type 1 Independent Review must still be conducted. For sole practitioners, a Type 2 Independent Review will inherently be required.

	<p>A Type 1 Independent Review is generally appropriate where the Professional of Record and Firm have extensive experience with the type and scale of the HRP AW, there are no innovative or particularly complex aspects of the HRP AW, or the HRP AW only involves problems with well-defined solutions.</p>		<p>external Independent Reviewer (i.e., proceeding with a Type 2 review) is intended to provide a perspective that has fewer of these commonalities with the Professional of Record.</p>
	<p>A Type 2 Independent Review is generally appropriate where the Professional of Record and Firm have less experience with the type and scale of the HRP AW, there are innovative or particularly complex aspects of the HRP AW, or the HRP AW involves problems without well-defined solutions. A Type 2 Independent Review will usually be required for HRP AW involving new and emerging technologies.</p>	<p>3.3.10</p>	<p>The determination of whether a Type 1 or Type 2 Independent Review is appropriate may be based, in part, on whether substantially similar HRP AW by the same Professional of Record was subject to a Type 2 Independent Review within a reasonable amount of time. This can be interpreted in one of two ways:</p> <p>That a Type 2 review was required for previous similar HRP AW and should be required for current and future similar HRP AW; or</p> <p>That a Type 2 review was done for previous similar HRP AW, and the Professional of Record was able to learn from that review, and to extrapolate and incorporate feedback from that review into current and future similar HRP AW, for a reasonable amount of time.</p>
<p>3.3.7</p>	<p>The assessed Risk of the HRP AW is a primary determinant of whether a Type 1 or Type 2 Independent Review is appropriate. A Type 2 Independent Review is more likely to be appropriate where the Risk identified by the Risk Assessment increases according to the number of Hazards as well as the severity and likelihood of the associated Consequences.</p>	<p>3.3.11</p>	<p>The underlying basis for requiring a Type 2 Independent Review is to gain a new perspective on the HRP AW; it is recommended that the second interpretation (Clause 3.3.8, item 2.) be used with caution, and that the first interpretation (Clause 3.3.8, item 1.) is applied periodically for the Professional of Record to learn new perspectives.</p>
<p>3.3.8</p>	<p>Regardless of whether the Independent Reviewer is employed by the same Firm as the Professional of Record or by a separate Firm, the Independent Reviewer must not have been previously involved in the HRP AW that are the subject of the Independent Review.</p>	<p>3.3.12</p>	<p>The extent and level of detail examined in an Independent Review will vary depending on the experience of the Independent Reviewer and the complexity and Risk associated with the Professional Activity or Work.</p>
<p>3.3.9</p>	<p>Professional Registrants employed by the same Firm are more likely to share previous experiences, precedent projects, approaches to problems, and Firm policies and procedures. Introducing an</p>		

The Independent Reviewer should consider the following questions when determining the necessary scope of the Independent Review:

1. What are the consequences of errors or incompleteness in the HRPAAW?
2. How complex is the HRPAAW?
3. Is the HRPAAW innovative or does it deviate from the previous practice?

3.3.13 Independent Reviewers must be satisfied that they have examined the HRPAAW in sufficient detail to make informed judgments as to the adequacy of the HRPAAW for the intended purpose. Independent Reviewers are required to re-evaluate and extend reviews when their evaluations suggest there might be problems with the HRPAAW.

3.4 SPECIAL CASES AND ALTERNATIVE APPROACHES

3.4.1 GENERAL

3.4.1.1 This section outlines types of HRPAAW that may not require Independent Review, and strategies that can simplify Risk Assessment and Independent Review processes. The purpose of requiring Independent Reviews of HRPAAW is to protect the public and the environment, not to create additional administrative work for Professional Registrants.

3.4.2 HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK NOT REQUIRING INDEPENDENT REVIEW

3.4.2.1 Engineers and Geoscientists BC can identify specific HRPAAW that do not require Independent Review. However, at

the time of publication of this Guide, Engineers and Geoscientists BC has not identified any HRPAAW that do not require Independent Review.

3.4.3 HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK REQUIRING PERIODIC INDEPENDENT REVIEW

3.4.3.1 Global Risk Assessments

3.4.3.1.1 Professional Registrants should consider periodically conducting global Risk Assessments on the types of Professional Activities or Work that constitute their regular practice. By conducting global Risk Assessments, Professional Registrants can sort their practice into categories defined according to the level of Risk:

1. Professional Activities or Work that are inherently low Risk, for which documented checks are sufficient;
2. Professional Activities or Work where the level of Risk will vary depending on the scope, context, and nature of each specific instance; and
3. Professional Activities or Work that are inherently high Risk (i.e., HRPAAW) that will always require an Independent Review.

3.4.3.1.2 For each instance of the second category above (Clause 3.4.3.1.1, item 2, varying risk), a project-specific Risk Assessment will be required, to determine whether the Professional Activity or Work is high Risk, and therefore whether an Independent Review is necessary. The Professional of Record will also need to determine the appropriate type and the appropriate frequency of Independent Review.

- 3.4.3.1.3 For each instance of the third category above (Clause 3.4.3.1.1, item 3, inherently high Risk), a project-specific Risk Assessment will be required, to determine the appropriate type and the appropriate frequency of Independent Review.
- 3.4.3.1.4 Conducting global Risk Assessments periodically should simplify these project-specific Risk Assessments by identifying the types of Consequences, Hazards, and Risk associated with each type of Professional Activities or Work, and what factors are more likely to cause the Professional Activities or Work to be defined as high Risk.
- 3.4.3.1.5 When Professional Registrants or Firms incorporate global Risk Assessments into their practice, the global Risk Assessment must be documented and should be repeated periodically. A Professional Registrant or Firm must create a documented process to identify what defines a Professional Activity or Work as being inherently low Risk or inherently high Risk, as well as the intervals at which global Risk Assessments will be conducted. The Professional Registrant or Firm must retain the Documents describing this process and the Documents from each Risk Assessment and Independent Review.
- 3.4.3.2 Repetitive Professional Activities or Work**
- 3.4.3.2.1 The Bylaw exempts “each instance of repetitive professional activities or work” from Independent Review. However, to confirm the maintenance of quality, the Bylaw requires an “initial” documented Independent Review of a typical Professional Activity or Work with Independent Reviews at “intervals.”
- 3.4.3.2.2 For repetitive Professional Activities or Work, a Professional Registrant or Firm must create a documented process to identify what defines a Professional Activity or Work as being repetitive, as well as the intervals at which Risk Assessments and Independent Reviews of the repetitive Professional Activity or Work will be conducted. The Professional Registrant or Firm must retain the Documents describing this process and the Documents from each Risk Assessment and Independent Review.
- 3.4.3.2.3 The appropriate scope and intervals of Independent Reviews of repetitive Professional Activities or Work are a matter of professional judgment, but should include, at minimum, any changes since the last Independent Review and the potential impact of those changes on the existing (unchanged) components of the Professional Activities or Work.
- 3.4.3.3 Iterative Professional Activities or Work**
- 3.4.3.3.1 Some industries and areas of practice use iterative processes for Professional Activities or Work, which involve regular upgrades to the product or process, often based on continual monitoring, analysis, or testing after implementation. Professional Registrants should treat iterative processes similarly to repetitive processes.
- 3.4.3.3.2 For iterative Professional Activities or Work, the Professional Registrant or Firm must create a documented process to identify what defines a Professional Activity or Work as being iterative, as well as the intervals at which Risk Assessments and Independent Review of the iterative Professional Activity or Work will be conducted.

The Professional Registrant or Firm must retain the Documents describing this process and the Documents for each Risk Assessment and Independent Review.

3.4.4 THIRD-PARTY COMPONENTS AND ARTIFACTS

- 3.4.4.1 Many Professional Activities or Work incorporate components or artifacts designed by another Professional Registrant. This may be the case for equipment supplied from out-of-province², or with multidiscipline teams, or for the design and integration of components or artifacts. Although the details will vary significantly depending on the nature of the HRP AW, in general a Professional Registrant should:
1. consider the design, operation, maintenance, and end-of-life Hazards of using the component or artifact;
 2. disclose the Hazards associated with using the component or artifact to the owner of the project; and
 3. use administrative, procedural, or engineered controls to mitigate the Hazards associated with using the component or artifact.
- 3.4.4.2 The Professional of Record for the overall Professional Activity or Work is not responsible for ensuring Independent Reviews are carried out on all individual components or artifacts designed by others and incorporated into the Professional Activity or Work. However, the Professional of Record for the Professional Activity or Work is responsible for incorporating and confirming that the components or artifacts are in general conformance with

applicable codes, standards, and other requirements.

- 3.4.4.3 Independent Reviews of the overall Professional Activity or Work must consider how the component or artifact interacts with the larger system or design.

3.5 AT WHAT STAGE SHOULD INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK OCCUR

- 3.5.1 If the design and planning for HRP AW is conducted in BC, or is for HRP AW that will take place in BC, an Independent Review must be conducted in accordance with the Bylaws before the Professional Activity or Work is submitted to those who will be relying on it. Submissions include, among other things, Documentation issued for construction or implementation.
- 3.5.2 To avoid surprises and unnecessary rework, Independent Reviews may be performed in stages as portions of the Professional Activity or Work are completed. The appropriate frequency for the staged review(s) will depend on the usual course of the Professional Activity or Work, and should be determined in advance by the Professional of Record and the Independent Reviewer. There is no requirement to have a separate Independent Reviewer for each stage; the same Independent Reviewer can review all stages of the Professional Activity or Work.

² See section 3.2.5 of the Guide to the Standard for the Authentication of Documents (Engineers and Geoscientists BC 2023d).

- 3.5.3 The Professional of Record should consider scheduling the Independent Review of the concept and approach before starting the detailed work, to minimize possible rework. However, the final Independent Review must be completed after checking and before the Documents are issued to those who will rely on them; for example, those issued for construction or implementation.
- 3.5.4 Construction or implementation of the Professional Activity or Work must not proceed on any portion of the HRP AW until an Independent Review of that portion has been completed.
- 3.5.5 Many industries and areas of practice have reviews and procedures in place for the quality control of Professional Activities or Work, especially highly regulated ones such as aviation, shipbuilding, and biomedical. If the Professional of Record determines that the existing requirements meet or exceed the standard of Independent Reviews of HRP AW, the Professional of Record must document such a determination, the considerations involved, and any modifications to the existing practice required in order to have regard for the standard outlined in the Bylaws for Independent Reviews of HRP AW.

3.6 WHAT DO INDEPENDENT REVIEWS OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK INCLUDE

- 3.6.1 The scope of Professional Activities or Work and the associated Independent Review will vary across industries and areas of practice. By categorizing projects into one of the following two project

types, Professional Registrants can determine the appropriate steps and considerations for Independent Review:

1. Professional Activities or Work that include design as well as implementation or construction; or
2. Professional Activities or Work that do not include design, implementation, or construction, such as assessments, investigations, reviews, or reports.

- 3.6.2 The Professional of Record and Independent Reviewer should refer to the lists of considerations below (Clause 3.6.3 and Clause 3.6.4), to determine which considerations apply to the Professional Activity or Work. Not all considerations will apply to all projects, and many projects will require additional considerations; both the Professional of Record and Independent Reviewer must use their professional judgment to determine the appropriate considerations and extent of review. This determination of the scope, extent, and considerations of the Independent Review must be documented.

- 3.6.3 For Professional Activities or Work that include design as well as implementation or construction, the considerations for Independent Review of HRP AW may include, but are not limited to, the following:

- Determine the extent of Independent Review required and record the rationale for this determination.
- Review the design criteria, Hazards identified in the Risk Assessment (including Risk imposed by components designed by other disciplines and Risk from external sources), and performance requirements.

- Review statutory and regulatory requirements.
- Review geographical and/or environmental conditions and requirements.
- Review material and/or other input properties.
- Where applicable, review test and analysis procedures and results.
- Review the concept and integrity of the design.
- Review adequacy and implementation of mitigation measures.
- Where applicable, review the integration of third-party components and artifacts into the Professional Activity or Work.
- Examine the assumptions made for the Professional Activity or Work.
- Evaluate the Documents related to the Professional Activity or Work to determine if they are complete, consistent, coordinated, and in general compliance with applicable codes, standards, and other requirements.
- Perform calculations on a representative sample of components, to determine whether the analysis, design, and detailing generally comply with the applicable codes, standards, and other requirements.
- Document any additional steps taken, as well as steps that were deemed not applicable to the Professional Activity or Work, and discuss them with the Professional of Record.
- Discuss any concerns with the Professional of Record. It is the responsibility of the Professional of

Record to adequately resolve concerns noted in the Independent Review.

- Provide a formal Record of the Independent Review to the Professional of Record highlighting any concerns (see Appendix A: Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work). If significant concerns are noted, the Professional of Record must revise the Professional Activity or Work and resubmit the revised Professional Activity or Work for an Independent Review, preferably by the same Independent Reviewer. Upon request, the Independent Reviewer must also provide this Record to any authority in charge of approving the Professional Activity or Work.
- Retain this documented Record of the Independent Review for 10 years.

3.6.4

For Professional Activities or Work that do not include design, implementation, or construction, such as assessments, investigations, reviews, or reports, the considerations for Independent Review of HRPAAW may include, but are not limited to, the following:

- Determine the extent of Independent Review required and record the rationale for this determination.
- Review Hazards identified in the Risk Assessment (including Risk imposed by the Professional Activities or Work by other Professional Registrants and Risk from external sources).
- Review the context or situation, the available data, and the performance criteria for the Professional Activity or Work.

- Where applicable, review geographical and/or environmental requirements and conditions.
- Where applicable, review test and analysis procedures and results.
- Review quality control and quality analysis procedures.
- Where applicable, review the integration of third-party components and artifacts into the Professional Activity or Work.
- Review adequacy and implementation of Risk mitigation measures.
- Review the assumptions made by the Professional of Record for the Professional Activity or Work.
- Review the concept and integrity of the result of the Professional Activity or Work.
- Review statutory and regulatory requirements.
- Evaluate the Documents related to the Professional Activity or Work to determine if they are complete, consistent, coordinated, and in general compliance with applicable codes, standards, and other requirements.
- Document any additional steps taken, as well as steps that were deemed not applicable to the Professional Activity or Work, and discuss them with the Professional of Record.
- Discuss any concerns with the Professional of Record. It is the responsibility of the Professional of Record to adequately resolve concerns noted in the Independent Review.
- Provide a formal Record of the Independent Review to the

Professional of Record highlighting any concerns (see [Appendix A: Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work](#)). If significant concerns are noted, the Professional of Record must revise the Professional Activity or Work and resubmit the revised Professional Activity or Work for an Independent Review, preferably by the same Independent Reviewer. The Independent Reviewer must also provide this Record to any authority charged with approving the Professional Activity or Work upon request.

- Retain this documented Record of the Independent Review for 10 years.

3.7 HOW DOES CHECKING COMPARE WITH AN INDEPENDENT REVIEW

3.7.1 Documented checks do not generally satisfy the requirements of an Independent Review. Documented checking identifies deficiencies but may be limited to evaluations of individual components by different individuals, some of whom may have been involved in the detailed design of other portions of the project. Conversely, an Independent Review does not satisfy the requirements of a documented check as it does not include detailed evaluation of all components.

3.7.2 While checking and Independent Reviews are distinct activities, if Professional Registrants are suitably experienced and independent, they could complete both the documented check and the Independent Review.

3.7.3 The extent of numerical checking and level of detail examined in an Independent Review will vary depending on the experience of the Independent Reviewer, the complexity and Risk associated with the given HRPAAW, and the extent of concerns that develop as the Independent Review proceeds.

3.8 WHAT DOCUMENTS ARE REQUIRED FOR AN INDEPENDENT REVIEW

3.8.1 Independent Reviews may occur in stages as portions of the Professional Activity or Work are completed. However, the final Independent Review should be based on the substantially complete Professional Activity or Work, such as Documentation issued for construction or implementation.

3.8.2 The specific Documents that the Professional of Record must provide to the Independent Reviewer will depend on the nature of the HRPAAW being reviewed. In general, the Professional of Record should provide all Documents necessary for the Independent Reviewer to form a professional opinion on whether the HRPAAW addresses the engineering or geoscience problem in an accurate, appropriate, and complete manner.

3.8.3 In addition to the substantially complete Documents for the Professional Activity or Work, additional Documents that the Professional of Record should provide to the Independent Reviewer may include:

- supporting Documents prepared by the Professional of Record, plus

supporting Documents from other disciplines, that may be necessary to review the Professional Activity or Work or have been requested by the Independent Reviewer;

- specifications prepared by the Professional of Record, plus specifications from other disciplines, that may be necessary to review the Professional Activity or Work or have been requested by the Independent Reviewer;
- as applicable, a summary sheet documenting
 - project-specific data such as client requirements, performance criteria, and the conditions that will apply during the intended use of the final product,
 - site-specific or context-specific data,
 - design assumptions and the applicable codes, standards, and other requirements referenced in the Professional Activities or Work, and
 - identified Hazards and the mitigation measures taken to decrease the overall Risk;
- where applicable, design notes and calculations, when requested by the Independent Reviewer; and
- all reports and any follow-up Documentation exchanged between the Professional of Record and other Professional Registrants involved in the Professional Activity or Work.

3.9 WHO IS RESPONSIBLE FOR ENSURING THAT AN INDEPENDENT REVIEW OCCURS

- 3.9.1 Professionals of Record must ensure that Independent Reviews of HRPAAW have been completed before the Professional Activity or Work is submitted to those who will be relying on it. The Independent Reviewer's responsibility is limited to completing the Independent Review in accordance with the standard established in the Bylaws and this Guide. Independent Reviews of HRPAAW do not relieve Professionals of Record of their professional responsibility for the HRPAAW.
- 3.9.2 Professional Registrants are required by Engineers and Geoscientists BC's Code of Ethics to practice only in those fields where their education, training, and experience make them professionally competent. Where components of the Professional Activity or Work approach the boundaries of the Professional Registrant's competency, the Professional Registrant should consider consulting with a more experienced Professional Registrant on those components of the Professional Activity or Work, and should consider getting an Independent Review of their Professional Activity or Work overall, regardless of whether they assessed it as HRPAAW.

3.10 WHO IS QUALIFIED TO CARRY OUT AN INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK

- 3.10.1 The Independent Reviewer must be a Professional Registrant with appropriate qualification and experience involving the type and scale of the Professional Activity or Work subject to the documented Independent Review. The level of experience required for a specific HRPAAW will depend on the Risk and complexity of the HRPAAW. The experience must be sufficient to critique concepts and identify deficiencies in Professional Activities or Work with complexity equal to or greater than the HRPAAW being reviewed. When asked to conduct an Independent Review, a Professional Registrant must use their judgment to determine if they have sufficient knowledge and experience.
- 3.10.2 For multi-disciplinary HRPAAW, it may be appropriate for a panel of subject matter experts to be convened to do the Independent Review. Each Professional of Record is responsible for determining the appropriate Independent Reviewer(s) for their scope of work and for making sure there are no gaps in the review. One Independent Reviewer may review multiple scopes of multi-disciplinary HRPAAW if they have the appropriate qualification and experience. Note that this allowance for multiple or a panel of Independent Reviewers of HRPAAW does not extend to Independent Reviews of Structural Designs

- 3.10.3 In the commercial building sector, six years of experience with a particular structural system is generally accepted as the minimum amount of experience required to be able to conduct Independent Reviews of that structural system. Note, however, that six years of experience is not a universal standard that can be applied to every type of HRPAAW. Professionals of Record and prospective Independent Reviewers should consider the nature of the HRPAAW and the depth of the prospective Independent Reviewer's experience with similar HRPAAW.
- 3.10.4 It is the responsibility of the Professional of Record to identify an appropriate Independent Reviewer based on the Risk Assessment carried out at the outset of the Professional Activity or Work.
- 3.10.5 The requirement for independence is intended to provide an unbiased review that critically evaluates the concept and approach to the Professional Activity or Work selected by the Professional of Record.
- 3.10.6 To maintain independence, the Independent Reviewer must not have been involved in the Professional Activities or Work. The Independent Reviewer may, however, be a member of the same Firm if a documented Risk Assessment determines that a Type 1 Independent Review is appropriate. Although for a Type 1 Independent Review the Independent Reviewer and the Professional of Record may be employed at the same Firm, there is no prohibition against using an external Independent Reviewer.
- 3.10.7 Although checking and Independent Reviews are distinct activities, if an

individual is suitably experienced and independent, the two activities can be completed by the same individual.

3.11 HOW SHOULD ISSUES IDENTIFIED IN AN INDEPENDENT REVIEW BE ADDRESSED

- 3.11.1 The Independent Reviewer is required to communicate in writing to the Professional of Record the issues found during the Independent Review. The Professional of Record is required to adequately resolve concerns noted in the Independent Review, and to document which actions were taken or not taken as a result of the Independent Review and the rationale for the decisions. Where appropriate, the Independent Reviewer may provide considerations and suggestions to improve the Professional Activity or Work, but should not provide detailed or prescriptive solutions.
- 3.11.2 The Professional of Record has the ultimate responsibility for the Professional Activity or Work and therefore is responsible for making the decision regarding if and how to address the Independent Reviewer's concerns, comments, and questions. The best practice is for the Professional of Record and Independent Reviewer to have an open channel of communication to discuss and resolve concerns found during the Independent Review. Where there is a fundamental difference of professional opinion between the Professional of Record and the Independent Reviewer, and the concerns cannot be resolved to the satisfaction of both parties, the Professional of Record may consider obtaining a second

Independent Review for, at a minimum, the portion(s) of the Professional Activity or Work in question. In these circumstances, the Professional of Record must bring the first Independent Reviewer's opinion to the attention of the second Independent Reviewer.

3.11.3 An Independent Reviewer's duty to report may be engaged when:

1. the fundamental difference in opinion is such that the Independent Reviewer believes there is significant Risk to the public or to the environment if no action is taken;
2. the concern has been brought to the attention of the Professional of Record; and
3. the Professional of Record does not agree with the concern and is not open to obtaining a second Independent Review.

3.11.4 In these situations, the Independent Reviewer should refer to Principle 9 of the Code of Ethics, which requires Professional Registrants to report to Engineers and Geoscientists BC and other applicable regulatory authorities if they reasonably believe that the practice of another Professional Registrant or Firm:

1. could pose a Risk of significant Consequences; or
2. is illegal or unethical.

3.11.5 The Independent Reviewer should also refer to Section 58 of the *Act* which outlines the statutory duty to report.

3.12 WHAT RECORDS OF AN INDEPENDENT REVIEW SHOULD BE CREATED AND RETAINED

3.12.1 The Independent Reviewer must document the results of the Independent Review and confirm that the results have been communicated to the Professional of Record. The Independent Reviewer must retain Documentation, such as calculations, check prints, computer scripts, and Records of communications concerning the Independent Review. The Records that must be retained will vary depending on the nature of the Professional Activity or Work. Refer to [Appendix A: Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work](#) for an example of a suitable Record and signoff. Records of Independent Reviews must be authenticated.

3.12.2 In its current form, the checklist in [Appendix A](#) is not mandatory; it can be recreated and adopted or adapted as appropriate to suit the particular Professional Activity or Work and Independent Review; for example, to alter the items reviewed or allow sign-off of multiple Independent Reviewers. See the discussion in [Section 3.10 Who is Qualified to Carry out an Independent Review of High-Risk Professional Activities or Work](#) for information on multi-disciplinary projects and panels of Independent Reviewers.

3.12.3 Professionals of Record or their Firms are required to retain Records of the documented Risk Assessment that determined the appropriate frequency of the Independent Review, and whether a Type 1 or a Type 2 Independent Review

was appropriate. Professionals of Record are also required to keep Records of the actions taken or not taken as a result of Independent Reviews. The Professional of Record must provide the Record of Independent Review to any authority charged with approving the Professional Activity or Work upon request.

3.12.4 All Records of Independent Reviews must be retained appropriately. For further guidance about retaining project Documentation, see the Engineers and Geoscientists BC *Guide to the Standard for Retention of Project Documentation* (Engineers and Geoscientists BC, 2023e).

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 HRPAAW 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 will have its own set of related Documents that should guide how Professional Registrants approach HRPAAW.

4.1 LEGISLATION

The following legislation is referenced in this Guide.

Engineers and Geoscientists Regulation, OIC 2021/037.

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

4.2 REFERENCES

The following documents are referenced in this Guide.

Engineers and Geoscientists BC. 2023a. Quality Management Guides – Guide to the Standard for Documented Independent Review of Structural Designs. Version 3.0. Burnaby, BC: Engineers and Geoscientists [accessed: 2023 May 30]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

Engineers and Geoscientists BC. 2023b. Quality Management Guides – Guide to the Standard for the Use of Professional Practice Guidelines. Version 2.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2023 May 30]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

Engineers and Geoscientists BC. 2023c. Quality Management Guides – Guide to the Standard for Documented Checks of Engineering and Geoscience Work. Version 3.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2023 May 30]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

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 Related Documents](#).

Engineers and Geoscientists BC. 2023d. Quality Management Guides – Guide to the Standard for the Authentication of Documents. Version 4.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2023 May 30]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

Engineers and Geoscientists BC. 2023e. Quality Management Guides – Guide to the Standard for Retention of Project Documentation. Version 3.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2023 May 30]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

4.3 RELATED DOCUMENTS

The following Documents are provided for information only, and are not referenced in this Guide.

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: 2023 May 30]. <https://www.apega.ca/about-apega/publications/standards-guidelines>

Engineers and Geoscientists BC. 2020. *Professional Practice Guidelines – Development of Safety-Critical Software*. Version 1.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2023 May 30]. <https://www.egbc.ca/app/Practice-Resources/Individual-Practice/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: 2023 May 30]. <https://www.egbc.ca/app/Practice-Resources/Individual-Practice/Guidelines-Advisories>.

Engineers and Geoscientists BC. 2023. *Professional Practice Guidelines – Landslide Assessments in British Columbia*. Version 4.1. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2023 May 30]. <https://www.egbc.ca/app/Practice-Resources/Individual-Practice/Guidelines-Advisories>.

Engineers and Geoscientists BC. 2021. *Regulation of Firms Permit to Practice Manual*. Version 1.1. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2023 May 30]. <https://www.egbc.ca/Practice-Resources/Firm-Practice/Firm-Practice>

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

5.0 APPENDICES

Professional Registrants may find the appended Documents useful either in themselves or as templates to adapt for their own practices. These appended Documents are intended to be resources, not mandatory formats. Professional Registrants and Firms should adapt or create Documents that work best with their own practices.

Appendix A: Checklist and Signoff for an Independent Review of High-Risk Professional Activities or Work A-1
Appendix B: Determining Risk Level for Professional Activities or Work B-1
Appendix C: Documented Risk Assessment Template..... C-1

5.1 APPENDIX A: CHECKLIST AND SIGNOFF FOR AN INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK

CHECKLIST AND SIGNOFF FOR AN INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK

[Print clearly and legibly]

RE:	PROFESSIONAL OF RECORD
Name of project, activity, or work	Name of professional and designation (P.Eng., P.Geo., P.L.Eng., or P.L.Geo.)
Address of project, activity, or work	Firm name
	Permit to Practice number
	Address of firm

ITEM	REVIEWED	REMARKS
	INITIALS	
Criteria for carrying out Professional Activities or Work		
Applicable codes, standards, and other requirements (laws, regulations, design requirements, etc.)		
Geographical and/or environmental conditions and requirements		
Assumptions for Professional Activities or Work		
Concept for Professional Activities or Work		
Test and analysis procedures and results		
Quality control and quality analysis procedures		
Calculations or analysis of representative elements		
Review of representative details		
Integration of third-party components and artifacts		
Representation of output (e.g., drawings, reports, spreadsheets, models)		
Hazards (current and future) identified in the Risk Assessment		
Adequacy and implementation of mitigation measures		
Concerns discussed with the Professional of Record		
For global, repetitive, or iterative design, recommendation for intervals of Independent Review		

[continued...]

CHECKLIST AND SIGNOFF FOR AN INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK

[...continued]

INDEPENDENT REVIEWER

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

Date: (yy/mm/dd)

Signature

CHECKLIST AND SIGNOFF FOR AN INDEPENDENT REVIEW OF HIGH-RISK PROFESSIONAL ACTIVITIES OR WORK

[Print clearly and legibly]

TO: PROFESSIONAL OF RECORD

DATE (yy/mm/dd): _____

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

RE: _____
Name of project, activity, or work

Address of project, activity, or work

The undersigned hereby records that an Independent Review of the professional activity or work, based on the documentation prepared by the Professional of Record for the professional activity or work, has been completed by this Independent Reviewer.

I am a member of the firm _____
(Name of firm)

With the Permit to Practice number: _____
(Permit to Practice number)

and I sign this letter on behalf of the firm.

I certify that I am a Professional Registrant as defined below.

DATE (yy/mm/dd): _____

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

Signed

Address

(Affix PROFESSIONAL SEAL here)

Telephone

NOTE:1. The above letter must be signed by a Professional Registrant (professional engineer, professional geoscientist, professional licensee engineering, or professional licensee geoscience, licensed to practice by Engineers and Geoscientists BC) qualified to conduct an Independent Review on the Professional Activity or Work being reviewed.

2. This letter is endorsed by Engineers and Geoscientists BC

APPENDIX B: DETERMINING RISK LEVEL FOR PROFESSIONAL ACTIVITIES OR WORK

B1 Introduction to Risk Assessments

Most Professional Activities or Work involve potential Hazards. Professional Registrants are responsible for examining how those Hazards create Risk, and for assessing and mitigating any Risk they identify. The core purpose of an Independent Review of High-Risk Professional Activities or Work (HRPAW) is to provide an additional opportunity for Risk identification and mitigation.

A Risk is present when a Hazard exists. The amount of Risk is a function of the likelihood of a Hazard occurring and creating a Consequence, as well as the severity of that Consequence. Classifications of Hazards and Risk will vary across industries and areas of practice, and the process of assessment is subjective, so identified Risks may not be uniform among Professional Registrants.

The requirement to conduct Risk Assessments to determine whether Professional Activities or Work are high Risk and require Independent Review is not intended to impose an administrative burden on Professional Registrants. Professional Registrants may find it useful to periodically conduct global Risk Assessments on the types of Professional Activities or Work in which they are regularly engaged. See [Section 3.4.3.1 Global Risk Assessment](#) of this Guide for more information.

A Risk Assessment to evaluate whether a project constitutes HRPAW has three steps:

1. Hazard identification begins by identifying any Hazards associated with the Professional 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 the Professional Activities or Work and determine how the unique scope and requirements of the Professional Activities or Work could add or remove Hazards.

Hazard identification techniques exist in many forms, from personal observation to formal techniques to professional analysis of near-miss failures of similar Professional 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.

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. A Risk matrix can be a useful tool for Risk analysis. See [Section B4: Determining Risk](#) of this appendix.
3. Risk evaluation and mitigation 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 excluded, avoided, or mitigated,

4. and to determine how specific mitigation measures would affect the Risk associated with the Professional Activities or Work. Risk evaluation and mitigation can be an iterative process. If done properly, each additional mitigation measure will lower the overall Risk associated with the Professional Activities or Work.

The residual Risk is the Risk left over after all mitigation measures have been implemented. The determination of whether a project includes HRPBW and requires an Independent Review is based on the Risk level before mitigation measures have been incorporated into the Professional Activities or Work. Reviewing the mitigation measures, including both implementation and adequacy, should be within the scope of the Independent Review.

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, and regulations. Professional Registrants are required only to determine the Risk associated with their professional practice and mitigate it accordingly, and to produce Professional Activities or Work that meet the requirements of the applicable codes, standards, and other requirements.

In some cases, in the absence of a defined acceptable level of Risk, Professional Registrants may be asked to make judgments regarding safety. Professional Registrants may make judgments as to the level of safety required to meet their ethical obligation to protect the public, but must document their assumptions and rationale for such judgments. Professional Registrants should communicate to the parties relying upon such judgments the rationale and

assumptions used to arrive at such judgments, and any limitations on their use. However, Professional Registrants may decline to make judgments regarding safety if they believe they are unable to reasonably do so.

When conducting Risk Assessments, Professional Registrants should consider the specific environments, specific workplaces, and specific public that are likely to interact with, or be impacted by, the Professional Activity or Work. Considerations should include factors such as location (rural or urban), local industry, and age and education of the affected public.

B2 Severity of Consequence

Risk is classified based on the severity and likelihood of the Consequence associated with a Hazard. Definitions and perceptions ranging from insignificant severity to catastrophic severity will vary among Professional Registrants.

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 B - 1: Examples of Definitions for Severity of Consequence](#) below provides five categories for defining the severity of Consequences associated with Hazards: insignificant, minor, moderate, critical, and catastrophic. [Table B - 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 loss of hundreds of lives would be instantaneous and 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, even though the Consequences occur over a much longer time scale, would also be considered catastrophic.

Therefore, it is critical that Professional Registrants consider both immediate and long-term effects of

their Professional Activities or Work when determining the severity of Consequences.

Table B - 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	<ul style="list-style-type: none"> No harm or negligible harm to the environment, including fish or wildlife habitat
Minor	Minor injury or recoverable bodily harm to persons	<ul style="list-style-type: none"> Minor damage or recoverable harm to the environment, including fish or wildlife habitat
Moderate	Major injury or permanent bodily harm to persons	<ul style="list-style-type: none"> Moderate damage or lasting harm to the environment, including fish or wildlife habitat
Critical	Loss of life	<ul style="list-style-type: none"> Significant damage to or loss of vulnerable ecosystems Increase susceptibility and/or resulting severity of natural disasters
Catastrophic	Loss of multiple lives	<ul style="list-style-type: none"> Irreparable damage to or loss of vulnerable ecosystems Destruction or major contamination of the environment

B3 Likelihood of Consequence [Probability]

Risk is classified based on the severity and likelihood of the Consequence associated with a Hazard. The likelihood of Consequence could be related to the return period or expected lifecycle of the Professional Activity or Work, or it could be related to the complexity of the project.

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 Activity or Work. See [Table B - 2: Examples of Definitions for Likelihood of Consequence](#) for examples to help define the likelihood of Consequence. [Table B - 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 likelihood of Consequence. It is equally important that Professional Registrants fully understand the relationship between likelihood of Consequence and the severity of Consequence, when determining the level of Risk of Professional 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-2,500-year return period). Based on the examples in [Table B - 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 seismic event

of some (likely smaller) scale will occur within the lifetime of the structure.

While the likelihood of Consequence to design-level forces is improbable, the likelihood of Consequence to a lower level might be occasional (e.g., 1-in-50 years or 1-in-100 years), and the severity could be catastrophic in either case.

Referring to [Table B – 3: Risk Matrix](#) below, structures would be considered inherently high-Risk and require Independent Review of the structural design; this is consistent with the Bylaws and established standard of practice.

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.

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

LIKELIHOOD OF CONSEQUENCE	RETURN PERIOD ^{a, b}	COMPLEXITY OF PROJECT AND RESOURCES AVAILABLE
Improbable	<ul style="list-style-type: none"> 1 in 500 years Expected not to happen in lifetime of project 	<ul style="list-style-type: none"> Design to prescriptive code (i.e., Canadian Electrical Code) or in a highly regulated area of practice (i.e., ship building)
Remote	<ul style="list-style-type: none"> 1 in 200 years Could happen in lifetime of project 	<ul style="list-style-type: none"> Varies with respect to area of practice
Occasional	<ul style="list-style-type: none"> 1 in 50 years Expected to happen in lifetime of project 	<ul style="list-style-type: none"> Varies with respect to area of practice
Probable	<ul style="list-style-type: none"> 1 in 10 years Expected to happen multiple times in lifetime of project 	<ul style="list-style-type: none"> Varies with respect to area of practice
Frequent	<ul style="list-style-type: none"> 1 in 1 year or less Expected to happen regularly in lifetime of project 	<ul style="list-style-type: none"> Innovative design in 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 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 B3](#) of this appendix.

B4 Determining Risk

Once the severity and likelihood of Consequence of the Hazard are determined, Professional Registrants can determine the Risk of the Professional Activity or Work.

Table B – 3: Risk Matrix is an example 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 B – 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 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 Activities or Work.

Table B – 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 Activities or Work.

Table B – 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			Insignificant	Minor	Moderate	Critical	Catastrophic
<ul style="list-style-type: none"> ■ Extreme Risk ■ High Risk ■ Moderate Risk ■ Low Risk ■ Minimal Risk 			1	2	3	4	5
SEVERITY OF CONSEQUENCE							

B5 Mitigating Risk

Professional Registrants are responsible for mitigating the Risk inherent in their Professional Activities or Work. In some cases, the nature of Hazards and the severity of the associated Consequences will generally be constant for a Professional Activity or Work. In other cases, Risk-mitigation measures can remove or alter identified Hazards (e.g., altering a manufacturing process to substitute a benign material for a material associated with occupational diseases in workers subject to prolonged or repeated exposure).

The likelihood of Consequence is more variable, and Professional Registrants can decrease (or increase) the Risk of a Professional Activity 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:

- applying Risk and Hazard analysis techniques;
- applying a “lessons learned” approach to the professional practice;
- preventing 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 that which is being protected;
- conducting a sensitivity analysis by varying inputs;
- 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;
- comparing hand calculations with output from software, or vice versa;
- engaging in continuing education in the area of practice; and/or
- involving a senior or experienced Professional Registrant.

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 they are willing to accept professional responsibility for.

The level of Risk that Professional Registrants are comfortable taking responsibility for may be different than that permitted in codes, standards, and regulations. 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 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 document these re-evaluations of Risk after implementing mitigation measures as part of the Risk Assessment.

It is not possible to eliminate all Risk from Professional Activities or Work; the Risk remaining after identifying and implementing mitigation measures may be 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 Activity or Work. Fundamentally, the Independent Review is an additional mitigation measure designed to further decrease the Risk associated with the Professional Activity or Work. Reviewing the mitigation measures, including both implementation and adequacy, should be part of the Independent Review scope.

B6 Independent Reviews

While all HRPAAW require an Independent Review, as per section 7.3.6(1) of the Bylaws, it is permissible for an Independent Review to be conducted for medium-Risk or low-Risk activities. A Professional Registrant can request an Independent Review at any time, to lower the Risk associated with their Professional Activity or Work. The guidance provided in this Guide can be applied to Independent Reviews of all types of Professional Activities or Work, not only HRPAAW.

The appropriate type of Independent Review (i.e., Type 1 or Type 2) will vary, depending on the nature of, and the Risk posed by, the Professional Activity or

Work. The assessed Risk of the HRPAAW is a primary determinant of whether a Type 1 or Type 2 Independent Review is appropriate. A Type 2 Independent Review, where the Independent Reviewer is employed at a different Firm than the Professional of Record, is more likely to be appropriate where the Risk identified by the Risk Assessment increases according to the number of Hazards, as well as the severity and likelihood of the associated Consequences. Although a Type 1 Independent Review allows the Independent Reviewer and the Professional of Record to be employed at the same Firm, there is no prohibition against using an external Independent Reviewer.

5.2 APPENDIX C: DOCUMENTED RISK ASSESSMENT TEMPLATE

DOCUMENTED RISK ASSESSMENT TEMPLATE

[Print clearly and legibly]

RE:

PROFESSIONAL OF RECORD

Name of project, activity, or work	Name of professional and designation (P.Eng., P.Geo., P.L.Eng., or P.L.Geo.)
Address of project, activity, or work	Firm name
	Permit to Practice number
	Address of firm

Table A: Type of Risk Assessment

TYPE OF RISK ASSESSMENT		
Global	Repetitive/Iterative	Project-Specific

Table B: Considerations for Risk Assessment

CONSIDERATIONS FOR RISK ASSESSMENT	REMARKS (INITIAL CONDITION)
Expertise of Professional of Record	
Experience of subordinates	
Previous experience with similar projects	
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)	

DOCUMENTED RISK ASSESSMENT TEMPLATE

Table C: 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 B, Section B2 of the *Guide to the Standard for Independent Review of High-Risk Professional Activities or Work (Guide)*, and Table D of this template.

^b See Appendix B, Section B3 of the *Guide*, and Table D of this template.

^c See Appendix B, Section B4 of the *Guide*, and Table D of this template.

Table D: Individual Hazard and Overall Risk Assessment

INDIVIDUAL HAZARD AND OVERALL RISK ASSESSMENT					
Severity of Consequence ^a	Insignificant	Minor	Moderate	Critical	Catastrophic
Likelihood of Consequence ^a	Improbable	Remote	Occasional	Probable	Frequent
Level of Risk ^a	Minimal	Low	Moderate	High	Extreme

^a As described in Appendix B of the *Guide to the Standard for Independent Review of High-Risk Professional Activities or Work*, and the tables and Risk matrix set out there, or based on another procedure developed by the Professional Registrant or Firm.

Table E: Type of Independent Review Required

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

^a The type of Independent Review must be determined after the initial Risk Assessment, thereby allowing any mitigation measures applied to the Professional Activity or Work to be part of the scope of the Independent Review.

DOCUMENTED RISK ASSESSMENT TEMPLATE

Table F: Applying Mitigation Measures

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

^a See Table B of this template.

^b See Appendix B, Section B4 of the *Guide to the Standard for Independent Review of High-Risk Professional Activities or Work*, and Table C of this template.

Table G: Final Remarks

FINAL REMARKS
(For example, recommended timing and/or intervals for Independent Review; reference supporting Documents used for Hazard identification or Risk Assessment)

Date: (yy/mm/dd)

Signature