

PRACTICE ADVISORY

REQUIREMENTS FOR PROVIDING BUILDING DEMOLITION SERVICES

Version 1.0, Published June 8, 2022

This practice advisory has been issued for registrants of Engineers and Geoscientists British Columbia (engineering professionals) to provide guidance on expectations and obligations of professional practice when providing services related to planning and executing demolitions of the primary structural systems of buildings.

BACKGROUND

Some recent collapses and incidents during demolitions of building structures have resulted in serious injury and loss of life. To ensure demolition planning and work is performed in alignment with current legislation, it is important to clarify the role of engineering professionals who are engaged to provide services in this area of practice.

Building demolition activities in British Columbia (BC) are regulated by the *Occupational Health and Safety Regulation (OHSR)*—administered by WorkSafeBC—and by the *BC Building Code* and Vancouver Building By-law (the latter two are collectively referred to in this advisory as “the code”).

The *OHSR*, Part 20 regulates demolition activities under sections 20.111 to 20.121. The *OHSR* mandates that an engineered demolition plan is required where demolition activities may endanger workers, or if the integrity of the structure being demolished or that of adjoining grounds and structures could be compromised by the demolition activities.

The code, Part 8 governs safety measures at construction and demolition sites. Part 8 refers to the standard CAN/CSA S350-M, Code of Practice for Safety in Demolition of Structures, as well as the *BC Fire Code*, Division B, Section 5.6, as applicable to the demolition phase of a building’s lifecycle. Furthermore, the objectives in the code related to fire safety, structural safety, and safety at construction and demolition sites should be considered during the demolition of buildings. For more information on these objectives from the code, see [Attachment 1](#).

In addition, specific local bylaws or policies may apply to submissions required to obtain a demolition permit; for example, the City of Vancouver sets out its requirements in their “Demolition or Deconstruction Checklist” (City of Vancouver 2020). Engineering professionals must be aware of and comply with all local requirements for their projects.

PROFESSIONAL PRACTICE

As noted above, the *OHSR* mandates that an engineered demolition plan is required where demolition activities may endanger workers, or if the integrity of the structure being demolished or that of adjoining grounds and structures could be compromised by the demolition activities. In addition, the code, Part 8 governs safety measures at construction and demolition sites, and in some cases specific local bylaws or policies also apply to submissions required to obtain a demolition permit.

Engineering professionals should be aware of the local requirements for their projects.

ENGINEERED DEMOLITION PLAN

The intent of an engineered demolition plan is to provide a set of instructions, drawings, and procedures to be used by a demolition contractor to safely deconstruct a building in a manner that is in compliance with the applicable codes and regulations.

Engineering professionals who prepare engineered demolition plans must authenticate (sign and seal) documents prepared in their professional capacity or under their direct supervision.

PHASES OF WORK

When engineering professionals are engaged to complete or contribute to an engineered demolition plan, the following phases of work will generally apply. Engineering professionals should consider the items below for each phase.

Preliminary Assessment Phase

During the preliminary assessment phase, engineering professionals should undertake the following:

- Perform a utility search to determine the location of overhead and underground utilities at the site.
- Obtain and review the existing structural drawings.
- Check whether the structural drawings include:
 - overall building dimensions;
 - typical floor plans and details;
 - roof plans and details;
 - non-typical plans and details (e.g., transfer slabs, slab bands);
 - details pertaining to the primary load-bearing elements of the structure;
 - details pertaining to the lateral load-resisting system of the structure (e.g., braced frames, shear walls, moment frames);
 - specified loads and design criteria used in the design of primary structural elements; and
 - referenced building codes, with editions and dates.

- If the structural drawings and details are unavailable or substandard, engineering professionals must undertake due diligence to determine building dimensions, material types, material condition, and load paths, in order to gain an appropriate understanding of the building structure in the next phase.

Site Evaluation Phase

During the site evaluation phase, engineering professionals should undertake the following:

- Confirm that the current structure matches the structural drawings, noting any modifications to the structure that may not be shown on the structural drawings (e.g., doors, windows, slab openings, mezzanines).
- Assess the material condition of the structural elements of the building (e.g., deterioration of concrete/masonry elements, corrosion of steel members, position and condition of reinforcement).
- Identify the location of underground and overhead facilities and utilities in relation to the structure.
- Identify cantilever and suspended components, as these require careful consideration during the development of the engineered demolition plan.
- Investigate and determine the presence of any pre-stressed elements, as improper release of pre-stressed elements can be hazardous to workers and/or the public.

Engineered Demolition Plan Development Phase

For development of the engineered demolition plan, engineering professionals should undertake the following:

- Perform a structural analysis, including the following:
 - Identify the stages of demolition and determine the effects of removing parts of the building on the remaining structure at each stage.
 - Perform analysis and calculations to reasonably determine that the demolition stages and interim structural conditions present during demolition activities will remain stable.
 - Consider the effects of differing loading conditions between the building's original design and those that will be encountered during demolition, paying special attention to potential effects of any differences.
 - Consider the load path during each demolition stage, paying special attention to suspended or cantilevered components.
 - Consider loads imposed on the structure by demolition equipment, demolition debris, environmental loads, and other loads that might be encountered during demolition activities.
 - Determine and mitigate the effects of demolition on adjacent structures, to avoid compromising their integrity and operation.
 - Consider the effects of lateral pressures on retaining walls and foundation walls that may result from the demolition.

- Consider the requirements set out in the quality management guide titled, *Guide to the Standard for Documented Independent Review of High-Risk Professional Activities or Work* (Engineers and Geoscientists BC 2021a), to determine if documented independent review is required for a structural analysis or demolition plan.
- Note any services and utilities, both underground and overhead, and provide a plan to isolate and/or mitigate these hazards, as appropriate.
- Address other safety considerations (see the [Specific Safety Considerations](#) section below).
- Create documents and/or drawings that include the following:
 - A brief description of the structure, including the type of construction.
 - The overall demolition methodology, including the demolition technology to be used, stages of demolition, and demolition procedures.
 - A key plan for the affected building(s), with distinct notation of the areas subject to demolition.
 - Descriptions of any required pre-demolition setup work.
 - Descriptions of the heavy equipment to be used during the demolition process and considerations for the loads they impose on the structure.
 - Detailed drawings for each stage of demolition.
 - Lift plans for each stage of demolition.
 - Details of temporary supports or bracing required during each stage of demolition.
 - Requirements for underpinning, shoring, and bracing.
 - Field review requirements, including critical points where demolition activities must be paused for field reviews (see below for further detail).

Field Review Phase

Field reviews must be done by engineering professionals for all professional activities or work, to verify that the intent of the work is being appropriately implemented during construction. This requirement also applies to demolition projects and engineered demolition plans.

The information gathered from the documented field reviews during demolition activities informs engineering professionals of the adequacy of the initial engineered demolition plan, enables assumptions from the plan to be verified, and identifies opportunities to obtain new information regarding the condition of the building or structure.

For the field review phase, engineering professionals should undertake the following:

- Determine the number, extent, frequency, and timing of the required field review activities, which are at the discretion of the engineering professional (referred to in this practice advisory as the “field review approach”).
- Document those decisions to an appropriate level within the engineered demolition plan.
- Ensure the field review approach is linked directly to the stages of demolition described in the engineered demolition plan, with critical points clearly identified where field reviews are required to ascertain that demolition activities are proceeding according to the intent of the engineered demolition plan.
- When necessary, adjust or modify the field review approach, engineered demolition plan, and demolition procedures based on information obtained during field reviews.

For further considerations and guidance on documented field reviews, see the quality management guide titled, *Guide to the Standard for Documented Field Reviews During Implementation or Construction* (Engineers and Geoscientists BC 2021b).

SPECIFIC SAFETY CONSIDERATIONS

In addition to assessing structural integrity of a building demolition project, engineering professionals should conduct an assessment to identify other potential risks and hazards at the demolition site, and should determine mitigation methods that reduce identified risks to an acceptable level within the engineered demolition plan.

A specialist engineering professional may be required to assist in mitigating hazards that have been identified.

Hazards and safety considerations that may be encountered during building demolition include but are not limited to:

- hazardous material identification;
- protection of the public as outlined in Part 8 of the code;
- potential for falling objects;
- effects of dust and dust control;
- sediment control;
- utility disconnections;
- fire protection, including possible impacts on adjoining buildings;
- traffic management;
- use of explosives;
- use of underpinning, shoring, and bracing;
- effects of stockpiling demolition debris and other materials on the structure;
- machine access; and
- use of critical lifts, including lift plans.

Engineering professionals should consider additional requirements of the *OHSR*, the code, and/or other applicable codes and standards, such as those related to:

- stairway accessibility;
- fencing;
- covered walkways; and
- material salvage requirements and techniques.

Items listed above that do not apply to a particular demolition project may be omitted, but their omission should be documented in the engineered demolition plan. Conversely, a particular demolition project may engage additional specific hazards and safety considerations not listed above.

The engineered demolition plan must be in conformance with the applicable codes and standards, and specific local bylaws and policies. While engineering professionals may not be primarily responsible for all aspects of code compliance, they should clearly define their scope of responsibility with their client, especially if the items listed above are not within their scope. The engineering professional should be satisfied that any aspects of code compliance that are outside of their responsibility or scope are attended to by an appropriately qualified individual.

If engineering professionals identify areas that require additional professional involvement that are outside of their scope or not listed above, they should communicate the need for additional professional involvement to the client and/or the authority having jurisdiction in writing.

ADDITIONAL GUIDANCE FROM OTHER JURISDICTIONS

Professional Engineers Ontario (PEO) has published a guideline titled, *Professional Engineers Providing Services for Demolition of Buildings and other Structures* that addresses this topic (PEO 2011).

ACKNOWLEDGEMENTS

This advisory was prepared in collaboration with the Engineers and Geoscientists BC's Temporary Works Advisory Group. Engineers and Geoscientists BC thanks the contributors involved in developing this practice resource.

REFERENCES

British Columbia (BC) Building Safety Standards Branch. 2018. BC Building Code. [accessed: 2022 Apr 11]. <http://www.bccodes.ca>.

British Columbia (BC) Building Safety Standards Branch. 2018. BC Fire Code. [accessed: 2022 Apr 11]. <http://www.bccodes.ca>.

City of Vancouver. 2020. Demolition or Deconstruction Checklist. December 2020. [accessed: 2022 May 11]. <https://vancouver.ca/files/cov/demolition-checklist.pdf>.

City of Vancouver. 2019. Vancouver Building By-law 2019. [accessed: 2022 Apr 11]. <https://www.bccodes.ca/vancouver-bylaws.html>.

CSA S350-M, Code of Practice for Safety in Demolition of Structures.

Engineers and Geoscientists BC. 2021a. Quality Management Guides – Guide to the Standard for Documented Independent Review of High-Risk Professional Activities or Work. Version 1.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2022 Apr 11]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

Engineers and Geoscientists BC. 2021b. Quality Management Guides – Guide to the Standard for Documented Field Reviews During Implementation or Construction. Version 2.0. Burnaby, BC: Engineers and Geoscientists BC. [accessed: 2022 Apr 11]. <https://www.egbc.ca/Practice-Resources/Individual-Practice/Quality-Management-Guides>.

Professional Engineers Ontario (PEO). 2011. Professional Engineers Providing Services for Demolition of Buildings and Other Structures. Ottawa, ON: PEO. [accessed: 2022 Apr 11]. <https://www.peo.on.ca/knowledge-centre/practice-advice-resources-and-guidelines/practice-guidelines>.

LIST OF ATTACHMENTS

Attachment 1: BC Building Code Requirements Related to Engineered Demolition Plans

VERSION HISTORY

VERSION NUMBER	PUBLISHED DATE	DESCRIPTION OF CHANGES
1.0	June 8, 2022	Initial version.

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ATTACHMENT 1

BC BUILDING CODE REQUIREMENTS RELATED TO ENGINEERED DEMOLITION PLANS

The *BC Building Code* is an objective-based code where objectives and functional statements present the underlying intent with respect to public safety.

Division A, Section 2.2. and Division B, Section 8.3. of the *BC Building Code* include the following objectives that should be considered during the development of an engineered demolition plan:

- OS1 Fire Safety
 - OS1.5 – persons being delayed in or impeded from moving to a safe place during a fire emergency
- OS2 Structural Safety
 - OS2.2 – loads bearing on the building that exceed the loadbearing properties of the supporting medium
 - OS2.3 – damage to or deterioration of building elements
 - OS2.5 – instability of the building or part thereof
- OS5 Safety at Construction and Demolition Sites
 - OS5.1 – objects projected onto public ways
 - OS5.3 – damage to or obstruction of public ways
 - OS5.6 – exposure to hazardous substances and activities