

**British Columbia Ministry of Education Seismic Mitigation Program - Seismic Retrofit
Guidelines**
Guidelines for Architectural, Mechanical and Electrical Design Professionals
November 30, 2015

Background

This document is intended for architectural, mechanical and electrical *design professionals* when providing services on a seismic upgrade under the Seismic Mitigation Program (SMP). The SMP requires the use of the *Seismic Retrofit Guidelines (SRG)* published by the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC); this document is part of *SRG*. *Design professionals (or registered professionals)* is a defined term in both the *British Columbia Building Code (BCBC)* and the *Vancouver Building Bylaw (VBBL)* as professional engineers registered with APEGBC or architects registered with the Architectural Institute of BC (AIBC). The *SRG* generally provides technical guidelines for structural and geotechnical engineers, these guidelines therefore apply to mechanical and electrical engineers and architects.

The SMP requires as part of the Ministry of Education project approval process a Seismic Project Identification Report (SPIR) that analyses the seismic risk, identifies the structural systems required to retrofit the building and provides a cost estimate. The cost estimate is construction only and includes allowances to remove and replace building systems only as required by the structural retrofit (architectural, mechanical and electrical) but does not include any soft costs. Some projects at the Project Definition Report (PDR) stage carry estimates that are higher than normal adjustments for soft costs due in large part to the inclusion of non-seismic improvements. While these non-seismic improvements are often important to the enhanced operations of the building, from a funding perspective, they need to be identified as either required as part of the base seismic upgrade and therefore fundable through the SMP, or as non-seismic improvements that require alternate funding sources. The challenge presented to the design professionals is identifying the scope required for mechanical, electrical and architectural building systems retrofits to comply with building codes and bylaws and professional practice standards as part of a seismic upgrade. This document is intended to provide clarity and consistency in identifying the requirements for a stand-alone (base case) seismic upgrade and the identification of any proposed non-seismic improvements.

British Columbia Building Code

BCBC 2012 Part 1 Compliance states:

- “1.1.1.2. Application to Existing Buildings.*
1. Where a building is altered, rehabilitated, renovated or repaired, or there is a change in occupancy, the level of life safety and building performance shall not be decreased below a level that already exists. (See Appendix A)”
- “A-1.1.1.1.(1) Application to Existing Buildings. ...It is not intended that the British Columbia Building Code be used to enforce the retrospective application of new requirements to existing buildings...”*

The *BCBC* exempts owners from upgrading a building to current *BCBC* standards when the owner performs a voluntary upgrade, such as a seismic retrofit under the SMP.

Vancouver Building Bylaw

Similar to the BCBC 2012, the VBBL 2014 Section 11.2.1.1 Upgrade Objectives states:

“(f) the level of safety and building performance shall not be decreased below the existing level.”

Additionally, the VBBL has always published an existing building upgrade mechanism with triggers that identify the levels of upgrade required. The current requirements are articulated in VBBL 2014 Part 11 – Existing Buildings. The specific clause applicable to a voluntary seismic upgrade under the SMP is:

“A- 11.2.1.2 Existing Building Upgrade Mechanism Model

Where a voluntary upgrade forseismic work...is performed, it is not the intent of this Bylaw to require the owner to further upgrade the building provided no other work is included in the project. If other work is included in the project, the upgrade requirement will only be based on the non-voluntary work proposed.”

This stated intent relating to voluntary upgrades is reinforced in Rehabilitation Project Flow Chart No.1 of A-11.2.1.2. This flow chart identifies the “triggers” for the level of upgrade required for rehabilitation projects as a function of the category of work. The upgrade level required increases from a “Voluntary Upgrade” to “Repair”, “Minor Renovation”, Major Renovation”, and “Reconstruction” . The scope of work for a seismic upgrade may in fact coincide with one of the other rehabilitation project types, nonetheless, it is clear from the stated intent and Flow Chart No.1 that a voluntary upgrade is exempt from other upgrade requirements. In fact, if an owner were to undertake a voluntary seismic improvement that did not meet new building requirements (e.g., a phased retrofit to achieve medium risk), that is permitted under VBBL 11.2.1.2.

For example, installing a full building mechanical system complying with the current energy requirements of the VBBL is only required under the most stringent project type, reconstruction. Reconstruction occurs when the building is completely gutted including all exterior cladding, flooring, roof membranes, all interior finishes etc. It is unlikely that a seismic upgrade would be this extensive, however, in the unlikely event that this were the case, it does not negate the fact that the upgrade is voluntary and would therefore not dictate a new fully compliant mechanical system. Any piece of mechanical equipment that perhaps cannot be relocated and would need to be replaced as a result of the seismic retrofit would need to be at least as efficient as the equipment being replaced.

The VBBL exempts owners from upgrading a building to current VBBL standards when the owner performs a voluntary upgrade, such as a seismic retrofit under the SMP.

Professional Practice Standards

In addition to compliance with building regulations, design professionals are bound by a code of ethics and practice standards established by their respective regulatory bodies, APEGBC and AIBC.

APEGBC Code of Ethics Guidelines [Principle 9](#) includes in the Commentary the following statement:

“If the immediate physical safety of the public is in jeopardy, speedy notification of the owner, operator, or appropriate regulatory authorities is the immediate duty of the member.”

In the context of a voluntary seismic upgrade under the SMP, a design professional is only required to object to the continued use of existing building systems and components if they pose an immediate life safety threat. Studying options to improve building performance through the replacement of systems or

system components outside of the SMP is of course the prerogative of the design professional and the owner.

Structural Engineering Post-SPIR

The SPIR stage cost estimate includes reasonable budget allowances to remove and re-install architectural, mechanical and electrical building components. Once a project moves through the SPIR stage into the PDR stage, the mechanical, electrical and architectural design professionals establish, for their respective project components, the “re and re” methodology for the basic seismic upgrade including re-commissioning and repairs as may be required, sufficient to confirm the SPIR budget allowances. Optional non-seismic improvements may be identified but subject to the funding restriction identified herein. It is imperative that the structural engineer of record be included in a fulsome way to offer options to the geometry of the seismic reinforcing to minimize the cost impact on the building systems. For example, relocating shear walls, or adding shear walls to avoid floor diaphragm reinforcing may ease the burden on the re and re requirements of the building systems. The process should not be linear by which the structural engineer completes an SPIR and the other design professionals add their component requirements; it should be inclusive and somewhat iterative to minimize costs and disturbance.

To ensure the effectiveness of the design process, the entire design team should be maintained from SPIR stage through to project completion.

Architectural Building Systems

As indicated above, the base professional responsibility of an architect in a voluntary upgrade is to ensure that level of safety and building performance is maintained. The following are examples of base requirements for architectural building systems and optional non-seismic improvements:

Base Seismic Upgrade Requirements - SMP Funding

- Ensure the integrity of fire protection assemblies such as fire separations, fire walls and construction type (combustible versus non-combustible) are maintained.
- Ensure fire exits, and access to exits (corridors and stairwells), are maintained.
- Ensure that seismic works do not reduce the accessibility and function of the existing building.
- Ensure the building envelope moisture, air and thermal barriers are maintained including wall cladding and roofing.

Optional Non Seismic Improvements - Alternate Funding Sources

- Fire protection upgrades to current codes for fire separations, combustibility and exiting.
- Building envelope upgrades.
- Window and door upgrades.
- Accessibility upgrades.
- Upgrade to interior finishes including millwork.
- Exterior improvements to wall surfaces or grounds.

Mechanical and Electrical Building Systems

As indicated above, the base professional responsibility of the mechanical and electrical engineers in a voluntary upgrade is to ensure that level of safety and building performance is maintained. The following are examples of base requirements for mechanical and electrical building systems and optional non-seismic improvements:

Base Seismic Upgrade Requirements - SMP Funding

- Remove and replace existing equipment, piping, conduits and fixtures as required to construction seismic components. Re-commission as required.
- Remove and replace existing fire protection systems including suppression sprinklers, piping and fire alarm equipment as required to construction seismic components. Fire suppression sprinkler testing and fire alarm verification.

Optional Non Seismic Improvements - Alternate Funding Sources

- Fire protection upgrades including suppression sprinkler systems.
- Fire alarm system upgrades.
- Upgrade exit signage and emergency lights.
- Mechanical Heating, Ventilation, Air Conditioning, and energy system upgrades to improve building performance.
- Plumbing and electrical fixture replacements.

Reasonable Life Safety & Access Improvements

- Notwithstanding the *BCBC* and *VBBL* language around voluntary upgrades, the Ministry of Education has in recent years agreed to allow reasonable fire safety and access improvements to be funded by the SMP. These improvements have been deemed necessary to achieve safe and accessible buildings for all students.
- Notwithstanding the *BCBC* and *VBBL* language around voluntary upgrades, the Ministry of Education has in recent years agreed to fund as part of the SMP the seismic restraint of Occupational and Functional Components (OFCs).

Conclusion

Based on the requirements of prevailing codes, bylaws and professional standards, when undertaking a seismic upgrade under the SMP the following is required:

1. The responsibilities of the owner and the architectural, mechanical and electrical design professionals are to ensure that the level of safety and building performance is not decreased below the existing level.
2. The base requirements for architectural, mechanical and electrical building systems scope of work in a seismic upgrade undertaken under the SMP is to remove and replace existing systems to facilitate the construction of the seismic improvement components.
3. Exceptions to the base requirements exist if an immediate or imminent threat to public safety is discovered.
4. At the direction of the owner, the design team may consider the merits of optional non-seismic improvements including replacing or upgrading architectural, mechanical and electrical systems to improve building performance and longevity. It may be practical and rational to undertake these concurrent with the seismic structural upgrade.
5. The optional non-seismic improvements are not fundable by the SMP. As an exception, the Ministry of Education acknowledges that life safety improvements such as fire protection systems upgrades may be funded through the SMP.
6. To facilitate management of the SMP, a clear reporting of “Base Requirements” versus “Optional Non Seismic Improvements” shall be provided by the design professionals in accordance with the scope delineation presented in this document.