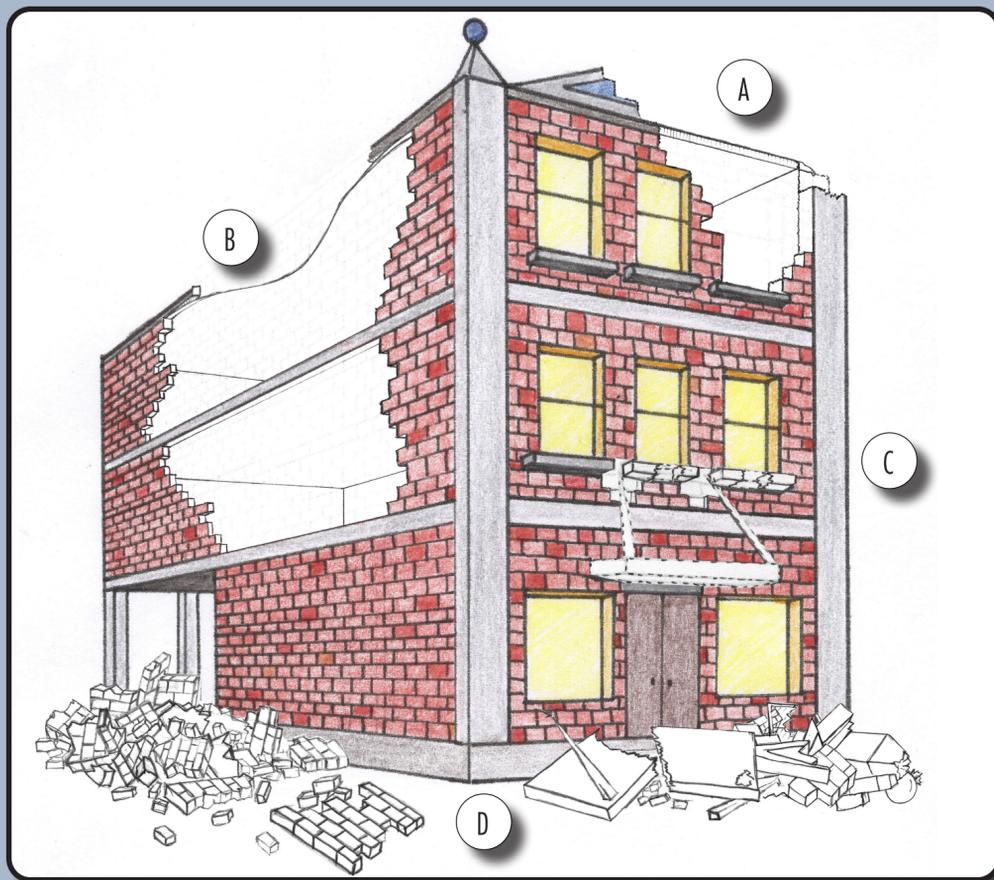


# SEISMIC UPGRADING HERITAGE STRUCTURES: SAVING LIVES, HOMES AND HISTORY

The province of British Columbia is the most seismically active, at-risk province in Canada and has an abundant supply of heritage buildings in need of seismic upgrading. Heritage buildings are an important part of the built environment. They connect to the histories and identities of communities, as well as provide a sense of place. Such buildings add visual interest and charm to the streetscapes experienced throughout the province, providing focal points and gathering places for communities. There is a need to protect these structures and the lives within them while respecting their heritage value, as discussed and illustrated in this document.



## WHAT ARE THE RISKS

All buildings (whether a heritage one or not) are at-risk when an earthquake strikes. They need to be able to withstand the ground shaking caused by an earthquake. An additional concern with heritage buildings is that many were built when the BC Building Code was either non-existent or not as stringent as it is today. There is therefore a need to upgrade heritage buildings to withstand seismic shaking to minimise damage and save lives. Fall hazards present the clearest threat and are of the greatest need for upgrading.

**A**  
**Parapet and other high level ornamental features** (including cornices and chimneys), if unbraced, can become fall hazards, with a risk of crushing pedestrians and blocking entry points in and out of the building.

**B**  
**Unreinforced walls**, where out-of-plane wall failure is likely, pose a significant risk to passing pedestrians, as these walls typically fall outward (rather than inwards).

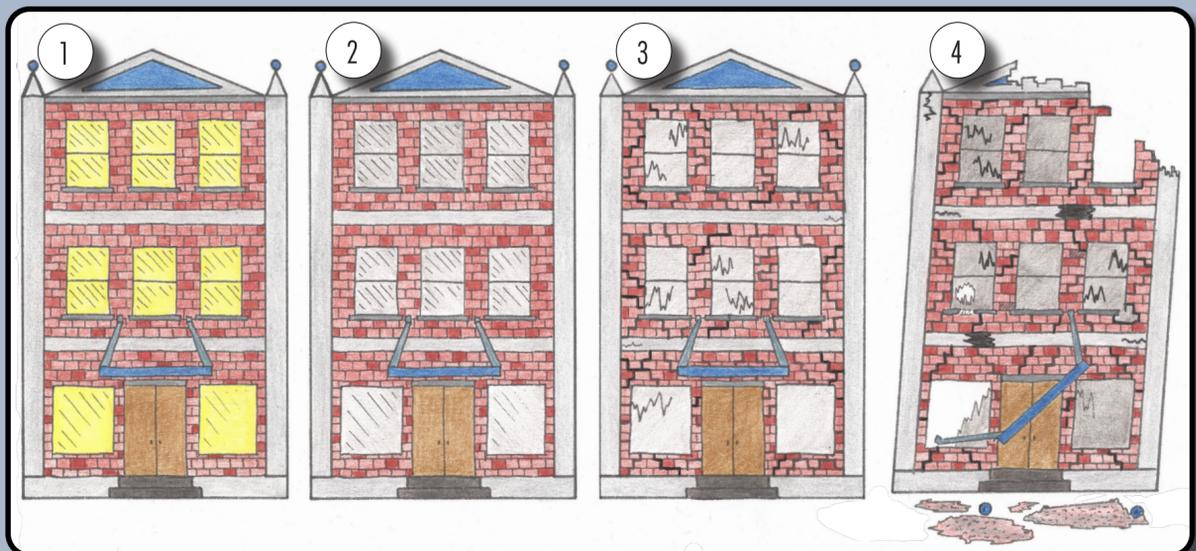
**C**  
**Lower-level awnings and signage** are also fall hazards and possible egress impediments, should they fall and block doorways.

**D**  
**Soft/weak storeys**, where lateral (horizontal) strength is significantly less than the storey/storeys above. Reinforcement and strengthening are highly recommended to avoid collapse in a seismic event.

## WHY UPGRADE

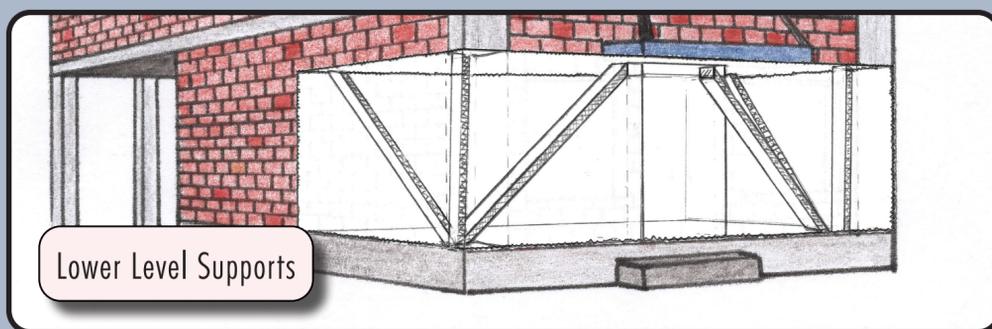
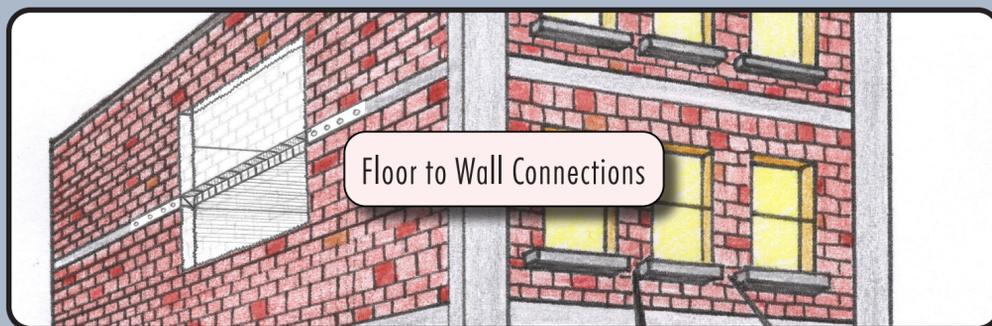
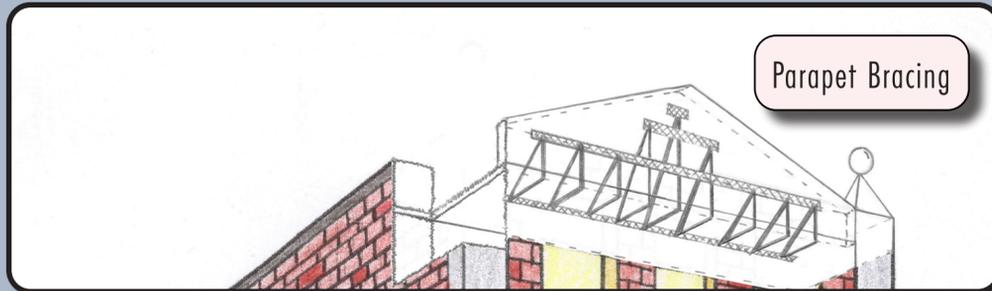
When considering seismic upgrading options, know what the objective of the work is and the desired performance level in the event of an earthquake. For example, is the building to be:

- 1) Fully operational with minimal impact to the building?
- 2) Safe for immediate occupancy, following clean up and repair?
- 3) Safe during the event, but possibly not afterwards?
- 4) Standing, but only barely? Any other damage is acceptable.



# UPGRADE OPTIONS

Every building (whether a heritage one or not) needs strong connections to withstand the seismic forces of an earthquake. Areas that can be stabilised include (but are not limited to):



# WHERE TO BEGIN

- 1) **Assemble** an **inter-disciplinary team** with individuals experienced with seismic upgrading and heritage conservation.
- 2) **Assess** the **seismic risk** of the building to **identify structural deficiencies** and **potential non-structural vulnerabilities** (such as chimneys, cornices, exterior cladding, interior partitions, parapets and signage).
- 3) **Identify inherent strengths** of the building and **articulate** its heritage **significance**, including a list of its **Character Defining Elements** (CDEs) to inform its seismic rehabilitation plan.
- 4) **Determine** the **desired outcome** of the proposed upgrading (what is the objective and **performance level** desired), to inform the level of work done.
- 5) Working **with** the **inter-disciplinary team**, **outline and design** the most appropriate **seismic upgrading plan** for the building, **prior to its implementation**.
- 6) **Follow** this **plan throughout** the **upgrading process** to guide the rehabilitation work.

Key Points: 1) There is **no one-size-fits-all solution**; 2) If funding is limited, **top priority** should be **securing fall hazards**; 3) **Get clarity** on the seismic upgrading performance level; 4) Whenever possible, **upgrading** work should **not impact** the building's **Character Defining Elements** (CDEs) and should **dictate where interventions do not go**; 5) **Creative solutions** can be found to **protect CDEs** while also achieving the desired level of seismic upgrading.

# CALL TO ACTION

Many heritage buildings in BC are at great risk of damage, or even collapse, in the next large earthquake. This is particularly worrisome considering the varied uses of these buildings, such as galleries, homes, offices, restaurants, schools, shops and more. Although the cost of seismic upgrading is high, the environmental and financial cost of wholesale replacing these buildings after an earthquake is greater than the cost of preventative investment.

It is crucial that British Columbia takes a more proactive approach to protecting its historic streetscapes and the lives within them. The potential loss of lives, livelihoods and fabric are too high to not do more, while there is still time.

For more information, including funding opportunities and additional resources, please see the larger report: **Seismic Risk and British Columbia's Historic Streetscapes**.



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