Alterations to Existing Buildings Project

Seismic Risk Reduction for Buildings: A Conversation about Options and Action

September 15, 2020

BRITISH COLUMBIA | Office of Housing and Construction Standards

AEB
Current BCBC Context:

✓**Over 70%** of the buildings that will existing in 2030 are already built, many before modern standards.

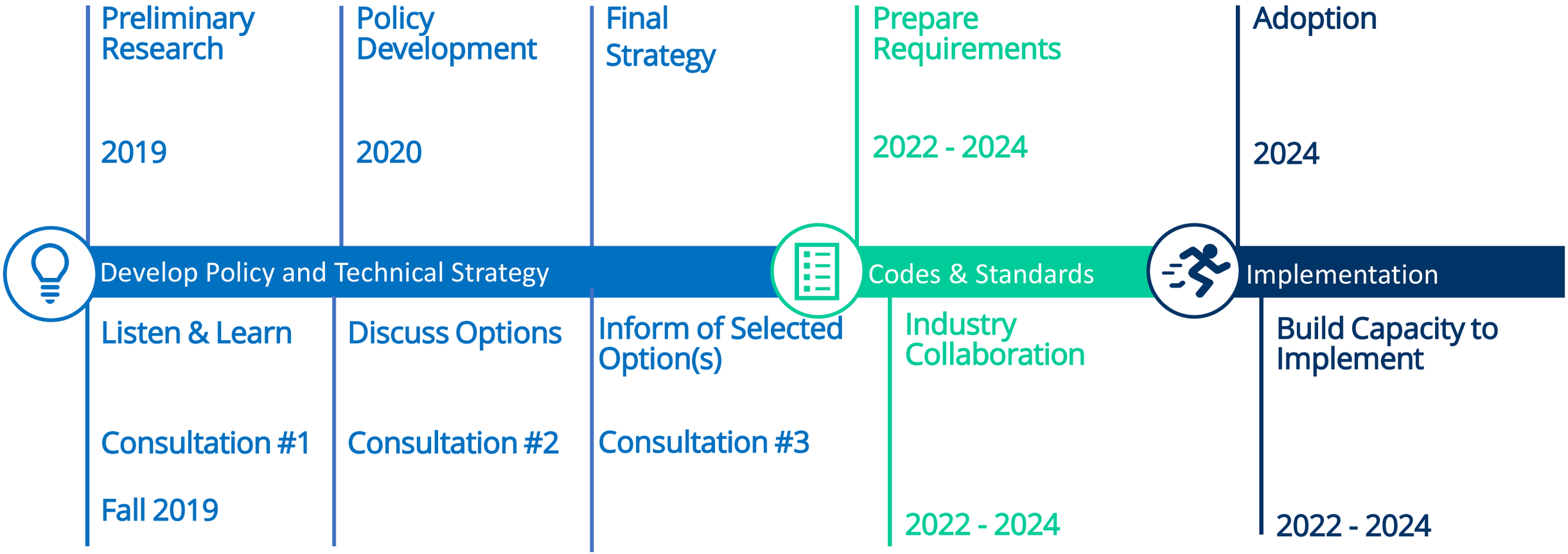
✓**BC Building Code**
- ✓Intended for New Construction
- ✓At Time of Construction

✓**BCBC on Existing Buildings:**
- ✓Not Primarily Intended for EB
- ✓Unclear and Inconsistently Used

AEB Project Objectives:

- ✓ **Existing Building Code 2024**
  - ✓ **Energy**
  - ✓ **Water**
- ✓ **Resiliency**
  - ✓ **Climate**
  - ✓ **Seismic**
- ✓ **Legacy Issues**
  - ✓ **Clarity**
  - ✓ **Consistency**

AEB Project Timeline



Fall 2019 Consultation

Key Themes Summary

Code Requirements

- ✓ Clarity / Consistency
- ✓ Practicality / Flexibility
- ✓ Achieves Objectives

Implementation

- ✓ Advanced Notice
- ✓ Phased Approach
- ✓ Capacity Building

Incentives / Financing

- ✓ Coordinated
- ✓ Relevant
- ✓ Simple

Seismic Retrofit Guidelines Expansion Project

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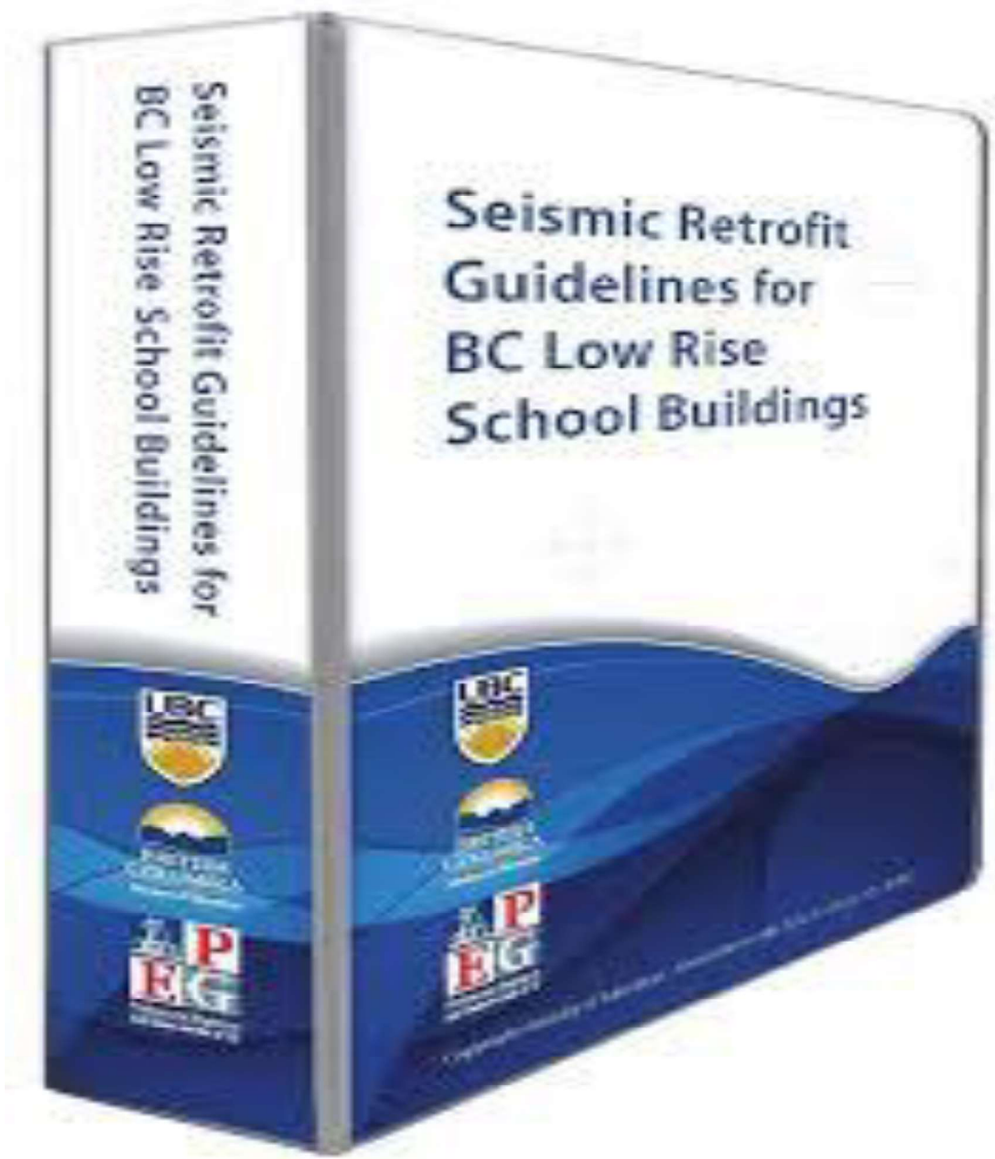
Seismic Retrofit Guidelines

- ✓Developed by EGBC for Ministry of Education's SSRP.
- ✓Received National/International Recognition.

- ✓Codifiable for use in BCBC.
- ✓Scalable for use in NBC, or elsewhere in Canada.



SRG Expansion Project:

Scope: Develop technical requirements to address high-risk low-rise and mid-rise existing buildings in BC's high-hazard communities.

Phase 1 – Low-Rise (2020-2021):

- ✓ Expand SRG Tools for 43 Low-Rise (1-3 Story) Building Prototypes
- ✓ Expected Completion: April 2021
- ✓ Project Partners: NRC, NRCan, EGBC

Phase 2 – Mid-Rise (2021-2022):

- ✓ Expand SRG Tools for Mid-Rise (4-8 Story) Building Prototypes
- ✓ Phase 2 not yet confirmed.

3 Step Assessment Process:

Step #1: Seismic Risk Assessment (SRA)

-Determines Risk Level

-Requires onsite/building access/construction drawings

Step #2: Seismic Project Identification Report (SPIR)

-Determines Construction Only Scope and Budget

-Requires soil testing/destructive testing

Step #3: Project Definition Report (PDA)

-Determines Comprehensive Project Scope and Budget

Seismic Performance Analyzer Tool:

Produces a Probability of Drift Exceedance (PDE)* value.

Produces a Retrofit Priority Ranking

Uses 6 Variables:

- ✓ Community (seismic hazard values)
- ✓ Soil Vs30 (avg shear wave velocity in the top 30m of soil/rock)
- ✓ Building Prototype
- ✓ Factored Resistance (as percent of total seismic weight above a location)
- ✓ Story Height
- ✓ Drift Limit (min Yield Drift to max Collapse (prevention) Drift Limit (CDL).

*PDE is the percent probability that the governing drift limit will be exceeded over 50 years for all levels of shaking and for all types of earthquakes).

Risk Levels and Retrofit Priority Ranking:

Risk	Maximum PDE	Definition
High 1 (H1)	**> 10 %**	**Most vulnerable structure**; at highest risk of widespread damage or structural failure; not repairable after event
High 2 (H2)	**7% to 10 %**	**Vulnerable structure;** at high risk of widespread damage or structural failure; likely not repairable after event
High 3 (H3)	**5% to 7 %**	Isolated **failure of building elements** such as walls are expected; building likely not repairable after event
Medium (M)	**2% to 5 %**	Isolated **damage to building elements** is expected; non-structural elements (bookshelves, lighting, etc.) are at risk of failure
Low (L)	**< 2 %**	**Least vulnerable structure**; would experience isolated damage and would likely be repairable after an event

Seismic Performance Levels:

Currently, school retrofits are designed to achieve one of two performance levels:

1. Collapse Prevention
2. Safe Shelter (gymnasiums)

The SRG Expansion Project may develop additional levels of resilience.

Thank You

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