Oregon’s SEISMIC REHABILITATION GRANT PROGRAM

Key Steps
for Successful Applications

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KEY STEPS FOR SUCCESSFUL APPLICATIONS

Step 1

The first step for a Seismic Rehabilitation Grant Program (SRGP) application is to read all of the SRGP guidance and materials to thoroughly understand what is required for a grant application. If you have any questions, contact the Oregon Business Development Department (OBDD) staff to get answers to all of your questions.

Step 2

Review your District's inventory of buildings to identify the schools or particular buildings that are likely good candidates for seismic retrofits. Key factors in this preliminary screening are:

1. The importance of a given school or building for your District.

2. Buildings that have been already identified as having substantial seismic vulnerabilities by detailed studies, or ASCE 31-03 or ASCE 41-13 screening. Screening by FEMA's Rapid Visual Screening is useful, but not as accurate as more detailed studies or the ASCE screening methods.

3. In general, older buildings are most likely to have been designed with minimal consideration of seismic forces or to levels of seismic design much lower than recent or current building codes. See: the table on the next page.

4. Structural system of the buildings. Non-ductile building types often have greater seismic vulnerabilities than more ductile building types. Examples of non-ductile building types are URMs, pre-cast concrete buildings, reinforced masonry buildings, concrete moment frame buildings and steel or concrete moment frame buildings with masonry infill. Examples of more ductile building types are wood frame buildings and steel frame buildings.

5. Site Conditions. Buildings on firm soil sites (Site Class D per the International Building Code) and especially buildings on soft soil sites (Site Class E) are subject to amplification of earthquake ground motion and thus may have greater seismic vulnerability than similar buildings on rock sites.

6. Buildings with significant vertical or horizontal irregularities, as defined by FEMA's Rapid Visual Screening (RVS) method. FEMA's RVS 3rd Edition adds a distinction between moderate and severe vertical irregularities.

7. Consultation with a structural engineer is recommended during the preliminary screening to identify possible candidates for SRGP grant applications.

The Oregon BCA Tool uses the time history of the seismic provisions of building codes in Oregon to estimate the seismic fragility curves both before and after mitigation. These fragility curves are used to estimate damages and casualties and thus are very important for the benefit-cost analyses.

Pre-Mitigation Seismic Fragility Curves for Typical Buildings

Oregon Year Built		Location in Oregon		
Start Year	Last Year	Eastern Oregon	Western Oregon	Coastal Oregon
Pre-1976	1976	Pre[1]	Pre[1]	Pre[1]
1977	1991	Low	Low	Low
1992	1994	Moderate	Moderate	Moderate
1995	2000	Moderate	(High + Moderate)/2	(High + Moderate)/2
2001	present	Moderate	(High + Moderate)/2	High

[1] Building Type W1 (light wood frame) buildings designated as Low Code per HAZUS.

The colors in the above table represent – in very general terms – the likelihood that seismic retrofits for buildings may be desirable.

- Seismic retrofits are most likely to be desirable for buildings in the red and orange shaded cells because these buildings were built to substantially lower seismic design provisions than current building codes.

- Seismic retrofits are less likely to be desirable for buildings in the yellow shaded cells because these buildings were built to somewhat lower seismic design provisions than current building codes.

- Retrofits for buildings in the green shaded cells are unlikely to be necessary because these buildings were built to seismic design provisions similar to the current building code.

The above statements are only generalizations and it is important to recognize that the seismic vulnerability of buildings depends very strongly on each building's design, construction and condition. The Oregon BCA Tool also makes further adjustments to the above HAZUS-based fragility curves based on the identification of moderate or severe vertical irregularities and/or horizontal irregularities.

For further details of the basis of the above table and the counties and/or longitudes to which the designations of Eastern, Western or Coastal Oregon are applied see the Appendix at the end of this document.

Step 3

The generalized priorities for seismic retrofits summarized above are subject to several important caveats. There are conditions where an otherwise high priority seismic retrofit may not be desirable, including:

1. The cost of the retrofit is a very high percentage of or even more than the cost of a new building. This situation may occur with buildings such as URMs that have profound vulnerabilities.

2. A building is in poor condition (separate from seismic issues) or functionally obsolete vis-à-vis more modern buildings which may make the combined cost of seismic and non-seismic upgrades a very high percentage of or even more than the cost of a new building

3. The building site has a high or very high liquefaction potential. The cost to adequately protect the building from liquefaction-induced settlement or lateral spreading may be prohibitively expensive.

4. A building is located with a high hazard area other than earthquakes, such as flood, tsunami or landslides or anthropogenic hazards such as close proximity to a major hazmat site.

    a. The SRGP cannot fund retrofits for buildings within Oregon’s regulatory tsunami inundation zones. Retrofits for buildings just outside of the regulatory tsunami zones, but within projected inundation zones for major tsunamis are also poor candidates for seismic retrofits.

    b. For buildings in FEMA-mapped 100-year floodplain a major seismic retrofit may also trigger mandatory flood retrofit, which would likely make the cost of the total retrofits prohibitively expensive. Even if a flood retrofit is not mandated, a seismic retrofit for flood-prone building generally doesn’t make sense.

5. The projected useful life of the building is short because the building is scheduled to be replaced with a new building or simply abandoned because of declining enrollment or changes in population distribution within a district.

8. When one or more of the above conditions apply, the alternative of building a new building in lieu of a seismic retrofit may be the preferred solution.

9. In combination, Steps 1, 2 and 3 outlined above will help to provide an initial list of buildings that are potential high priority targets for seismic retrofits and possible SRGP grant applications.

Step 4

1. The next step is to identify a small number of schools or individual buildings that are the District's highest priority for seismic retrofits and SRGP grant applications, in consultation with an engineer experienced in seismic retrofits.

2. Consultation with an engineer will enable the District to narrow the list of potential targets for SRGP grant applications by identifying the schools or specific buildings for which seismic evaluations using the ASCE 41-13 Tier I evaluation methodology are the highest priority.

3. It is not necessary to complete ASCE 41-13 evaluations for all or even many of a District's buildings. Rather, the purpose of the initial steps outlined above is to narrow the focus to a small number of buildings from which the buildings for which grant applications to the SRGP will be selected by the District.

4. The completed ASCE 41-13 Tier 1 evaluations identify the structural elements and key nonstructural elements that are seismically-deficient vis-à-vis the current seismic design provisions in the building code. This is the first step in the process of developing the scope of work for a retrofit proposal to be submitted to the SRGP.

Step 5

1. The next step is complete an engineering analysis. You MUST use the ASCE 41-13 evaluation method either Tier I or Tier II, except increase the levels of earthquake ground motion to not less than 75% of the ground motion used for design of new buildings (per the IBC); instead of the 20% in 50 year ground motion used in the 41-13. Clearly document the findings. A robust engineering report is essential for a successful SRGP application and should include:

2. A narrative clearly identifying the significant structural <u>and</u> non-structural seismic deficiencies for each of the buildings or building-parts for which seismic retrofits are proposed

3. Each building or building discussed <u>must</u> be identified by the Building Part designations (A, B, C….) used in the Oregon BCA Tool. For example, if the gymnasium is Building Part D, then this building should be identified throughout the engineer report and the engineering cost estimate as Building Part D – Gymnasium. The best way to identify building parts is by a drawing, sketch of photograph clearly identifying the building parts by year built, name (or function) <u>and</u> by corresponding Building Parts (A,B,C..etc).

4. Provide a clear scope of work for each building part included in the proposed retrofit, including the Performance Level (Life Safety or Immediate Occupancy) and the specific structural and nonstructural measures necessary to meet these performance targets. If no nonstructural measures are necessary, explicitly state so.

5. Sketches or red-line markups of as-built drawings to clearly identify where the proposed retrofit measures are necessary are recommended because this helps reviewers better understand each proposed retrofit.

6. If any of the identified seismic deficiencies are not included in the proposed retrofit, a narrative justifying the exclusion(s) must be provided. The narrative must explain why the element(s) is/are excluded and how the proposed retrofit without the excluded element (s) still meets the SRGP's mandatory performance levels of Life Safety or Immediate Occupancy.

Step 6

1. The engineering cost estimate must clearly document the anticipated costs for the proposed structural and nonstructural retrofit measures. Good elements for a credible, easy-to-understand cost estimate include:

2. Provide cost estimates itemized for each building or building part included in the proposed retrofit, as well as the total for the entire retrofit.

3. For major retrofit elements, provide quantities and unit costs whenever practicable, rather than just lump sums.

4. Lump sum estimates are fine for minor items.

5. Include all necessary soft costs such as final design, permits, insurance, inspection, construction management etc.

6. Provide explanations for any costs that may be seen as "unusual."

7. If the total retrofit cost exceeds the SRGP grant limit of $1,500,000 clearly identify the source of District funds available to cover the costs above the SRGP grant limit.

8. Districts should be aware that the cost estimates submitted for the SRGP grant application are preliminary and subject to change when

    a. Final designs are completed or

    b. Unexpected complications are found when initial demolition as part of the retrofit uncovers additional deficiencies.

9. The cost estimates must be reasonable for the proposed seismic retrofit. For example, cost estimates that are just very slightly under $1,500,000 may be deemed questionable. "Squeezing" cost estimates to be under the grant limit or for any other reason may result in loss of an awarded grant, if the actual costs upon final design are significantly higher and a District lacks other funds to coverage the cost overrun beyond the grant amount.

Step 7

Complete the SRGP Application and provide all required supplemental documentation, including the complete benefit-cost analysis. Suggestions:

1. As with any grant application, read or re-read all of the SRGP guidance materials <u>before</u> starting your application. If you have any questions, contact the OBDD staff to get answers to all of your questions before starting your application.

2. For the benefit-cost part of the applications, the suggestions for success are:

    a. Read the Benefit-Cost Analysis user guide <u>before</u> starting to complete the BCA. If you have any questions, contact the OBDD staff to get answers to all of your questions before starting to complete the BCA.

    b. The technical parts of the BCA are probably best completed by the engineers who have done the 41-13 evaluations, developed the seismic retrofit concept and the engineering cost estimate.

    c. The OR BCA Tool has been updated from the 2014 version used for last year's SRGP program, including the following changes that are designed to help applicants to avoid common errors and to provide more complete documentation of the data entered into the OR BCA Tool:

        i. References to specific pages in the User Guide for most of the data inputs into the BCA.

        ii. Addition of documentation tables on each of the building part pages. Applicants <u>must</u> document the source of data inputs that differ from the default values built into the OR BCA Tool.

        iii. Addition of pink-shaded "caution" text boxes with suggestions for how to avoid common errors or pitfalls made by many applicants for last year's SRGP grants.

    d. Other updates from the 2014 version include the following:

i. Adding the option to select Immediate Occupancy as the performance target for school buildings that are designated as emergency shelters.

ii. Adding consideration of the “historic” value for some buildings.

iii. Updates of several of the “standard” values built into the OR BCA Tool, including the building and contents values, displacement costs and statistical values for injuries and deaths.

iv. Several other technical refinements, including updating the USGS seismic hazard data from the 2008 version to the 2014 version.

v. Eliminating the separate Excel file with the seismic hazard data. In the 2015 Oregon BCA Tool, the seismic hazard data have been merged into the tool. The seismic hazard data now update automatically on each of the building part pages, once the latitude, longitude and Site Class are entered.

APPENDIX

Oregon Structural Specialty Code History

Structural

Oregon Structural Specialty Code (OSSC)	
Edition	Effective date
1973 (UBC)	July 1, 1974
1976 (UBC)	March 1, 1978
1979 (UBC)	July 1, 1980
1982 (UBC)	August 1, 1983
1985 (UBC)	July 1, 1986
1988 (UBC)	January 1, 1990
1991 (UBC)	January 1, 1993
1994 (UBC)	April 1, 1996
1997 (UBC)	October 1, 1998
1997 (UBC)	Oregon Amended 1998, 4/99, 10/99, 4/00, 10/00, 10/01, 1/02, 10/03
2003 (IBC)	October 1, 2004

ATC-35 Seminar on New Knowledge of Earthquake Hazard In Oregon and Implications for Seismic Design Practice
Portland ♦ April 7, 2005

In later years, Oregon has adopted subsequent editions of the IBC

Oregon's Building Code History: Five Time Periods

Oregon Year Built		UBC Zone	HAZUS CODE LEVEL	Applicability	Notes
Start Year	Last Year				
0	1976	N/A	Pre-Code[1]	Oregon	1970 UBC: Oregon is Zone 1 and Zone 2, but no statewide building code and little awareness of seismic design[2]
1977[3]	1991	Zone 2	Low-Code	Oregon	1973 UBC adopted July 1, 1974. 2-year lag = 1975, 1976 (2.5 years - first code) Oregon = Zone 2 in 1973-1985 UBC Codes
1992[3]	1994	Zone 2B	Moderate Code	Oregon	Oregon = Zone 2B in 1988 UBC, adopted January 1, 1990[4] 2-year lag = 1990, 1991
1995[3]	2000	Zone 2B/3	Zone 2B: Moderate Code Zone 3: Halfway Between Moderate and High Codes	East/West	1991 UBC adopted January 1, 1993. Oregon designated western counties as Zone 3. 2-year lag = 1993, 1994
2001[3]	present	Zone 2B/3/4, IBC 2003-later	Zone 2B and 3 as above Zone 4: High Code	East/West/Coast	1997 UBC adopted October 1, 1998. Oregon added Zone 4 - Southwest Coast 2-year lag = 1999, 2000 (2 years + 3 months)

[1] Building Type W1 = Low Code per HAZUS

[2] Buildings assumed to be predominantly pre-code.

[3] 2-year lag between code adoption year and application to buildings' year built because of permits issued under preceding code.

[4] Small area near Lakeview = Zone 3, but not differentiated in BCA Tool.

The approximately two-year time lag between building code adoptions in Oregon and attribution of the new code to buildings of a given year built is based on the frequently long duration of the planning, design and construction process for public buildings. Buildings for which permits have been issued under previous building codes are generally allowed to be built under the previous codes. NOTE: more precise attribution of the appropriate HAZUS fragility curves can be made if the Code Year for the design of a given building is known.

Counties designated by Oregon as Zone 3 or Zone 4 with adoption of the 1991 and 1997 UBCs are show below.

Zone 3 Counties 1991 UBC		Zone 4 Counties 1997 UBC
Clackamas	Lincoln	Curry
Clatsop	Linn	Coos
Columbia	Lane	Douglas - part
Coos	Marion	Lane - part
Curry	Multnomah	Lincoln - part
Douglas	Polk	
Hood River	Tillamook	
Jackson	Washington	
Josephine	Yamhill	

The Oregon BCA Tool defines Eastern and Western Oregon by county as follows:

Designation of Counties as Western or Eastern Oregon

County	Location	County	Location
Lake	East	Baker	East
Lane	West	Benton	West
Lincoln	West	Clackamas	West
Linn	West	Clatsop	West
Malheur	East	Columbia	West
Marion	West	Coos	West
Morrow	East	Crook	East
Multnomah	West	Curry	West
Polk	West	Deschutes	East
Sherman	East	Douglas	West
Tillamook	West	Gilliam	East
Umatilla	East	Grant	East
Union	East	Harney	East
Wallowa	East	Hood	West
Wasco	East	Jackson	West
Washington	West	Jefferson	East
Wheeler	East	Josephine	West
Yamhill	West	Klamath	West

Coastal Oregon is defined as locations with longitudes at or west of 123.5º.