Oregon's SEISMIC REHABILITATION GRANT PROGRAM

Guidance for
Engineering Reports

September 2017

PREFACE

The completeness and clarity of the engineering reports directly affects the viability of grant applications. An engineering report must clearly document that the proposed seismic retrofit fully meets the seismic performance requirements for the grant. A grant cannot be awarded if the engineering report fails to document that the proposed seismic retrofit meets the grant program's requirements.

The quality of the engineering reports submitted in previous rounds of the Oregon Seismic Rehabilitation Grant Program (SRGP) varied markedly. Some engineering reports were complete, robust and clear. Other engineering reports were acceptable but significantly less clear so that reviewers had some difficulty in verifying that the grant program's requirements were met. Unfortunately, some engineering reports simply failed to document eligibility for the SRGP.

The guidance in this memo is intended to help engineering firms improve the content of their engineering reports to ensure that they clearly document that the proposed seismic retrofits are eligible for grant funding. Simply put, better engineering reports improve the likelihood of grant awards.

The most common major shortcomings in previously submitted engineering reports were:

- Failure to clearly document that the proposed seismic retrofit measures addressed all of the seismic deficiencies identified in the ASCE 41-13 evaluation, and
- Failure to clearly document that all of the proposed seismic retrofit measures were included in the engineering cost estimate.

Other common major shortcomings included:

- Failure to clearly identify which building parts were included in the proposed seismic retrofit,
- Failure to clearly identify which proposed retrofit measures applied to which building parts,
- Omission of retrofits for nonstructural seismic deficiencies that pose life safety risks, and
- Failure to identify which building parts have had previous partial seismic retrofits.

This memo provides guidance and templates to help engineering firms improve the completeness and clarity of the engineering reports and to help expedite the review process.

OVERVIEW

The first two numbered sections below include mandatory information to include on the cover page and second page of the engineering report.

1. Engineering Report Cover Page

Include the following information on the cover page:

- District name, school name and school address
- Engineering firm name, address and telephone number
- Names of engineer(s) who prepared the report and e-mail address(es) for communications during review of the application

2. Project Summary Page

Include the table below, with project-specific information, on the second page of the engineering report. **The table below is an editable Word Table and that can be edited to be project specific, copied and pasted into the engineering report.**

Project Summary Template (Mandatory):

Project Summary Information						
Building Part	Building Part Name	Included in Retrofit	Year Built	Building Type***	Nonstructural Retrofits Included in Scope Y/N***	Previous Seismic Retrofit Y/N*** (Year if Yes)
A	Library	Y	1955	W2	Y	N
B	Classrooms	Y	1955	W2	Y	N
C	Music Room	N	2005			
D	Gym	N	1999			
E	Classrooms	Y	1939	W2	Y	Y (1989)
*** Entries required **ONLY** for building parts included in proposed seismic retrofit						
Nonstructural deficiencies posing life safety risk **MUST** be included in the scope of work and budget.						
Seismic fragility inputs for existing buildings with previous seismic retrofits **MUST** be adjusted to reflect previous seismic retrofit measures completed for a building part.						
Total Retrofit Cost	$1,456,789					
Retrofit Square Feet	15,678					
Retrofit Cost per Square Foot	$92.92					Yes/No
Is the campus within a tsunami, FEMA flood zone or other high hazard area? **If so, provide documentation.**						No

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- Note: the information about nonstructural retrofits and previous seismic retrofits is required because previous engineering reports often omitted these

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3. Clear Identification of Building Parts

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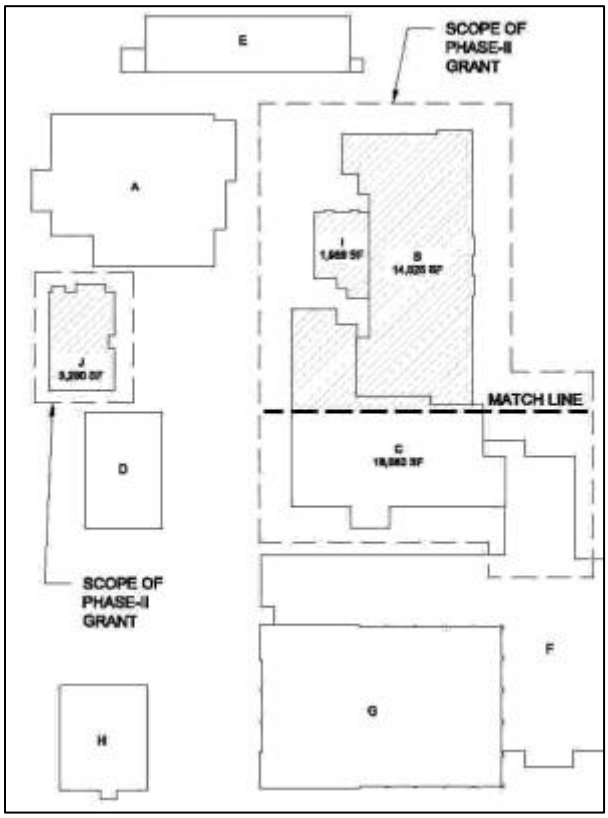
- The engineering report must clearly identify which building parts are included in the seismic retrofit and thus included in the benefit-cost analysis. This information can be provided by including an annotated drawing, sketch or photo. Examples:



Building Part Key

Proposed retrofit is for Part G, the Gymnasium

4. Narrative Summary of Identified Seismic Deficiencies

Provide a brief narrative describing the identified seismic deficiencies, including structural deficiencies and nonstructural deficiencies. For retrofits that address more than one building part, itemize for each building part. This information can be provided in several ways, including:

- A table as in the example below,
- A text narrative, or
- As part of the "mapping" between the deficiencies identified by the 41-13 evaluation, the retrofit scope of work and the cost estimate, as discussed in the following sections.

Structural Seismic Deficiencies

#	Deficiency/unknown	Description
1	Load Path	There does not appear to be sufficient blocking to tie the roof diaphragm to shear walls.
2	Shear Stress Check	Let in braced timber frame walls have an estimated shear stress of 420plf. This is less than the target value of 100plf. Therefore walls fail the shear stress check.
3	Openings	There are walls which have openings greater than 80% of the length which are insufficiently tied to adjacent construction.
4	Roof Chord Continuity	There do not appear to be sufficient tension chord elements present.
5	Diagonally sheathed and unblocked diaphragms	The gymnasium diaphragms have spans greater than 40ft. Further analysis should deem this roof acceptable.
6	Wood Sill Bolts	There was no information available regarding sill bolt spacing.

Nonstructural Seismic Deficiencies

#	Deficiency/unknown	Description
7	Hazardous Material Storage	There are hazardous materials in the Janitors closet and boiler/mechanical room that are on unbraced shelves
8	Hazardous Material Distribution	Natural Gas piping is not adequately braced to prevent damage and subsequent leakage in a seismic event.
9	Shut off Valves	Seismic shut-off valves do not appear to be installed.
10	Heavy Partitions supported by ceilings	The tops of hollow clay tile walls are not laterally braced to the roof structure.
11	Overhead Glazing	Glazing in the lobby has potential to break and create a falling hazard in a seismic event.

Note: Numbering the seismic deficiencies is essential to clearly document that all of the deficiencies are addressed in the retrofit scope of work and in the cost estimate.

5. Seismic Evaluation, Retrofit Scope and Cost Estimate

For a grant application to be credible and fundable, it is essential to document that the proposed retrofit addresses all of the identified seismic deficiencies and clearly meets the stated seismic performance objective of Life Safety or Immediate Occupancy. Applications that fail to clearly meet these requirements cannot be funded by the Seismic Rehabilitation Grant Program.

An example of a clear statement of the retrofit performance objective is given below:

> *ASCE 41-13 defines two levels of ground motions (BSE-1E and BSE-1N). The BSE-1E ground motions are lower than the BSE-1N ground motions and are intended to be used for existing buildings since they will likely have a shorter continued life span than a new building. The Seismic Rehabilitation Grant Program has placed a 25% cap on the reduction in ground motions that can be taken from the BSE-1N level.*
> *The target for rehabilitation is to achieve a Life Safety Performance Level for the 75% of BSE-1N event.*

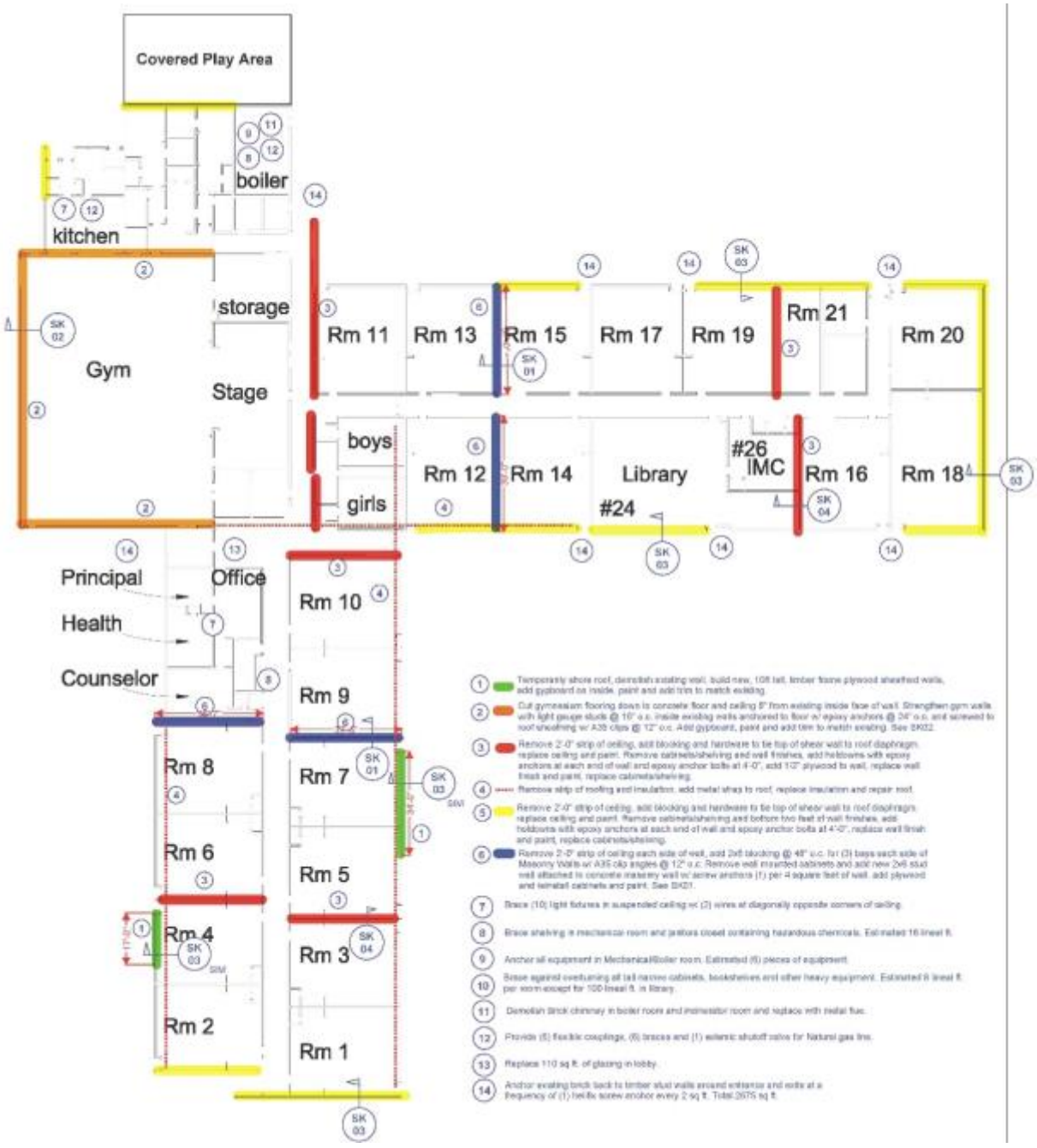
Applications must include the following three documentation elements:

- Completion of all of the ASCE 41-13 Tier 1 checklists that are applicable, including both structural and nonstructural checklists. For retrofits that include buildings with different structural systems, appropriate checklists for each applicable structural system must be included.
- Clear statements of each retrofit measure necessary to mitigate the deficiencies identified in the ASCE 41-13 Tier 1 checklists.
- An itemized construction cost estimate including construction costs and all of the necessary soft costs to complete the proposed retrofit – with documentation that the cost estimates includes the full scope of work.

Credible applications must not only contain clear documentation of the three bulleted elements above but also document the consistency and completeness between these three elements:

- The stated retrofit measures must clearly address each of the seismic deficiencies identified by the ASCE 41-13 Tier 1 checklists, and
- The engineering cost estimate must clearly include all of the stated retrofit measures.
- Engineering reports must clearly document the consistency between the ASCE 41-13 deficiencies, the scope of work elements and the cost estimate.
- Applications that do not provide adequate documentation of the consistency and completeness of the above elements will not be eligible for funding under the Seismic Rehabilitation Grant Program.
- The following figure is an example of a drawing showing where each of the proposed retrofit measures will be implemented, with references to the sketches of preliminary designs that are included in the engineering report.

Numbering the retrofit measures facilitates checking that the retrofit scope includes all of the deficiencies identified in the ASCE 41-13. This example is simply to show the concept.



- Construction cost estimates are expressed in many different ways with varying degrees of detail. The “ideal” engineering cost estimate has detailed cost estimates for each component of each retrofit element.
- An excerpt from a very detailed cost estimate is shown below:

work task # 4	470	lf				
cut & remove roofing & insulation	470	lf	2.50	1,175		
weather protect	940	sf	0.50	470		
haul & disposal	1	sum	235.00	235		
install strapping	470	lf	8.00	3,760		
roof insulation	940	sf	3.00	2,820		
roofing	940	sf	10.00	9,400		
protect / clean-up / misc. support / ladders	470	lf	6.00	2,820		
Sub-total	45,920	sf	0.45	/sf		$20,680
work task # 5 - dtl SK03	490	lf				
remove 2' ceiling	490	lf	2.75	1,348		
add new 2 x blocking	490	lf	6.25	3,063		
A35 clips @ 12" oc top & bottom	980	ea	1.50	1,470		
remove / reinstall cabinets / shelving	123	lf	35.00	4,288		
cut access holes for new sill ab @ 48" oc	123	ea	20.00	2,460		
drill @ epoxy ab @ 48" oc	123	ea	35.00	4,305		
patch holes	123	ea	30.00	3,690		
finish to match	490	lf	3.50	1,715		
reinstall ceiling	490	lf	5.00	2,450		
cleanup / protect existing	490	lf	10.00	4,900		
Sub-total	45,920	sf	0.65	/sf		$29,689

- Construction cost estimates with as much detail as above are ideal. This level of detail should be included if available. Cost estimates should always provide as much detail as possible. It is essential that the cost estimate clearly demonstrate that each of the proposed scope of work items is included.
- Less detailed cost estimates may include more lump sum estimates for low cost elements and/or aggregated costs by category (concrete, steel, wood, etc.). Such less detailed cost estimates are acceptable for Seismic Rehabilitation Grant Program applications with two caveats:
- The cost categories in the cost estimate must be identified by the number(s) of the seismic deficiencies identified in the ASCE 41-13 evaluation. For example: Wood (deficiencies: 1, 2, 3 and 7).
- The design engineer must review the engineering cost estimate and certify that:
    - All of the seismic deficiencies are included in the retrofit scope of work, and
    - All of the retrofit’s scope of work elements are included in the cost estimate.
- The certification statement above is mandatory for all engineering reports.

6. Summary

- The engineering reports are the essential foundation for credible, fundable grant applications.
- The reports should provide clear documentation of why the proposed seismic retrofit is required and why the proposed project should be a high priority for SRGP funding.
- Key elements for every engineering report include:

1. Document all of the structural and life-safety nonstructural seismic deficiencies by including all of the applicable ASCE 41-13 checklists.
2. Provide a clear, numbered narrative summary of each identified noncompliant element.
3. Provide clear documentation of the proposed retrofit, including drawings or sketches and narratives numbered to identify which retrofit measures address which identified seismic deficiencies.
4. Provide an as detailed as possible construction cost estimate, clearly annotated to identify which numbered retrofit measures are included in which cost estimate line items.
5. Include a statement by the design engineer certifying that the retrofit scope of work addresses all of the identified seismic deficiencies and that the cost estimate includes all of the retrofit measures.
6. Provide narratives explaining any aspects of the proposed retrofit project that appear “unusual” such as costs per square foot that are unusually high or unusually low, unusual building characteristics that require non-typical retrofit measures, or any other aspects of the proposed project that, absent explanations, might appear to reviewers to be “out of bounds” of credibility.