

Seismic Safety Program: Partial Credit

Examples:

The following are examples of retrofit items that are potentially eligible for partial credit toward seismic compliance, organized by construction type and estimated credit range. The list is not intended to be comprehensive. Any questions regarding eligibility and the applicability of credits should be directed to the UCSeismicProgram@ucop.edu.

Wood

- Higher partial credit
 - Cripple wall strengthening
 - Soft/weak story strengthening
 - Plywood roof strengthening and roof-to-wall tension and shear ties, such as part of a roofing replacement
 - Hillside foundation strengthening
- Lower partial credit
 - Added sill bolts and/or hold-downs without associated cripple wall strengthening
- *Disqualifying RESIDUAL features for Va rating*
 - Weak story
 - Unbalanced or non-redundant lateral system layout
 - Lateral strength < 50% of code

Unreinforced Masonry (URM)

- Higher partial credit
 - Removal of falling hazards, including parapets and exterior ornamental features
 - Installation of roof-to-wall anchors
 - Installation of roof-to-wall shear anchors
 - Installation of roof diaphragm sheathing
- Lower partial credit
 - Correcting URM material conditions (degradation, mortar joints, etc.)
- *Disqualifying RESIDUAL features for Va rating*
 - Inadequate roof/floor diaphragm to wall anchors
 - Excessive diaphragm span

- Unbalanced or non-redundant lateral system layout
- Lateral strength < 50% of code

Steel - Moment frames

- Higher partial credit
 - Beam to column connection strengthening
 - Column splice strengthening
 - Add brace frames or other stiff lateral systems to reduce drifts
- Lower partial credit
 - Add collectors to the end of brace frames
- Disqualifying RESIDUAL features for Va rating
 - Weak story
 - Unbalanced or non-redundant lateral system layout
 - Lateral strength < 50% of code

Steel - Braced frames

- Higher partial credit
 - Strengthening the gusset plate
 - Strengthening braces
 - Adding braced frames
- Lower partial credit
 - Installation of hold-downs at the brace to the foundation
 - Strengthening beams in chevrons
 - Add collectors to the end of brace frames
- Disqualifying RESIDUAL features for Va rating
 - Weak story
 - Unbalanced or non-redundant lateral system layout
 - Lateral strength < 50% of code

Reinforced Concrete (R/C)

Note- the usage of “code” refers to current UCOP/CBC/ASCE provisions for retrofit of existing buildings.

R/C - Moment Frames with Rigid Diaphragms

- Higher partial credit
 - Eliminate or minimize asymmetrical plan layout of LRFS.

- Resolve LRFS vertically discontinuity at affected stories.
- Add moment frames or other compatible LRFS elements to reduce inter-story drift.
- Increased LRFS lateral strength to a minimum of 50% of code.
- Strengthen LRFS columns and joint regions to create a strong column/weak beam condition
- Retrofit (decouple) inter-story ramps (parking garage example)
- Lower partial credit
 - Resolve gravity element in compatibility (e.g., add redundant gravity support or increase gravity connection resiliency.)
 - Strengthen diaphragms and collectors.
 - Retrofit for stair/exitway drift compatibility
 - Resolve “captive” columns
 - Provide vertical continuity transfer columns in lateral system
- Disqualifying RESIDUAL features for Va rating
 - Weak story
 - Extreme torsional irregularity
 - Lateral strength < 50% of required by UCOP

R/C - Moment Frames with Flexible Diaphragms

- Higher partial credit
 - Add LRFS to increase redundancy and/or reduce diaphragm span.
 - Provide LRFS vertical continuity.
 - Increased LRFS lateral strength to a minimum 50% of code.
 - Reinforce wall-to-floor and/or wall-to-roof connections to meet the (acceptable percentage) code
 - Strengthen diaphragms and collectors to an acceptable % of code.
 - Add structural panel floor and/or roof sheathing
- Lower partial credit
 - Strengthen LRFS columns and joint regions to create a strong column/weak beam condition.
 - Resolve gravity element incompatibility (e.g., add redundant gravity support or increase gravity connection resiliency.)
 - Retrofit for stair/exitway drift compatibility
- Disqualifying RESIDUAL features for Va rating
 - Weak story

- Excessive diaphragm span
- Unbalanced or non-redundant lateral system layout
- Lateral strength < 50% of code

R/C - Shear Walls/Rigid Diaphragms

- Higher partial credit
 - Eliminate or minimize asymmetrical plan layout of LRFS.
 - Resolve LRFS vertically discontinuity at affected stories.
 - Increase wall shear strength to a minimum 50% of code
- Lower partial credit
 - Create independent gravity columns near wall boundaries
 - Resolve punching shear in flat plate floors
 - Retrofit for stair/exitway drift compatibility
 - Strengthen diaphragms and collectors.
- Disqualifying RESIDUAL features for Va rating
 - Extreme weak story
 - Unbalanced or non-redundant lateral system layout
 - Wall lateral strength < 50% of code

R/C - Shear Walls/Flexible Diaphragms

- Higher partial credit
 - Add LRFS to increase redundancy and/or reduce diaphragm span.
 - Provide wall vertical continuity.
 - Increased LRFS lateral strength to a minimum 50% of code.
 - Reinforce wall-to-floor and/or wall-to-roof connections to meet the acceptable percentage of code
 - Strengthen diaphragms and collectors to an acceptable percentage of code.
- Lower partial credit
 - Resolve gravity element incompatibility (e.g., add redundant gravity support or increase gravity connection resiliency.)
 - Retrofit for stair/exitway drift compatibility
- Disqualifying features for Va rating
 - Extreme weak story
 - Unbalanced or non-redundant lateral wall layout
 - Wall lateral strength < 50% of code
 - Non-structural diaphragm (gypsum, tectum, etc.)

- Wall to floor/roof connections lacking (or “inadequate”)
- Diaphragm/collectors/crossties lacking (or “inadequate”)

R/C - Tilt-Up Buildings - Low-Rise/Primarily Single Story with Flexible Diaphragms

- *Higher partial credit*
 - Wall to floor/roof connection meets the acceptable percentage of code
 - Strengthen diaphragm/collectors/crossties meet the acceptable % of code
 - Stiffen diaphragm to protect bearing walls from excessive drift.
- *Lower partial credit*
 - Retrofit gravity columns to provide compatibility with diaphragm drift
 - Increase wall shear strength minimum 50% of code
- Disqualifying features for Va rating
 - Unbalanced or non-redundant lateral wall layout
 - Wall lateral strength < 50% of code
 - Non-structural diaphragm (gypsum, tectum, etc.)
 - Wall to floor/roof connections lacking (or “inadequate”)
 - Diaphragm/collectors/crossties lacking (or “inadequate”)

Reinforced Masonry (RGBM and CMU) with Rigid Diaphragms

- Higher partial credit
 - Solid-grouted cells (CMU)
 - Wall shear strength minimum 50% of code
 - Symmetrical/redundant wall layout
 - Wall to floor/roof connection meet (acceptable %) code
 - Diagonal or plywood floor/roof sheathing
- Lower partial credit
 - Gravity column compatibility with diaphragm drifts
 - Diaphragm/collectors/crossties meet (acceptable %) code
 - Disqualifying features for Va rating
 - Unbalanced or non-redundant lateral wall layout
 - Partially grouted walls
 - Wall lateral strength < 50% of code
 - Non-structural diaphragm (gypsum, tectum, etc.)
 - Wall to floor/roof connections lacking (or “inadequate”)
 - Diaphragm/collectors/crossties lacking (or “inadequate”)