

# STRUCTURAL ENGINEERS ASSOCIATION OF OREGON

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Structural Engineers Association of Oregon  
Seismic Committee

Re: Residential Seismic Strengthening of Wood-Frame Dwellings  
Committee Statement Recommending Adoption of FEMA DR-4193-RA2

To whom it may concern:

On behalf of the Seismic Committee of the Structural Engineers Association of Oregon I am writing this committee statement recommending the adoption of FEMA DR-4193-RA2 *Earthquake Strengthening of Cripple Walls in Wood-Frame Dwellings* to replace existing prescriptive methods for residential seismic strengthening. A full list of members supporting this committee statement, as well as the one opposing, can be found at the bottom of this letter.

For background, existing prescriptive methods (i.e., procedures which do not require engineering analysis) are available for residential seismic strengthening in the State of Oregon, depending on jurisdiction. The most widely used prescriptive method is currently provided by the City of Portland Bureau of Development Services and can be found at <https://www.portlandoregon.gov/bds/53562>. To date, this prescriptive method has been used by contractors and homeowners for voluntary seismic strengthening. While they have served an important purpose, it is time for the City of Portland's and other jurisdictions' existing prescriptive methods to be replaced by the improved, standardized procedure available in FEMA DR-4193-RA2 *Earthquake Strengthening of Cripple Walls in Wood-Frame Dwellings*.

The procedure contained in FEMA DR-4193-RA2, hereafter simply referred to as the FEMA plan set, was motivated by the damage to cripple walls in wood-frame residential buildings during the South Napa Earthquake of August 2014. The FEMA plan set can be found at <https://www.fema.gov/media-library-data/1439242021425-3b4c44f900c8893449327f0e764ef849/FEMAP-1024RA2.pdf>. The FEMA plan set represents a technically robust, tailorable and straightforward approach to cripple wall and anchor bolt strengthening. Similar to existing prescriptive methods, it is intended for use by non-engineers (e.g., homeowners, contractors, etc.). However, unlike existing prescriptive methods, it has a strong, documented technical basis and allows for the use of an extensive array of connections and existing details. For these reasons, we recommend the adoption of the FEMA plan set and phasing out of the existing prescriptive methods.

In reviewing the FEMA plan set, we agreed that several points required clarification prior to adoption by an Authority Having Jurisdiction. These include:

1. *Waiving Special Inspection* – Special inspection of post-installed anchors and other hardware, as often required by ICC-ESR reports, should not be required for designs utilizing the FEMA plan set. The reasoning behind waiving special inspection is that it would be cost prohibitive to require it for the scale of projects typically employing the FEMA plan set. Note that this waiver recommendation should not be construed as referring to inspection provided by the Authority Having Jurisdiction nor to the testing required for tie-downs in the FEMA plan set.

2. *Equivalent Anchors* – Although the FEMA plan set provides for the use of an extensive list of proprietary and non-proprietary connectors, we recommend that connectors not listed be permitted so long as they can be shown to be equivalent to a connector included in the FEMA plan set. This would allow connectors which come on the market in the future to be integrated into the FEMA plan set.
3. *Eligibility for Use Clarifications* – Item #1 on “Eligibility for Use” on Sheet S0 of the FEMA plan set, should also include townhouses in addition to duplexes and single family residences. Item #2 should clarify that the home must be two stories or less except that the basement story need not be counted so long as it is below ground on all sides. Item #6 should be revised to permit wood-frame dwellings with one story basements in addition to those with crawlspaces.
4. *Site Seismicity* – It should be recognized that the seismicity parameters (i.e.,  $S_s$  and  $S_1$ ) used to develop the FEMA plan set can be much higher than those expected in jurisdictions in the State of Oregon. See Item #11 of the “Eligibility for Use” on Sheet S0. While it may be advisable to adjust the required strengthening based on lower realized seismicity parameters, this can complicate the use of the FEMA plan set and make it more difficult for non-engineers (e.g., homeowners and contractors) to implement it.
5. *Recommendation for Post Caps* – Although not addressed in the FEMA plan set, we recommend that connections between wood posts and beams be reinforced with post caps or some other positive connection (e.g., steel tees or plywood gussets). This reduces the tendency for the beam to fall off the post during earthquake shaking and can be achieved with minimal additional cost to the homeowner when the other retrofit work is being completed.

In conclusion, the Seismic Committee of the Structural Engineers Association of Oregon believes the FEMA plan set represents the best available procedure for prescriptive seismic strengthening of wood-frame cripple walls and anchor bolts. With the clarifications and modifications listed above, the Seismic Committee recommends the adoption of the FEMA plan set as a replacement for existing prescriptive methods for jurisdictions in the State of Oregon.



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Members Supporting This Statement

Lisa Buellesbach  
Andrew Conrad  
Trevor Currie  
Adam Jongeward  
Chad Kilian  
Amit Kumar  
Eric Pfau  
Mike Poulos  
Spencer Straub  
Wade Younie

Members Opposing This Statement

James Bela