



City of Portland, Oregon
Bureau of Development Services
Plan Review / Permitting Services
FROM CONCEPT TO CONSTRUCTION

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City of Portland
Structural Advisory Board Meeting
February 18th 2015
Room 6(B) 11:00 AM to 1:00 PM

Board Members: Blake Patsy, KPFF Consulting Engineers,
Brandon Erickson, Erickson Structural Engineers,
David Nilles, JHI Engineering
BDS Staff: Amit Kumar, Eric Thomas, Emily Sandy

The Structural Advisory Board considered comments provided on the proposed changes to City of Portland's Title 24.85. The following are the comments and recommendations in response to the comments.

Comment from Jason Thompson, Catena Consulting Engineers via email on 12/8/2104

In response to the proposed changes to cap the reduction for the seismic design of existing buildings to 75% that of new buildings, I wonder if we're being too focused on *elastic design forces* being the driver in our decision-making process behind the seismic vulnerability of existing buildings. What is the return period for the 75% force? If it's 1,700 years (I'm just making this up... I have no time to actually calculate these things at the moment!), then it seems like we're overdesigning existing buildings and what really is the point in that? I understand that change is hard, but I wouldn't proceed until these types of parametrics have actually been studied so that we understand the implications. As you know, the retrofit costs associated with a 15% to 44% increase in elastic design forces (percentage increase between the referenced 52% or 65% and the proposed 75% cap) can be very sizable.

Recommendation from Structural Advisory Board :

The Structural Advisory Board (SAB) feels that the 75% cap is appropriate at this point in time. Without the cap, depending on the soil type, the existing buildings in the Portland area could see existing buildings being evaluated and retrofitted for about 50% to 60% of the force required for new buildings. That magnitude of reduction would not be appropriate or justifiable. For the 20% in 50 year event the mean return period is around 225 years. By placing the cap of 75% the return period would change to 300-400 years depending on the soil type.

Comments from Josh McDowell, Mackenzie via email on 12/22/2104

I am glad to hear that the City of updating this provision to address the new ASCE 41 standard. As I went back through the 24.85 provisions, I noticed a few other things that could use some clarification as part of this "refresh". Please see below for a detailed description:

1. 24.85.050.B: On occasion, we have been told that the 5% limit in this section could really be 10% to be in line with the OSSC 3404.4 provisions. It would be good to clarify if this is the intent, or that no, this threshold is truly to be more stringent than the OSSC.
2. 24.85.050.C: I have never fully understood how this section worked. If I read Part B right above it, a structural alteration can increase the forces in an element by 5%....but then Part C says that the structural alteration cannot reduce the capacity at all unless the capacity is that required for new buildings. Doesn't the very nature of a structural alteration decrease the seismic capacity? This doesn't seem to be how the City is interpreting these provisions either, it just seems confusing. OSSC Chapter 34 seems to address this more clearly.
3. 24.85.051.B: If I have a four story building with a 10,000 SF floor plate (40,000 SF net area), one could interpret the maximum mezzanine footprint to be 13,333SF, or at least as big as the floor print. Part D below would require that I look at 24.85.050, which of course governs. How would this section ever get used to the full 1/3 limit prescribed here? Wouldn't it make sense to just say that mezzanines have to meet 24.85.050? The unsophisticated reader could become convinced that they can add a huge mezzanine when they really can't.
4. 24.85.060: Should Eco-Roofs really be excluded from the list of seismic evaluations? The weight of an eco-roof would likely trigger upgrades per 24.85.050, is it really the intent of the ordinance to not require this work to take place when an eco-roof has been added?
5. 24.85.065.B.3: Again, eco-roofs are excluded from the cost calculations. If this is the intent, additional language stating that the provisions of 24.85.050 are not enforced in this case would be good.

Recommendation from Structural Advisory Board :

Structural Advisory Board agrees with the comment for item 1 and 2 and agreed that the referenced sections be modified. Also, see response to comment from SEAO Vintage building committee (item 4) below

For item 3 : By definition in OSSC, the aggregate area of a mezzanine can not exceed 1/3rd the floor area above which it is located. The example provided would not meet the definition of a mezzanine but rather a new floor. The City recommended no change to this section. The SAB did not disagree with the City's position.

For items 4 and 5, no change to the existing provisions is recommended. The current provisions only exclude the costs associated with eco roof to be excluded from the triggers that would require a seismic upgrade or evaluation. The two sections referenced are related to cost triggers. If the weight of the eco roof triggers a seismic upgrade, then a seismic upgrade is required due to that reason but not because of costs. In addition, the costs require a full building upgrade whereas the added weight from an ecoroof may trigger only portions of the lateral system to be upgraded. These are therefore two different issues and should be kept separate. The City recommended no change to this section. The SAB did not disagree with the City's position.

Comments from Structural Engineers Association of Oregon (SEAO) Vintage Building Committee

Comment 1:

Unreinforced Concrete: Treat Unreinforced concrete as URM with same triggers as URM buildings. Unreinforced concrete is defined as one whose reinforcement is less than Reinforced Concrete

1. Vertical reinforcement of at least 0.0012 times the gross cross-sectional area of the element and at each corner or end, at each side of each opening.
2. Horizontal reinforcement of at least 0.002 times the gross cross-sectional area of the element with a maximum spacing of 120in and at the top and bottom of the load bearing walls.

Recommendation from Structural Advisory Board :

The proposal is not within the scope of the proposed update to Title 24.85 and was not considered by the Structural Advisory Board. This would be a policy change which would require consideration by a Seismic Task force. A similar proposal was rejected by the Seismic Task Force in 2004 when Title 24.85 was updated in 2004

Comment 2:

The city is proposing the following definition of BSE-1E

BSE-1E : Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Building, taken as a seismic hazard with a 20% probability of exceedance in 50 years, except that the design spectral response acceleration parameters S_x and S_{x1} for BSE-1E seismic hazard level shall not be taken as less than 75 percent of the respective design spectra response acceleration parameters obtained from BSE- 1N seismic hazard level and need not be greater than BSE-2N at a site.

SEAO proposes the following revision:

BSE-1E : Basic Safety Earthquake-1 for use with the Basic Performance Objective for Existing Building, as defined in ASCE 41 Section 2.4.1.4 except that in no case shall the design spectral response parameters be taken less than 75% of those determined for a hazard having a 10% probability of exceedance in 50 years.

The justification for this change as presented by SEAO is based on a compromise between the probabilistic thinking proposed in ASCE 41-13 and the interest by the City of Portland to avoid a large change in the ground motion considered for existing buildings. While it is acknowledged that the 0.75 factor has historically been used to give a “break” to existing buildings, the presumed intent of this factor was to convert from a probabilistic ground motion used for new buildings to a higher probability of exceedance

value appropriate for existing buildings. This is the course taken by ASCE 41-13 (i.e. it specifies different return periods for existing buildings than new buildings). The factor of 0.75 (which used to be buried in ASCE 31 but not explicitly in the ground motions) has now, in essence, become site-specific (because in ASCE 41-13 existing and new ground motions are considered probabilistically). For Oregon, this factor is less than 0.75 (due to the shape of the hazard curve) and thus the City of Portland has raised the concern that ground motions are decreasing more here than in other parts of the country (e.g. California). While there seemed to be some disagreement within the Vintage Buildings Committee as to whether a City of Portland limit on existing ground motions should be imposed at all, there was an interest in, at the very least, making the application of the limit philosophically consistent. Since the presumed intent of the City of Portland's 0.75 factor is to limit the change in demand from that previously used for evaluating existing buildings in ASCE 31, the 0.75 factor should technically be applied to the seismic hazard from that version of the standard. However, since the BSE-2 (old version of the standard) and ASCE 41-13 BSE-2N have similar probabilistic bases at a 2% exceedance in 50 years (but are not identical), there is not as great of an issue with limiting the BSE-2E to not less than $0.75 \times \text{BSE-2N}$. However, the BSE-1N is now taken as $2/3$ of the BSE-2N (rather than being directly probabilistically based) whereas the BSE-1 (old version of the standard) was set at 10% probability of exceedance in 50 years. The difference between $2/3$ of BSE-2N and the hazard corresponding to a 10% probability of exceedance in 50 years can be significant in Portland. It is therefore recommended that the change shown in the revised version of Title 24.85 be made.

Recommendation from Structural Advisory Board :

While the justification is well intended, the Structural Advisory Board feels that this adds further to complications in which the engineer has to determine yet another ground motion (10% in 50 years) in addition to 2% in 50 years and 20% in 50 years. A quick analysis of the difference between using the design acceleration parameters which are 75% of that required for new buildings and that obtained from 75% of a 10% in 50 years is minimal. SAB recommended recommend using the acceleration parameters equal to 75% of that required for new buildings.

Comment 3:

For Category III and IV buildings the City is proposing a Tier 3 analysis and retrofit under 'Definitions B and C'
SEAO proposes that this not be required.

Recommendation from Structural Advisory Board :

The Structural Advisory Board recommended that the requirement for a Tier 3 analysis be removed . The requirement for a Tier 3 analysis is built into ASCE 41 when justified based on the building type. The SAB felt that this requirement is not necessary. The City's proposal will be modified to reflect this determination.

Comment 4:

Delete section 24.85.050 (B) and 24.85.050(c) and replace with the following

Existing structural elements carrying lateral load.
Any existing lateral load-carrying structural element whose demand-capacity ratio with the addition(s) or structural alteration(s) considered is no more than 10% greater than its demand-capacity ratio with the addition(s) or structural alteration(s) ignored shall be permitted to remain unaltered. For purposes of this paragraph, comparisons of demand-capacity ratios and calculation of design lateral loads, forces, and capacities shall account for the cumulative effects of additions and structural alterations since original construction.

The justification for this change is so that this is consistent with OSSC chapter 34.

Recommendation from Structural Advisory Board :

The Structural Advisory Board recommended revising the proposal to incorporate the changes to section 24.85.050 (B) and 24.85.050(c)

Additional Revisions Recommended by Structural Advisory Board.

The Structural advisory Board recommended that section 24.85.055 be revised such that the trigger for upgrades to the lateral system for a building damaged by catastrophic events be based on the damage to the lateral elements of the building instead of on the area of the building. This will also be consistent with section 24.85.056 which addresses upgrade to lateral elements for buildings damaged by earthquake.