

CHAPTER 24.85
SEISMIC DESIGN
REQUIREMENTS FOR EXISTING
BUILDINGS

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24.85.010 Scope.

- A.** The provisions of this chapter prescribe the seismic design requirements for existing buildings undergoing changes of occupancy, additions, alterations, catastrophic damage, fire, or earthquake repair, or mandatory or voluntary seismic strengthening. The requirements of this chapter only apply to buildings for which a building permit has been applied for to change the occupancy classification, add square footage to the building, alter or repair the building.
- B.** Under the authority provided by State law, the provisions of this chapter prescribing seismic rehabilitation standards for existing buildings can be used in lieu of meeting the requirements of the current edition of the State of Oregon Structural Specialty Code.

24.85.015 Structural Design Meeting.

Upon request, BDS engineering staff is available to meet with an owners design engineer to review proposed seismic strengthening plans in a pre-design meeting. A written record of the meeting discussion and determinations will be placed in the permit record.

24.85.020 Seismic Related Definitions.

The definitions contained in this Section relate to seismic design requirements for existing buildings outlined in this Chapter.

- A. **ASCE 41** means the *Seismic Evaluation and Retrofit of Existing Buildings ASCE/SEI 41-13* published by the American Society of Civil Engineers and the Structural Engineering Institute.
- B. **ASCE 41 Evaluation** means the process of evaluating an existing building for the potential earthquake-related risk to human life posed by that building, or building component, and the documentation of that evaluation, performed and written according to the provisions of ASCE 41.

Tier 1 and Tier 2 deficiency based evaluation for both structural and non-structural components using the Basic Performance Objective for Existing buildings (BPOE) as defined in ASCE 41 shall be the performance objective for the evaluation, unless a Tier 3 evaluation is required by ASCE 41.
- C. **ASCE 41-BPOE Improvement Standard** means the Tier 1 and Tier 2 Deficiency based retrofit for both structural and non-structural components using the Basic Performance Objective for Existing buildings (BPOE) as defined in ASCE 41, unless a Tier 3 retrofit is required by ASCE 41.
- D. **ASCE 41-BPON Improvement Standard** means Tier 3 Retrofit for both structural and non-structural components using the Basic Performance Objective Equivalent to New Buildings (BPON) as defined in ASCE 41.
- E. **ATC 20** means the latest Edition of the manual on “Procedures for Post Earthquake Safety Evaluation of Buildings” published by Applied Technology Council.
- F. **BDS** means the City of Portland’s Bureau of Development Services.
- G. **BPOE** - Basic Performance Objective for Existing Buildings : A series of defined Performance Objectives based on a building’s Risk Category meant for evaluation and retrofit of existing buildings; See Table 2-1 of ASCE 41.
- H. **BPON** – Basic Performance Objective Equivalent to New Building Standards: A series of defined Performance Objectives based on a building’s Risk Category meant for evaluation and retrofit of existing buildings to achieve a level of performance commensurate with the intended performance of buildings designed to a standard for new construction ; See Table 2-2 of ASCE 41.
- I. **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.

- J. BSE-1N** : Basic Safety Earthquake-1 for use with the Basic Performance Objective Equivalent to New Buildings Standards, taken as two-thirds of the BSE-2N.
- K. BSE-2E** : Basic Safety Earthquake-2 for use with the Basic Performance Objective for Existing Building, taken as a seismic hazard with a 5% probability of exceedance in 50 years, except that the design spectral response acceleration parameters S_x s and S_x 1 for BSE-2E seismic hazard level shall not be taken as less than 75 percent of the respective design spectra response acceleration parameters obtained from BSE- 2N seismic hazard level and may not be greater than BSE-2N at a site.
- L. BSE-2N**: Basic Safety Earthquake-2 for use with the Basic Performance Objective Equivalent New Buildings Standards, taken as the ground shaking based on Risk-Targeted Maximum Considered Earthquake(MCEr) per ASCE 7 at a site.
- M. Building Addition** means an extension or increase in floor area or height of a building or structure.
- N. Building Alteration** means any change, addition or modification in construction.
- O. Catastrophic Damage** means damage to a building that causes an unsafe structural condition from fire, vehicle collision, explosion, or other events of similar nature.
- P. Essential Facility** has the same meaning as defined in the OSSC.
- Q. Fire and Life-safety for Existing Buildings (FLEx) Guide** means a code guide published by the Bureau of Development Services, outlining alternative materials and methods of construction that are allowed for existing buildings in Portland

- R. FM 41 Agreement** means a joint agreement between the Fire Bureau, the Bureau of Development Services and a building owner to schedule improvements to the building following a determination of the fire and life safety hazards posed by the existing condition of the building as provided under Oregon law.
- S. Live/Work Space** means a combination working space and dwelling unit. A live/work space includes a room or suite of rooms on one or more floors designed for and occupied by not more than one family and including adequate working space reserved for the resident's occupancy. A live/work space is individually equipped with an enclosed bathroom containing a lavatory, water closet, shower/and or bathtub and appropriate venting.
- T. Net Floor Area** means the entire area of a structurally independent building, including an occupied basement, measured from the inside of the permanent outer building walls, excluding any major vertical penetrations of the floor, such as elevator and mechanical shafts.
- U. Occupant Load** means the number of persons for which the means of egress of a building or portion thereof is designed. The occupant load shall be calculated based on occupant load factors in the table assigned to each space in the Oregon Structural Specialty Code (OSSC).
- V. Oregon Structural Specialty Code (OSSC)** means the provisions of the State of Oregon Structural Specialty Code as adopted by Section 24.10.040 A.
- W. Reinforced Masonry** means masonry having both vertical and horizontal reinforcement as follows:
1. Vertical reinforcement of at least 0.20 in² in cross-section at each corner or end, at each side of each opening, and at a maximum spacing of 4 feet throughout. One or two story buildings may have vertical reinforcing spaced at greater than 4 feet throughout provided that a rational engineering analysis is submitted which shows that existing reinforcing and spacing provides adequate resistance to all required design forces without net tension occurring in the wall.
 2. Horizontal reinforcement of at least 0.20 in² in cross-section at the top of the wall, at the top and bottom of wall openings, at structurally connected roof and floor openings, and at a maximum spacing of 10 feet throughout.
 3. The sum of the areas of horizontal and vertical reinforcement shall be at least 0.0005 times the gross cross-sectional area of the element.
 4. The minimum area of reinforcement in either direction shall not be less than 0.000175 times the gross cross-sectional area of the element.
- X. Risk Category:** A categorization of a building for determination of earthquake performance based on Oregon Structural Specialty Code (OSSC)
- Y. Roof Covering Repair or Replacement** means the installation of a new roof covering following the removal of an area of the building's roof covering exceeding 50% or more of the total roof area within the previous five year period.

- Z. Unreinforced Masonry (URM)** means adobe, burned clay, concrete or sand-lime brick, hollow clay or concrete block, hollow clay tile, rubble and cut stone and unburned clay masonry that does not satisfy the definition of reinforced masonry as defined herein. Plain unreinforced concrete shall not be considered unreinforced masonry for the purpose of this Chapter.
- AA. Unreinforced Masonry Bearing Wall** means a URM wall that provides vertical support for a floor or roof for which the total superimposed vertical load exceeds 100 pounds per lineal foot of wall.
- AB. Unreinforced Masonry Bearing Wall Building** means a building that contains at least one URM bearing wall.

24.85.030 Seismic Improvement Standards.

For changes of occupancy structural additions, building alterations and catastrophic or earthquake damage repair, the design standard shall be the current edition of the OSSC unless otherwise noted by this Chapter.

24.85.040 Change of Occupancy or Use.

The following table shall be used to classify the relative hazard of all building occupancies:

TABLE 24.85-A		
Relative Hazard Classification	OSSC Occupancy Classification	Seismic Improvement Standard
5 (Highest)	A, E, I-2, I-3, H-1, H-2, H-3, H-4, H-5	OSSC or ASCE 41-BPON
4	R-1, R-2, SR, I-1, I-4	
3	B, M	ASCE 41-BPOE
2	F-1, F-2, S-1, S-2	
1 (Lowest)	R-3, U	

- A. Occupancy Change to a Higher Relative Hazard Classification.** An occupancy change to a higher relative hazard classification will require seismic improvements based upon the factors of changes in the net floor area and the occupant load increases as indicated in Table 24.85-B below. All improvements to either the OSSC or ASCE 41 improvement standard shall be made such that the entire building conforms to the appropriate standard indicated in Table 24.85-B.

TABLE 24.85-B				
Percentage of Building Net Floor Area Changed		Occupant Load Increase	Required Improvement Standard	Relative Hazard Classification
1/3 of area or less	and	Less than 150	None	1 through 5
More than 1/3 of area	or	150 and above	ASCE 41-BPOE	1, 2, and 3
More than 1/3 of area	or	150 and above	OSSC or ASCE 41-BPON	4 and 5

Multiple occupancy changes to a single building may be made under this section without triggering a seismic upgrade provided the cumulative changes do not exceed 1/3 of the building net floor area or add more than 149 occupants with respect to the legal building occupancy as of October 1, 2004.

- B. Occupancy Change to Same or Lower Relative Hazard Classification.** An occupancy change to the same or a lower relative hazard classification or a change in use within any occupancy classification will require seismic improvements using either the OSSC or ASCE 41 improvement standard, as identified in Table 24.85-A above, where the change results in an increase in occupant load of more than 149 people as defined by the OSSC. Where seismic improvement is required, the entire building shall be improved to conform to the appropriate improvement standard identified in Table 24.85-A.

Multiple occupancy changes to a single building may be made under this section without triggering a seismic upgrade provided the cumulative changes do not result in the addition of more than 149 occupants with respect to the legal building occupancy as of October 1, 2004.

- C. Occupancy Change to Live Work Space.** Any building occupancy classified as relative hazard category 1, 2, or 3 may undergo a change of occupancy to live/work space provided that:
1. The building shall be improved such that the entire building conforms to the ASCE 41-BPOE improvement standard; and
 2. The building meets the fire and life safety standards of either the FLEEx Guide or the current OSSC.
 3. Any Unreinforced Masonry bearing wall building converted to live/work space, regardless of construction costs, shall be improved such that the entire building conforms to the ASCE 41-BPOE improvement standard.

- D. Occupancy Change to Essential Facilities.** All structures which are being converted to essential facilities, as defined in the OSSC, shall comply with current state code seismic requirements or ASCE 41-BPON improvement standard, regardless of other requirements in this section.

24.85.050 Building Additions or Structural Alterations.

An addition that is not structurally independent from an existing building shall be designed and constructed such that the entire building conforms to the seismic force resistance requirements for new buildings unless the following two conditions listed below are met. Furthermore, structural alterations to an existing building or its structural elements shall also meet the following two conditions:

- A.** The addition or structural alteration shall comply with the requirements for new buildings;
- B.** 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.

24.85.051 Mezzanine Additions.

A mezzanine addition shall not require seismic strengthening of the entire building when all of the following conditions are met:

- A.** Entire building strengthening is not required by any other provision contained in this Title;
- B.** The net floor area of the of the proposed mezzanine addition is less than 1/3 of the net floor area of the building;
- C.** The mezzanine addition does not result in an occupant load increase, as defined by the OSSC, of more than 149 people; and
- D.** Subsections A, B and C of Section 24.85.050 shall also apply to mezzanine additions.

24.85.055 Structural Systems Damaged by Catastrophic Events.

- A. Building Lateral Load Resisting system along any principal axis damaged less than or equal to 50%.**

1. If a building is damaged by a catastrophic event such that less than or equal to 50% of the lateral load resisting components along any principal axis of the building are damaged, only the damaged lateral load resisting components of the building's structural system must be designed and constructed to current provisions of the OSSC. These components must also be connected to the balance of the undamaged lateral load resisting system in conformance with current code provisions. Undamaged components need not be upgraded to current lateral load provisions of the current code, unless required by other provisions of this title.
2. New lateral system vertical elements must be compatible with any existing lateral system elements, including foundations. In multistory buildings, the engineer shall confirm that the new lateral system vertical elements do not introduce soft or weak story seismic deficiencies, as defined by ASCE 41, where they did not previously exist, or make existing conditions more hazardous.

- B. Building Lateral Load Resisting systems along any principal axis damaged more than 50%.** Where a building is damaged by a catastrophic event such that more than 50% of the lateral load resisting components along any principal axis of the building are damaged, all lateral load resisting components of the entire building's structural system along that principal axis must be designed and constructed to the current provisions of the OSSC or ASCE 41-BPON improvement standard.

24.85.056 Structural Systems Damaged by an Earthquake.

As a result of an earthquake, the Director may determine through either an ATC 20 procedure or through subsequent discovery any structure or portion thereof to be in an unsafe condition as defined by State law. As a result of making this determination, the Director may declare the structure or portion thereof to be a public nuisance and to be repaired or rehabilitation as provided in Subsections A through C below, or abated by demolition or removal in accordance with Title 29. For the purposes of this Section, an "unsafe condition" includes, but is not limited to any portion, member or appurtenance of a building that has become detached or dislodged or appears likely to fail or collapse and thereby injure persons or damage property; or any portion of a building or structure that has been damaged to the extent that the structural strength or stability of the building is substantially less than it was prior to the damaging event.

- A.** Buildings built prior to January 1, 1974 with lateral support systems that have unsafe conditions shall be repaired or improved to resist seismic forces such that the repaired lateral system conforms to the ASCE 41-BPOE improvement standard.
1. Where less than 50% of the lateral support system has been damaged, only the damaged elements must be repaired.
 2. Where 50% or more of the lateral support system has been damaged, then the entire lateral support system must be repaired to resist seismic forces such that the repaired system conforms to the ASCE 41-BPOE improvement standard.
- B.** Buildings built on or after January 1, 1974 with lateral support systems that have unsafe conditions shall be repaired or improved to resist seismic forces such that the repaired lateral system conforms to the code to which the building was originally designed, but not less than that required to conform to the ASCE 41-BPOE improvement standard.
1. Where less than 50% of the lateral support system has been damaged, only the damaged elements must be repaired.
 2. Where 50% or more of the lateral support system has been damaged, then the entire lateral support system must be repaired to resist seismic forces such that the repaired system conforms to the code to which the building was originally designed, but not less than that required to conform to the ASCE 41-BPOE improvement standard.

- C. New lateral system vertical elements must be compatible with any existing lateral system elements, including foundations. In multistory buildings, the engineer shall confirm that the new lateral system vertical elements do not introduce soft or weak story seismic deficiencies, as defined by ASCE 3141, where they did not previously exist, or make existing conditions more hazardous.

24.85.060 Required Seismic Evaluation.

When an alteration for which a building permit is required has a value (not including costs of mechanical, electrical, plumbing, permanent equipment, painting, fire extinguishing systems, site improvements, eco-roofs and finish works) of more than \$175,000, an ASCE 41 evaluation is required. This value of \$175,000 shall be modified each year after 2004 by the percent change in the R.S Means Construction Cost Index for Portland on file with the Director. A letter of intent to have an ASCE 41 evaluation performed may be submitted along with the permit application. The evaluation must be completed before any future permits will be issued. The following shall be exempted from this requirement:

- A. Buildings constructed or renovated to seismic zone 2, 2b or 3 under a permit issued after January 1, 1974.
- B. Detached One-and two-family dwellings and their accessory structures.
- C. Single story, light frame metal and light frame wood buildings, not more than 20 feet in height from the top surface of the lowest floor to the highest interior overhead finish and ground area of 4,000 square feet or less.

A previously prepared seismic study may be submitted for consideration by the Director as equivalent to an ASCE 41 evaluation.

24.85.065 Seismic Strengthening of Unreinforced Masonry Bearing Wall Buildings.

When any building alterations or repairs occur at an Unreinforced Masonry Bearing Wall Buildings, all seismic hazards shall be mitigated as set forth in Subsections A and B below. A previously permitted seismic strengthening scheme designed in accordance with FEMA 178/310/ASCE 31 may be submitted for consideration by the Bureau Director as equivalent to the ASCE 41 improvement standard.

- A. **Roof Repair or Replacement.** When a roof covering is repaired or replaced, as defined in 24.85.020, the building structural roof system, anchorage, and parapets shall be repaired or rehabilitated such that, at a minimum, the wall anchorage for both in-plane and out-of-plane forces at the roof and parapet bracing conform to the ASCE 41-BPOE improvement standard. Inplane brick shear tests are not required as part of the ASCE evaluation under this subsection.
- B. **Additional Triggers.**
 - 1. **Building alterations or repair.** When the cost of alteration or repair work which requires a building permit in a 2 year period exceeds the following

criteria, then the building shall be improved to resist seismic forces such that the entire building conforms to the ASCE 41-BPOE improvement standard.

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Table 24.85-C	
Building Description	Cost of Alteration or Repair
Single Story Building	\$40 per square foot
Buildings Two Stories or Greater	\$30 per square foot

2. **Special building hazards.** Where an Unreinforced Masonry Building of any size contains any of the following hazards, the building shall be seismically improved if the cost of alteration or repair exceeds \$30 per square foot:
 - a. The Building possesses an Occupancy Classification listed within the Relative Hazard Category 5 as determined in Section 24.85.040 of this Chapter; or
 - b. The building is classified as possessing either vertical or plan irregularities as defined in the OSSC.
3. **Exclusions from cost calculations.** Costs for site improvements, eco-roofs, mandated FM41 agreements, mandated ADA improvements, mandated non-conforming upgrades under Title 33, mandated elevator improvements and mandated or voluntary seismic improvements or work exempted from permit as described in Chapter 1 of the OSSC will not be included in the dollar amounts listed in Sub-sections 1 and 2 above.
4. **Live/Work spaces in Unreinforced Masonry buildings.** See Section 24.85.040 B for requirements when a Unreinforced Masonry building is converted to contain live/work spaces.
5. **Automatic cost increase.** The dollar amounts listed in subsections 1 and 2 above shall be modified each year after 2004 by the percent change in the R.S. Means of Construction Cost Index for Portland, Oregon. The revised dollar amounts will be made available at the Development Services Center.

24.85.067 Voluntary Seismic Strengthening.

Subject to permit approval, a building may be strengthened to resist seismic forces on a voluntary basis provided all of the following conditions are met:

- A. Mandatory seismic strengthening is not required by other provisions of this Title;
- B. The overall seismic resistance of the building or elements shall not be decreased such that the building is more hazardous;
- C. Testing and special inspection are in accordance with the OSSC and the City of Portland Administrative Rules;
- D. The standard used for the seismic strengthening is clearly noted on the drawings along with the pertinent design parameters; and,

- E. A written narrative shall be clearly noted on the drawings summarizing the building lateral system, seismic strengthening and known remaining deficiencies. The summary information shall reflect the level of analysis that was performed on the building.

24.85.070 Phasing of Improvements.

- A. The Director may approve a multi-year phased program of seismic improvements when the improvements are pre-designed and an improvement/implementation plan is approved by the Director. The maximum total time allowed for completion of phased improvements shall be ten years. A legal agreement between the building owner and the City of Portland shall be formulated outlining the phased seismic improvements and shall be recorded with the property deed at the County.
- B. Upon review, the Director may extend the maximum time for the phased improvements. The Director shall adopt rules under Section 3.30.035 describing the process for granting an extension.

24.85.075 Egress Through Existing Buildings.

The building structure and seismic resistance of an egress path through, under or over an existing building must meet the required seismic improvement standard specified in Section 24.85.040, Table 24.85-A, under any of the following conditions:

- A. The egress path is from an adjacent new building or addition and the new building or addition area equals 1/3 or more of the existing building area; or,
- B. The egress path is from an adjacent existing building that undergoes alterations or a change of occupancy requiring its egress path(s) meet the seismic improvement standards as required by this Chapter; or
- C. The additional occupant load, as determined by the OSSC, using the egress path through the existing building is 150 people or more.

24.85.080 Application of Other Requirements.

Building permit applications to improve the seismic capability of a building shall not trigger: accessibility improvements so long as the seismic improvement does not lessen accessibility; fire life safety improvements so long as the seismic improvement does not lessen the buildings fire resistance or exiting capability; landscape improvements required by Chapter 33; street tree improvements required by Section 20.40.070. Conformance with these regulations may not exempt buildings from future seismic regulations.

24.85.090 Fee Reductions.

Building permit, plan review and fire life safety review fees for structural work related to seismic strengthening covered by this Chapter will be waived when such fees total less than \$2,500, and will be reduced by 50% when such fees would total \$2,500 or more.

24.85.095 Appeals.

Because unanticipated circumstances may arise in the enforcement of these requirements for existing buildings, consideration as to the reasonable application of this Chapter may be addressed through the Board of Appeals as provided in Section 24.10.080.

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AK 11/14/14

AK 2/18/15 – Structural advisory board and other comments incorporated