Statewide Code Interpretation
October 2019

No. 10-01
Construction Requirements for Suspended Ceiling Systems

In accordance with OAR 918-008-0110, the information contained in this statewide code interpretation is legally binding on any party involved in activities regulated by applicable Oregon law, applicable Oregon regulations or the state building code. If the information contained in this statewide code interpretation is cited as a basis for a civil infraction, a representative of the jurisdiction must cite the interpretation number found in this document.

Code / section: 2019 Oregon Structural Specialty Code (OSSC) Section 1613.1
ASCE 7-16 — Minimum Design Loads and Associated Criteria for Buildings and Other Structures — Sections 13.4.5 and 13.5.6

Date: Issued—July 1, 2010
Last updated—Oct. 1, 2019

Subject: Construction Requirements for Suspended Ceiling Systems

Question: What are the minimum requirements of the Oregon Structural Specialty Code (OSSC) for the construction of suspended ceiling systems?

Answer:

Risk Category I, II, or III.

For structures classified as Risk Category I, II, or III, the following options are available:

1. An engineered ceiling system designed for appropriate forces.
2. A prescriptively designed ceiling system in accordance with ASTM E580:
   a. In Seismic Design Category C—Prescriptive ceiling systems designed and installed in accordance with ASTM E580.
   b. In Seismic Design Categories D through F—Prescriptive ceiling systems designed and installed in accordance with ASTM E580 as modified by ASCE 7 Section 13.5.6.2.2 and OSSC Section 1613.4.11.
4. Seismic qualification by experience data based on nationally recognized procedures. [ASCE 7 Section 13.2.6.]
5. In accordance with the prescriptive provisions of the Northwest Wall & Ceiling Bureau (NWCB) Technical Document 401, Suspension Systems for Acoustical Lay-In Ceilings, available at NWCB.org, which contains information compiled from the different applicable design standards such as ASCE 7-16, the International Building Code, ASTM C635, ASTM C636 and ASTM E580.
Other requirements for Risk Category I, II, and III

1. **Specialty ceilings.** Specialty ceilings must be installed using an engineered design and may not use the provisions of this interpretation. Specialty ceilings include, but are not limited to, those incorporating arched ceilings, curved or curvilinear ceilings or sloped ceilings; or having no direct connection to the surrounding walls or supports, such as "free floating" or "cloud" ceiling elements.

2. **Tiles.** Suspended ceilings installed to this interpretation may use either standard acoustical lay-in ceiling panels, **tegular, kerfed** or similar lightweight ceiling panels.

3. **Spreader bars.**
   - a. Wire ties are deemed equivalent to spreader bars
   - b. Spreaders are not required if a 90 degree intersecting cross or main is within 8 inches of the perimeter wall.
   - c. Spreaders are not required at perimeters where ceiling grid ends are attached to closure angles.

4. **Wire gauge.** The minimum wire size shall be US Steel Wire Gage #12 (0.1055- inch).

Risk Category IV

For structures classified as Risk Category IV, an engineered ceiling system designed for appropriate forces is required, with the following exceptions:

1. Ceilings less than or equal to 144 square feet and surrounded by walls connected to the structure above are exempt from the seismic design requirement (ASTM E580 Section 1.4 and ASCE 7 Section 13.5.6).

2. Existing ceilings upgraded in accordance with this interpretation (see below) are deemed to comply.

Requirements specific to **Seismic Design Categories D through F**

1. **Lateral force bracing** is required for ceilings over 1000 square feet in area.

2. Ceilings with interstitial spaces less than 12-inches to framing are not required to have lateral force bracing.

3. **Grid attachment.** The suspended ceiling grid shall be attached to two adjacent walls. Soffits complying with Item 4.b. of this section are deemed to be equivalent to walls. The other end of the grid in each horizontal direction shall have a 0.75 in (19 mm) clearance from the wall and shall rest upon and be free to slide on a closure angle.

4. **Seismic joints.**
   - a. For ceiling areas exceeding 2,500 square feet, a seismic separation joint shall be provided with the limits of the long to short dimension ratio being less than or equal to 4 in accordance with ASCE 7 section 13.5.6.2.2 Item b. The layout and location of seismic separation joints shall be per the designer of record and noted on the plans.
   - b. In lieu of seismic separation joints, the ceiling may be divided into areas less than 2,500 square feet by the use of partitions or soffits as described below.
     - i. **Partitions.** Where used, partitions shall extend a minimum of 6-inches above the horizontal plane of the grid and shall be independently braced to the structure above.
ii. Soffits. Where used, soffits shall extend to a point at least level with the bottom horizontal plane of the grid and shall be independently supported and laterally braced to the structure above. Soffits that comply with these requirements are deemed to be equivalent to walls.

c. Other than partitions and soffits, seismic joints may not be used as part of a fire resistance rated ceiling assembly unless substantiating documentation is provided, and approved.

d. The minimum movement that must be accommodated at seismic joints is $\frac{3}{4}$ of an inch.

5. **Perimeter clips.**

   Where substantiating documentation is provided, perimeter clips may be used to satisfy the following requirements:

   a. 2-inch closure angle
   
   b. Spreader bar requirements

6. **Sprinkler heads.**

   Flexible head design that can accommodate 1-inch free movement in any direction shall be permitted as an alternate to the requirement for 2-inch oversize rings, sleeves or adapters through the ceiling tile.

7. **Power Actuated Fasteners (PAFs),** when used for seismic application as part of the prescriptive path in *Seismic Design Categories* D, E, and F, shall have an ICC-ES® approval for seismic applications and shall require "special inspection" irrespective of the type of "Risk Category" the structure is in. Anchors for kicker wires (*splayed wires installed for purposes other than seismic restraint*) are exempt from this requirement.

   As of the issuance of this interpretation, approved load testing values for the use of PAFs in normal-weight concrete over a metal pan deck have not been established. Until such time as approved load testing values are established, an on-site pull-test of such assemblies is required. The test shall demonstrate that the anchor can support a minimum 250 lbs. for not less than 10 seconds and be conducted by an approved testing agency. At a minimum, such testing shall be performed on 5 percent of the total number of wires but not less than 5. Test samples shall be selected from dispersed locations.

   **On Site Test Failures.**

   In case of pull test failures, the approved testing agency shall notify the local municipality. An increased level of testing, as described below, shall be conducted. All failed anchors shall be replaced.

   **Increased Testing Requirements.**

   a. A minimum of 6 anchors in the immediate vicinity of the failed anchor shall be tested.
   
   b. In the event of any additional failure, all anchors placed on the same day shall be tested. Load testing results are required to be submitted to the local municipality for approval prior to the ceiling grid inspections.

**Upgrading of Existing Ceilings (Applies to all Risk Categories)**

1. Ceilings without Seismic Bracing. Where existing ceilings are without seismic bracing, the ceiling system shall be brought into *substantial compliance* with current code requirements when 50 percent or more of the ceiling tile is altered, repaired or replaced as part of a general
space alteration, or if all of the ceiling system is removed.

*Substantial compliance* means installation of the following items where required in new construction:

a. Lateral force bracing (splayed wires)

b. Compression struts

c. Slack wires on all light fixtures and air terminals

This requirement *does not trigger* the need for:

a. 2-inch closure angle as specified in Section II

b. Seismic separation joints

c. 1-inch movement in all directions around sprinkler pendants

These upgrades *are not required* when:

a. Removing portions of tiles or panels and/or grid to alter ductwork, sprinkler pipe, low voltage wiring, etc.

b. Portions of a ceiling are removed only to facilitate the installation of sprinkler piping

2. Ceilings without Compression Struts. Where existing ceilings have seismic bracing but do not have compression struts at the center of the splayed wires, the addition of compression struts will only be required when and where the grid is replaced, altered, raised or lowered.

**Analysis:**

The OSSC and ASCE 7 provide the requirements for prescriptive design and installation of suspended ceiling systems by referencing ASTM standards. Since there are no areas in Oregon classified as *Seismic Design Category* A or B, the lateral restraint of suspended ceiling systems is required unless specifically exempted. The specific code sections relating to this interpretation are:

- **OSSC Section 808** requiring acoustical ceiling systems to conform to generally-accepted engineering practices, the provisions of Chapter 8, and other applicable requirements of the OSSC.

- **OSSC Section 808.1.1** requiring suspended acoustical ceiling systems to be installed in accordance with the provisions of ASTM C635 and ASTM C636.

- **OSSC Section 1604.1** requiring that buildings, structures and parts thereof be designed and constructed in accordance with strength design, load and resistance factor design, allowable stress design, empirical design or conventional construction methods, as permitted by the applicable material chapters and referenced standards.

- **OSSC Section 1613.1** requiring that every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, be designed and constructed to resist the effects of earthquake motions in accordance with ASCE 7 as modified by Section 1613.4. The *seismic design category* for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

- **OSSC Section 1613.4.11** amending ASCE 7 Section 13.5.6.2.2, by adding the following Item c for suspended ceilings in *Seismic Design Categories* D through F:

  “c. For ceiling areas exceeding 1,000 square feet (93 m²), horizontal restraint of the ceiling to the structural system shall be provided.”
ASCE 7 Section 13.5.6 addressing the design of suspended ceilings with subsections 13.5.6.2.1 and 13.5.6.2.2 referencing ASTM E580 for prescriptive design and installations, and providing additional prescriptive requirements for Seismic Design Categories D through F.

Contact: Visit the division website to contact a building code specialist.