



# Lateral Bracing Requirements for Suspended Gypsum-Board Ceilings

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Traditionally, suspended gypsum-board ceilings have not been subjected to seismic considerations or engineering. With the new proprietary suspended T-bar drywall grid ceilings and their similarities to suspended T-bar acoustical ceilings, there is the question of whether T-bar drywall grid ceilings must conform to the same seismic considerations as suspended T-bar acoustical ceilings. Although the materials are similar in appearance and installation methods, suspended T-bar drywall grid ceilings are not required to conform to seismic considerations required of suspended T-bar acoustical ceilings.

The following information will provide a clear understanding of whether suspended T-bar drywall grid ceilings must conform to the seismic design requirements of ASCE 7 Chapter 13, Seismic Design Requirements for Nonstructural Components.

The first irrefutable fact is that we are dealing with two types of ceilings. One, lay-in acoustical ceiling tiles and two, screw- or nail-attached gypsum wallboard.

## International Building Code (IBC)

For the construction of walls or ceilings that receive screw- or nail-attached gypsum board, we begin with the building code.

IBC Chapter 25, Gypsum Board and Plaster; Section 2508, Gypsum Construction, directs that construction and materials shall be installed in accordance with Table 2508.1, Installation of Gypsum Construction.

When installing gypsum board to steel framing, the code references ASTM C754 and ASTM C1007. ASTM C754 covers the requirements for the installation of interior nonstructural steel framing and furring members designed to receive screw-attached gypsum panel products. Section 6 of ASTM C754 describes the standard installation of wire-suspended CRC main runners and furring members to receive gypsum panels. ASTM Standards do not address specific proprietary systems. Thus, suspended T-bar drywall grid ceilings are not described in ASTM C754. Furthermore, ASTM C754 does not address seismic requirements for suspended

gypsum-board ceilings. (ASTM C1007 is for installation and erection requirements for load-bearing construction.)

To determine what seismic requirements must be met for suspended gypsum-board ceilings, we look to IBC Chapter 16, Structural Design, Section 1613, Earthquake Loads, which states: "Every structure, and portion thereof, including nonstructural components that are permanently attached to the structure and their support and attachments, shall be designed and constructed to resist the effects of earthquake motion in accordance with ASCE 7, excluding Chapter 14 and Appendix 11a."

## American Society of Civil Engineers ASCE/SEI 7

ASCE 7, Chapter 13, Seismic Design Requirements for Nonstructural Components, Section 13.5.6, *Suspended Ceilings*, states: "Suspended Ceilings shall be in accordance with this section," and provides two exceptions. The second exception specially addresses suspended gypsum-board ceilings by stating: "Suspended ceilings constructed of screw or nail-attached gypsum board on one level that are surrounded by and connected to walls or soffits that are laterally braced to the structure above are exempt for the requirements of this section." Therefore, suspended gypsum-board



ceilings meeting this criterion are specifically excluded from seismic requirements. But are proprietary suspended T-bar type drywall grids also exempt from these seismic requirements?

### **International Code Council (ICC) Evaluation Service Reports (ESR)**

For the installation of proprietary systems such as suspended T-bar drywall grid ceilings, we must refer to the manufacturer's literature. To ensure that the installation meets the intent of the code, we must comply with IBC Chapter 1, Scope and Administration, Section 104, Duties and Powers of Building Official, Sub-Section 104.11, Alternative Materials, Design and Methods of Construction and Equipment. Sub-Section 104.11 permits the use of alternative material, design or method of construction provided the proposed design is satisfactory and complies with the intent of the provisions of the code. To ensure that the alternative materials and method of installation comply with the code, supporting data shall be provided to the building official and shall consist of valid research reports from *approved sources*.

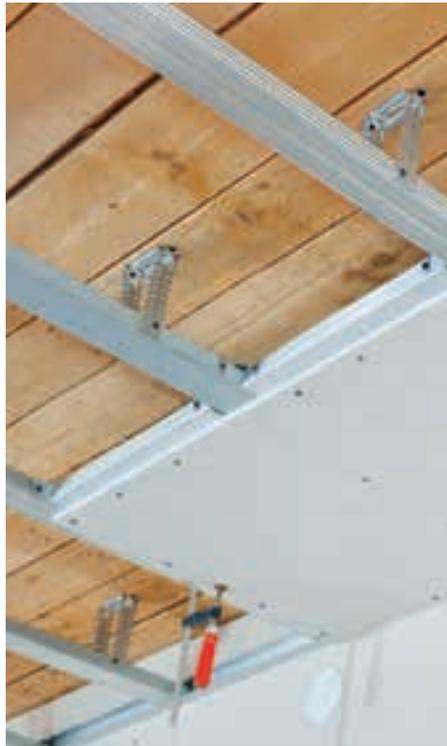
The ICC is identified in IBC Chapter 35, Referenced Standards, as a recognized and referenced agency by the code.

As required by the code, the ICC is an independent agency that provides supporting data to assist in approval of materials or assemblies not specifically provided for in the code. ICC provides the supporting data by testing the alternative material and their installation, and providing that data in the form of an evaluation service report.

The four major manufacturers of T-bar drywall grid ceilings have ICC evaluation service reports for their proprietary T-bar drywall grid ceilings: Armstrong ESR-1289, CertainTeed ESR-3336, Chicago Metallic ESR-2631 and USG ESR-1222. All four manufacturers address seismic requirements in basically the same manner as noted previously in ASCE 7 Section 13.5.6: "Suspended ceilings constructed of screw or nail-attached gypsum board on one level that are surrounded by and connected to walls or soffits that are laterally braced to the structure above are exempt for the requirements of this section." Or, in language similar to ASTM E580, the *Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile Lay-In Panels in Areas Subject to Earthquake Motions*.

### **ASTM E580**

Although ASTM E580, referenced by ASCE 7, is specific to seismic requirements for acoustical ceiling tile, ASTM E580 Section 1.7 also addresses seismic requirements for suspended gypsum panels as follows: "Ceilings



constructed of gypsum board which is screw- or nail-attached to suspended members that support a ceiling on one level extending from wall to wall shall be exempt from the requirements of this practice."

At this point, it is relatively clear that the code, by reference to ASCE 7, does not require seismic design for suspended drywall ceilings that meet the criteria of ASCE 7 Section 13.5.6 Exception No. 2. It is also clear that the ICC ES reports for these proprietary drywall grid ceilings systems do not require seismic design provided the ceiling meets the criteria of ASCE 7 Exception #2. And it is also clear that ASTM E580 excludes suspended gypsum panel ceilings from seismic requirements.

### **ASTM C1858**

But is there an ASTM Standard, similar to ASTM E580, that addresses seismic considerations for proprietary or T-bar drywall grid ceilings? Yes; *ASTM C1858, the Standard Practice for Design, Construction, and Material Requirements for Direct Hung Suspended T-bar Type Ceilings Systems Intended to Receive Gypsum Panel Products in Areas Subject to Earthquake Ground Motions*.

ASTM C1858 covers the installation requirements of direct-hung suspended T-bar ceiling systems intended to receive gypsum panel products constructed as flat, single level, surrounded on all sides by a wall, bulkhead or soffit braced to the building structure to resist the effects of earthquake ground motions. As to seismic requirements for these ceilings, ASTM

C1858 addresses those in Section 5.1: "This practice provides a standardized installations procedure for ceilings designed and installed as a diaphragm. When installed according to this practice, these ceilings have sufficient strength to resist seismic forces without lateral force bracing." Also, Section 7.1 states, similarly to Exception No. 2 of ASCE 7: "The installation method described in this practice is limited to flat, single level designs surrounded on all sides by a wall, bulkhead, or soffit braced to the building structure to resist potential seismic forces imposed by the ceiling." ASTM C1858 is clear that no seismic bracing is required of T-bar type drywall grid ceilings, provided those ceilings meet the criteria of ASCE 7, Exception No. 2 and ASTM C1858 Section 7.1.

ASTM C1858 also clears up any confusion related to seismic separation joints in T-bar drywall grid ceilings. A seismic separation joint is required for suspended acoustical ceilings when the area of ceiling exceeds 2500 square feet. This is not the case when the ceiling is a suspended drywall grid ceiling. ASTM C1858 specifically states in Section 7.4.4: "Seismic separation joints are not required for suspended gypsum board grid systems designed within the scope of this standard." Even though seismic separation joints are not required, this does not preclude the use of control joints in suspended gypsum-board grid systems.

### **ASTM C840**

For control joints requirements we must refer to ASTM C840, Standard Specification for Application and Finishing of Gypsum Board, Section 20.3.3, which states: "Control joints in interior ceiling with perimeter relief shall be installed so that linear dimensions between control joints do not exceed 50 feet and total area between control joints does not exceed 2500 square feet." Additionally, Section 20.3.4 states: "Control joints in interior ceiling without perimeter relief shall be installed so that linear dimensions between control joints do not exceed 30 feet and total area between control joints does not exceed 900 square feet."

In conclusion, although suspended acoustical grid ceilings and suspended drywall grid ceilings have similarities in the appearance of the materials and installation methods, the code is clear that seismic bracing or design is not required when suspended ceilings constructed of screw- or nail-attached gypsum board on one level are surrounded by and connected to walls or soffits that are laterally braced to the structure above.

*Reprinted from NWCBS Higher Standard magazine, Winter/Spring 2018, with minor edits and permission from the author.*