



Suspended Ceiling Seismic Assemblies

Seismic Compliance

Seismic compliance refers to the use of approved systems and designs that meet the seismic design requirements of a building project to provide life safety to occupants during and after an earthquake.

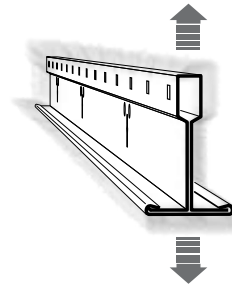
New Seismic Requirements

Seismic force levels and design criteria were once considered only in certain earthquake-prone locations. But major revisions to the International Building Code (IBC) now require seismic ceilings throughout the U.S. In addition to geographic location, the new code considers soil type and building function (e.g., hospital, school). Based on these criteria, more than half of the U.S. is now considered to have some level of seismic risk.

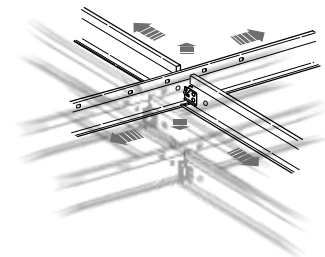
The design team, consulting engineers and code officials must work together to analyze these factors and determine the applicable seismic design category (A–F). This information is now required for every construction project and must be included in the construction documents.

Research and Design Features

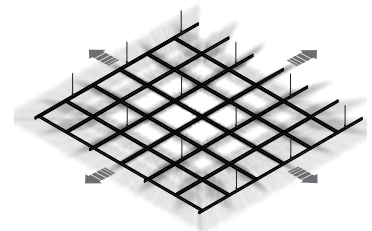
DONN grid is produced with the optimal combination of shape, size, steel gauge and connection details to produce systems with the greatest stiffness and movement resistance.



The advanced connection details used on DONN grid are nearly double the intersection strength requirement of 180 lbs. of tension and compression for seismic construction.



Extensive seismic testing proves the advanced connection details along with the systems' optimal combination of shape, size, and steel gauge.



Standard Seismic Applications

For lay-in acoustical panels and direct-hung acoustical tiles visit the USG Seismic Ceilings Resource Center at www.seismicceilings.com

		IBC Category C ¹	IBC Category D, E, F ²	UBC 25-2
Basic Connections, Perimeter, and Lateral Splay Bracing	Minimum intersection strength limits @ MT / CT ³	60 lbs	180 lbs	180 lbs
	Vertical hanger wire 12-gauge @ 4' o.c.	Required	Required	Required
	Connection device from vertical wire to the structure above must sustain min 100 lbs	Not required	Required	Required
	Main-tee classifications ⁴	Intermediate- or heavy-duty	Heavy-duty	Intermediate- or heavy-duty ⁴
	1 in 6 max plumb of vertical hanger wires	Required	Required	Required
	Perimeter vertical hanger wires not more than 8" from wall	Not required unless molding < 7/8"	Required	Required
	Grid end/wall clearance	Min 3/8"	Min 3/4"	Some clearance on two non-attached walls, if applicable
	Perimeter closure (molding) width	Min 7/8" (or use perimeter wires)	Min 2"	Min 7/8"
	Grid connection to perimeter attached on two adjacent walls	Not permitted	Required	Optional
	Perimeter tee ends tied together at perimeters	Required	Required	Required
	Horizontal restraint (splay wires or rigid bracing) within 2" of intersection and splayed 90° apart at 45° angles	Not required	Required ^{6,6}	Required ^{6,7}
	Compression posts (struts) 12' o.c. in both directions, starting 6' from walls	Not required	Required ^{6,6}	Required ^{6,7}
	Splay bracing connection strength 200 lbs or the design load, whichever is greater	Not required	Required	Required
	Partition attachment	Allowed only if ceiling is able to move laterally	Bracing independent of ceiling splay bracing	Allowed with bracing
	Seismic separation joint	Not required	Required for areas > 2,500 sq. ft. (or full height partition) ⁸	Not required
Rigid bracing for ceiling plane elevation changes	Not required	Required	Not required	
Light Fixture Attachment	Light fixture (all types) mechanically attached to grid per NEC 410-16 (two per fixture unless independently supported)	Required	Required ⁶	
	– Surface-mounted fixtures attached to grid	Not required	Not required	Required (including safety wires to vertical wire or structure) ⁹
	– Pendant-hung fixtures directly supported from structure with 9-gauge wire (or approved alternative)	Required	Required	Required
	– Rigid lay-in or can light fixtures			
	< 10 lbs – one wire to structure (may be slack)	Required	Required	Lower limit is 20 lbs.
	10 to 56 lbs – two wires from housing to structure (may be slack)	Required	Required	Required – lower limit is 20 lbs.
	> 56 lbs – supported directly to structure by approved hangers	Required	Required	Required
Service Applications	Air terminals			
	< 20 lbs – positively attached to grid	Required	Required	Required
	20 to 56 lbs – positively attached to grid and two 12-gauge wires to structure (may be slack)	Required	Required	Required
	> 56 lbs – directly supported to structure	Required	Required	Required
	Sprinkler heads and other penetration clearance	Min 3/8" on all sides	Min 2" dia. opening or a swing joint	Not required
	Cable trays and electrical conduit independently supported and braced	Not required	Required	Not required

Notes
The information presented is correct to the best of our knowledge at the date of issuance. Because codes continue to evolve, check with a local official prior to designing and installing a ceiling system. Other restrictions and exemptions may apply. This is only intended as a quick reference.

1. Refers to CISCA installation recommendations for zones 0-2 via ASCE 7. Max ceiling weight: 2.5 psf.
2. Refers to CISCA installation recommendations for zones 3-4 via ASCE 7.
3. All USG Dorn® brand ceiling suspension systems meet these requirements.
4. Per ASTM C635.
5. Required for ceilings larger than 1,000 square feet.

6. Where substantiating design calculations are not provided.
7. Seismic standards generally apply to ceilings larger than 144 square feet.
8. When intermediate-duty systems are used, No. 12-gauge hanger wires shall be attached to the suspension members within three inches of each corner of each fixture.
9. Please refer to AC3235 for more information.

Alternate Seismic Solutions

		IBC Category D, E, F (Alternate Method) ⁹	IBC Category C (Alternate Method) ⁹
Basic Connections, Perimeter, and Lateral Splay Bracing	Minimum intersection strength limits @ MT / CT ³	180 lbs	60 lbs
	Vertical hanger wire 12-gauge @ 4' o.c.	Required	Required
	Connection device from vertical wire to the structure above must sustain min 100 lbs	Required	Not required
	Main-tee classifications ⁴	Heavy Duty	Intermediate or Heavy Duty
	1 in 6 max plumb of vertical hanger wires	Required	Required
	Perimeter vertical hanger wires not more than 8" from wall	Required	Not required
	Grid end/wall clearance	3/4" min.	3/8" min.
	Perimeter closure (molding) width	Min. 7/8" with ACM7 Seismic Clip	Min. 7/8"
	Grid connection to perimeter attached on two adjacent walls	Required	N/A
	Perimeter tee ends tied together at perimeters	Required (ACM7 Seismic Clip satisfies this requirement)	Required (ACM7 Seismic Clip satisfies this requirement)
	Horizontal restraint (splay wires or rigid bracing) within 2" of intersection and splayed 90° apart at 45° angles	Required ^{5, 6}	Not required
	Compression posts (struts) 12' o.c. in both directions, starting 6' from walls	Required ^{5, 6}	Not required
	Splay bracing connection strength 200 lbs or the design load, whichever is greater	Required	Not required
	Partition attachment	Bracing independent of ceiling splay bracing	Allowed only if ceiling is able to move laterally
Seismic separation joint	Required for areas >2,500 sq. ft. (or full height partition) ⁶	Not required	
Rigid bracing for ceiling plane elevation changes	Required	Not required	
Light-Fixture Attachment	Light fixture (all types) mechanically attached to grid per NEC 410-16 (two per fixture unless independently supported)	Required	Required
	– Surface-mounted fixtures attached to grid	Not required	Not required
	– Pendant-hung fixtures directly supported from structure with 9-gauge wire (or approved alternative)	Required	Required
	– Rigid lay-in or can light fixtures		
	< 10 lbs – one wire to structure (may be slack)	Required	Required
	10 to 56 lbs – two wires from housing to structure (may be slack)	Required	Required
	> 56 lbs – supported directly to structure by approved hangers	Required	Required
Service Applications	Air terminals		
	< 20 lbs – positively attached to grid	Required	Required
	20 to 56 lbs – positively attached to grid and two 12-gauge wires to structure (may be slack)	Required	Required
	> 56 lbs – directly supported to structure	Required	Required
	Sprinkler heads and other penetration clearance	Min 2" dia. opening or a swing joint	Min 3/8" on all sides
Cable trays and electrical conduit independently supported and braced	Required	Not required	

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Construction Standards

Seismic construction standards are established to prevent structural collapse during or after an earthquake that could cause panic, injury or death. More than half of the U.S. is now considered to be at some level of risk for seismic activity, based on three factors:

Factors that Determine Seismic Design Category	
Soil Conditions	Certain soil types may be prone to liquefaction, when the stress and shaking of earthquake forces cause sediments to behave like liquids rather than a solid, reducing or eliminating structural support. The soil at a building site is analyzed and categorized into one of six types: A – Hard rock C – Very dense soil and soft rock E – Soft soil B – Rock D – Stiff soil (default) F – Special soils
Building Usage	The function of the structure also determines the level of precaution that is to be designed and built in. Building types fall into three groups: Seismic Use Group III: essential facilities such as hospitals, fire departments and police departments that must function both during and after an earthquake. Seismic Use Group II: buildings that constitute a substantial public interest, such as power plants and those that house more than 300 people. Seismic Use Group I: all other buildings.
Geographic Location	Thoughts of earthquakes and seismic activity may typically bring to mind California and the West Coast. However, this is not the only region considered to face seismic risks. In fact, more than 3,500 earthquakes have been recorded east of the Mississippi River since 1700. Today's building codes are recognizing that seismic activity may be a risk almost anywhere in the country.

By analyzing these three criteria for a construction project, you can determine the seismic design category (A-F). This is typically done by the project's structural engineer. The design team performs the analysis required to assign the seismic design category for a construction project and must include that information in the construction documents. This tells the construction team the required level of performance for the building.

Refer to local building codes to determine in which section of the specification the seismic design category must appear (usually in the general-contractor section of the specification and on the first page of structural drawings).

Learn more at www.seismicceilings.com

To find out more about new requirements for seismic ceilings, visit the USG Seismic Ceilings Resource Center at seismicceilings.com. This informative online resource features in-depth articles about the code change, FAQs, and interviews with ceilings experts. It also includes a comprehensive library of architectural details downloadable in PDF and CAD formats.

Physical Data/ Footnotes

Material

Hot-dipped galvanized steel.

Recycled Content

25%. For details, see the Sustainability selector.

Installation

Must be installed in compliance with ASTM C636, CISCA, and standard industry practices.

Limitations

The performance of DOWN ACM7 seismic clip and systems is based on the specific combination of superior components, and design and installation methods shown. Components from other manufacturers were not evaluated, and their use or any mixed use is not recommended.

ICC Evaluation Service, Inc., Report Compliance

Suspension systems manufactured by USG Interiors, Inc., have been reviewed and are approved by listing in ICC-ES Evaluation Report 1222. Evaluation Reports are subject to reexamination, revision and possible cancellation. Please refer to usgdesignstudio.com or 800 USG.4YOU for current reports.

L.A. Research Report Compliance

DOWN brand suspension systems manufactured by USG Interiors, Inc., have been reviewed and are approved by listing in the following L.A. Research Report number: 25764.

AC156 Disclaimer

The current ICC-ES acceptance criterion (AC) used for the testing and evaluation of seismic clips is AC156, Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems. AC156 was not specifically designed to provide testing guidelines or pass/fail criteria for acoustical suspension systems in a seismic event. However, in the absence of a specific AC for this purpose, ICC-ES allowed AC156 to act as the basis for all seismic testing and evaluation for the acoustical ceiling suspended ceilings industry.

Code Compliance

Testing and evaluation performed at the University at Buffalo (SUNY), the Department of Civil, Structural and

Environmental Engineering—Structural Engineering and Earthquake Simulation Laboratory (SEESL) qualify the performance of these systems according to the AC156—Seismic Qualification Specification, and AC368—Acceptance Criteria for Suspended Ceiling Framing Systems. Several alternative materials, designs and methods of construction were evaluated and tested. Results of this investigation indicates that these tested alternative designs are at least the equivalent of that prescribed in the code for quality, strength, effectiveness, fire resistance, durability and safety. These alternative designs are at least equivalent to the criteria set forth in AC156 and AC368, and otherwise demonstrate compliance with the performance features of

the codes. The data and test results presented provide technical evidence on which a code official can base approval.

Note

The University of Buffalo and the University of California do not endorse specific products.

Construction Details

Please see AC3235 for construction details.

Safety First!

Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read MSDS and literature before specification and installation.



Manufactured by
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