



Municipality of Anchorage



Handout A.04

Suspended Ceilings Industry Standard Construction

1.0 SCOPE

Industry standard construction for installation of metal suspension systems for acoustical tile and lay-in panel ceilings is described. Alternatively a system may be designed. For design requirements see applicable sections of ASCE 7 Chapter 13, Section 13.5.6.1, and Section 13.5.6.2.2.

2.0 CODES

2006 IBC code sections:

- IBC 803.9
- IBC 2506.2.1

Referenced codes:

- ASCE 7-05 Section 13.5.6, Suspended Ceilings
- CISCA-04 Seismic Zones 3 & 4, CISCA Guidelines for Seismic Restraint for Direct Hung Suspended Ceiling Assemblies
- ASTM C 635, Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
- ASTM C 636, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

Note: Suspended ceiling systems covered by a current ICC Evaluation Service Report for Seismic Design Category D are approved, provided design and installation conform to the provisions of the ICC report, including the “Conditions of Use.” A copy of the report must be onsite for use by installers and inspectors.

Note: Any deviation from code requirements or an ICC Evaluation Service Report must be approved by Building Safety through an “alternate material and methods request.” Provide a letter from the grid manufacturer explaining the deviation and a basis for approving it.

3.0 GENERAL

3.1 A heavy duty T-bar grid system shall be used. (ASCE 7 Section 13.5.6.2.2, item a)

3.2 Perimeter closure angles shall be not less than 2 inches in width. (ASCE 7 Section 13.5.6.2.2, item b)

3.2.1 One end of the ceiling grid shall be attached to the closure angle in each orthogonal (perpendicular) horizontal direction.

3.2.2 The other end in each horizontal direction shall have a $\frac{3}{4}$ inch clearance from the wall and shall rest upon and be free to slide on a closure angle.

3.3 Ceiling areas greater than 1,000 square feet shall be seismically restrained to the structure. (ASCE 7 Section 13.5.6.2.2, item c)

3.3.1 Prescriptive restraint may be provided by splay wires installed in accordance with the Lateral Force Bracing section. Tributary areas of restraints shall be approximately equal.

3.3.2 Alternatively, the ceiling system must be designed to resist 2006 IBC seismic forces in accordance with ASCE 7 Section 13.3.1, with a maximum deflection of ¼ inch.

3.4 Ceiling areas greater than 2,500 square feet shall be broken into areas not exceeding 2,500 square feet separated by either full-height partition walls or seismic joints that are a minimum of 1.5 inches wide. Each area shall be seismically restrained. (ASCE 7 Section 13.5.6.2.2, item d)

3.5 Penetrations through the ceiling grid, such as sprinkler heads, shall have a 2 inch oversized ring, sleeve, or adapter to allow a 1 inch free movement in any horizontal direction. (ASCE 7 Section 13.5.6.2.2, item e)

3.5.1 The 2" oversize rings/adapters are not required where a swing joint that can accommodate 1 inch of ceiling movement in all horizontal directions is provided at the top of the sprinkler head extension.

3.5.2 The 2" oversize rings/adapters are not required where the sprinkler pipe between the head and branch line is flexible.

3.6 Changes in ceiling plan elevation shall be provided with positive bracing. (ASCE 7 Section 13.5.6.2.2, item f)

3.7 Cable trays and electrical conduits shall be supported independently of the ceiling. (ASCE 7 Section 13.5.6.2.2, item g)

3.8 Special inspection of the grid system and its anchorage is not required.

4.0 LATERAL FORCE BRACING

4.1 Lateral force braces shall consist of 4 splay wires and a compression strut. (CISCA Seismic Zones 3 & 4)

4.1.1 They shall be spaced no more than 12 feet on center in both directions.

4.1.2 The first brace shall be located no more than 6 feet from each wall.

4.2 Splay wires shall be 12 gage minimum. (CISCA Seismic Zones 3 & 4)

4.2.1 They shall be attached to a main runner within 2 inches of an intersection with a cross runner.

4.2.2 They shall be splayed 90 degrees from each other.

4.2.3 Their angle with the horizontal shall be no greater than 45 degrees.

4.2.4 They shall be spaced not less than 6 inches clear from horizontal piping or duct work that is not horizontally braced for seismic forces.

4.2.5 No attachment to the structure to resist horizontal seismic forces shall be made with power actuated fasteners. (ASCE 7, Section 13.4.5)

4.2.6 Attachment to the main runner and to the structure shall be not less than:

200 pounds for buildings in Occupancy Categories I or II

250 pounds for buildings in Occupancy Category III, Substantial Hazard to Human Life

300 pounds for buildings in Occupancy Category IV, Essential Facilities

(See ASCE 7, Table 1-1 for Occupancy Category definitions)

4.3 Compression struts with capacity to resist the vertical component of the splay wires shall be attached to both the main runner and the structure above. (CISCA Seismic Zones 3 & 4)

5.0 VERTICAL HANGERS

5.1 Suspension wires (CISCA Seismic Zones 3 & 4)

- 5.1.1 Wire shall be galvanized, soft-annealed, mild steel wire. (ASTM 636, Section 2.1.6)
- 5.1.2 Wire size and spacing along each main runner shall be 12 gage wire minimum at 4 feet on center, or 10 gage wire minimum at 5 feet on center.
- 5.1.3 Wires shall be attached to the ceiling grid and to the structure. As a minimum the wire must be wrapped around itself a minimum of three full turns (360 degrees each) within a 3-inch length. (ASTM C636, Section 2.3.4)
- 5.1.4 They shall be not more than 1 in 6 out-of-plumb in any direction unless counter sloping wires are used.
- 5.1.5 They shall not be attached to, or bend around, interfering material or equipment.
- 5.1.6 Where direct attachment is not possible due to interfering material or equipment, a trapeze or equivalent device shall be used. For spans greater than 48 inches trapeze suspensions shall at least be back-to-back 1-1/4 inch cold-rolled channels.
- 5.1.7 Attachment to the structure shall be for not less than:
 - 100 pounds for buildings in Occupancy Categories I and II,
 - 105 pounds for buildings in Occupancy Category III, Substantial Hazard to Human Life
 - 110 pounds for buildings in Occupancy Category IV, Essential Facilities(See ASCE 7, Table 1-1 for Occupancy Category definitions)

6.0 PERIMETER HANGERS (CISCA Seismic Zones 3 & 4)

6.1 Locate perimeter hangers at the ends of main and cross runners not more than 8 inches from walls and ceiling discontinuities

6.2 Suspension wires

- 6.2.1 They shall be 12 gage wire minimum.
- 6.2.2 They shall be not more than 1 in 6 out-of-plumb in any direction.
- 6.2.3 They shall be connected to the structure above or to an adjacent wall.
- 6.2.4 Wires shall be attached to the ceiling grid and to the structure or adjacent wall. As a minimum the wire must be wrapped around itself a minimum of three full turns (360 degrees each) within a 3-inch length. (ASTM C636, Section 2.3.4)

7.0 PERIMETER MEMBERS (CISCA Seismic Zones 3 & 4)

Ends of main runners and cross members shall be tied together to resist spreading. This can be done with spreader bars or wire ties. This is not required where the perpendicular distance from the wall to the first parallel runner is 12 inches or less.

8.0 LIGHTING FIXTURES (CISCA Seismic Zones 3 & 4)

8.1 *Heavy-Duty Systems* – Only heavy-duty systems are allowed in Anchorage because the Seismic Design Category is always D or E. Lighting panels must be positively attached to ceiling grid for 100 percent of fixture weight acting in any direction. Supplemental hanger wires at fixture corners are required except where a 4 foot modular hanger wire pattern is used and cross runners provide the same load capacity as the main runners. Where cross runners do not provide the same carrying capacity as the main runners, supplemental hanger wires shall be attached to grid members within 3 inches of each corner of each fixture supported by a cross tee.

8.1.1 *Light fixtures weighing less than 10 pounds:* Provide one 12 gage wire connected from the fixture housing to the structure above. This wire may be slack.

8.1.2 *Light fixtures weighing between 10 and 56 pounds:* Provide two 12 gage wires connected at diagonal corners of the fixture housing to the structure above. These wires may be slack.

8.1.3 *Light fixtures weighing greater than 56 pounds:* Provide full direct support from the structure above. Attach wires within 3 inches of each corner of each fixture.

8.1.4 *Pendant-hung lighting fixtures* shall be supported directly from the structure above using 9 gage wire or an approved alternate support without using the ceiling suspension system for direct support.

9 CEILING MOUNTED AIR TERMINALS OR SERVICES (CISCA Seismic Zones 3 & 4)

9.1 *Those weighing less than 20 pounds:* Positively attach to main runners, or to cross runners that have the same load capacity as the main runners.

9.2 *Those weighing between 20 pounds and 56 pounds:* Positively attach to main runners, or to cross runners with the same load capacity as the main runners. Provide two 12 gage hanger wires at diagonal corners connected from the terminal or service to the structure above or to the ceiling system hangers. These wires may be slack.

9.3 *Those weighing greater than 56 pounds:* Provide full support from the structure above. Attach wires within 3 inches of each corner of each fixture.

10.0 PARTITIONS

Brace partitions to the building structure. Such bracing shall be independent of any ceiling splay wire bracing. (ASCE 7 Section 13.5.8.1)

11.0 DRAWINGS AND SPECIFICATIONS (CISCA Seismic Zones 3 & 4)

Grid-specific installation information and specifications shall be on-site for use by installers and inspectors.

Ron Thompson, Building Official

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(Ref. 97-04, 00-03; 06-02)