



Designation: E580/E580M – 22

Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions¹

This standard is issued under the fixed designation E580/E580M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This practice covers the installation of suspended systems for acoustical tile and lay-in panels and their additional requirements for two groups of buildings that are constructed to resist the effects of earthquake motions as defined by ASCE 7 and the International Building Code. These groupings are for Seismic Design Category C and Seismic Design Categories D, E and F.

1.2 The authority having jurisdiction shall determine the applicability of this practice.

1.3 Test Methods E3090/E3090M, Specification C635, and Practice C636 cover suspension systems, their installation, and testing without special regard to seismic lateral restraint needs. They remain applicable and shall be followed when this practice is specified.

1.4 Ceilings less than or equal to 144 ft² [13.4 m²] and surrounded by walls connected to the structure above are exempt from the requirements of this practice.

1.5 This practice is not intended to stifle research and development of new products or methods. This practice is not intended to prevent the installation of any material or prohibit any design or method of construction not prescribed in this practice, provided that any such alternative has been substantiated by verifiable engineering data or full-scale dynamic testing that is acceptable to the authority having jurisdiction.

1.6 Ceiling areas of 1000 ft² [92.9 m²] or less shall be exempt from the lateral force bracing requirements of 5.2.8.

1.7 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.

¹ This practice is under the jurisdiction of ASTM Committee E33 on Building and Environmental Acoustics and is the direct responsibility of Subcommittee E33.04 on Application of Acoustical Materials and Systems.

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1.8 Free floating ceilings (those not attached directly to any structural walls) supported by chains or cables from the structure are not required to satisfy the seismic force requirements provided they meet the following requirements:

1.8.1 The design load for such items shall equal 1.4 times the vertical operating weight.

1.8.2 Seismic interaction effects shall be considered in accordance with 5.7.

1.8.3 The connection to the structure shall allow a 360° range of motion in the horizontal plane.

1.9 The values stated in either inch-pound or SI units are to be regarded as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems result in nonconformance with the specification.

1.10 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.11 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

C635 Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

C636 Practice for Installation of Metal Ceiling Suspension

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



Systems for Acoustical Tile and Lay-In Panels
E3090/E3090M Test Methods for Strength Properties of
Metal Ceiling Suspension Systems

2.2 Other Standards:

ASCE 7 Minimum Design Loads for Buildings and Other Structures³

CISCA Recommendations for Direct-hung Acoustical Tile and Lay-in Ceilings, Seismic Zones 0-2⁴

CISCA Guidelines for Seismic Restraint for Direct Hung Suspended Ceiling Assemblies, Seismic Zones 3 & 4⁴

International Building Code⁵

NFPA 70 National Electric Code⁶

3. Significance and Use

3.1 This practice is a prescriptive set of installation methods to be used for suspended ceilings and is often used in lieu of designing a separate lateral restraint system. The authority having jurisdiction shall determine the applicability of this practice to local code requirements.

3.2 This practice covers installation of suspended ceiling systems and related components in areas that require resistance to the effects of earthquake motions as defined by ASCE 7 and the International Building Code.

3.3 The practice is broken into two main sections. The first section covers areas with light to moderate earthquake potential (Seismic Design Category C) while the second deals with severe earthquake potential (Seismic Design Category D, E & F).

3.4 This practice includes requirements from multiple sources including previous versions of this practice, CISCA Seismic Recommendations for Direct-hung Acoustical Tile and Lay-in Ceilings, Seismic Zones 0-2 and CISCA Guidelines for Seismic Restraint for Direct Hung Suspended Ceiling Assemblies, Seismic Zones 3 & 4, suspended ceiling requirements from the International Building Code and ASCE 7. The purpose is to combine the requirements from these sources into a single comprehensive document.

4. Seismic Design Category C

NOTE 1—This section is intended to provide an unrestrained (free-floating) ceiling system that will accommodate the movement of the structure during a seismic event.

4.1 Suspension System Components:

4.1.1 The recommendations in this section are for ceilings systems with an average weight over the entire ceiling of 2.5 lb/ft² [12 N/m²] or less. This average weight includes suspension members, panels or tiles, light fixtures, supported flexible sprinkler drops and air terminals. (See 4.4 and 4.5 for details on lights and mechanical services.) Ceilings with an average weight over the entire ceiling greater than 2.5 lb/ft² [12 N/m²]

³ Available from American Society of Civil Engineers (ASCE), 1801 Alexander Bell Drive, Reston, VA 20191 or www.pubs.asce.org.

⁴ Available from Ceiling & Interior Systems Construction Association (CISCA), 1500 Lincoln Hwy, Suite 202, St. Charles, IL 60174.

⁵ Available from International Code Council (ICC), 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795.

⁶ Available from National Fire Prevention association (NFPA), 1 Batterymarch Park, Quincy, MA 02269-9101.

shall be installed as specified in 5.1 taking into account the design lateral forces appropriate for Category C. Other deviations or variations shall be substantiated by verifiable engineering data or full-scale dynamic testing.

4.1.2 The main runners and cross runners of the ceiling system and their splices, intersection connectors, and expansion devices shall be designed and constructed to carry a mean ultimate test load of not less than 60 lb [27 kg] in tension and in compression when tested per Test Methods E3090/E3090M. The tensile test shall allow for a 5° offset of the connection in any direction.

4.2 Suspension System Application:

4.2.1 Unless perimeter members meet the structural load carrying requirements and have been approved as a structural part of the system, wall angles or channels shall be considered as aesthetic closers and shall have no structural value assessed to themselves or their method of attachment to the walls.

4.2.2 All perimeter closure angles or channels shall provide a support ledge of 7/8 in. [22 mm] or greater unless the perimeter ends of each cross runner and main runner shall be independently supported as specified in 4.2.1.

4.2.3 When a perimeter closure angle that provides less than 7/8 in. [22 mm] has been approved for use, the perimeter ends of each cross runner and main runner shall be independently supported within 8 in. [200 mm] from each wall or ceiling discontinuity (see Fig. 1).

4.2.4 The terminal ends of suspension members shall have a minimum of 3/8-in. [10-mm] clearance from the wall as shown in Fig. 2. Reveal (shadow) edge wall closures with these clearances are shown in Fig. 3.

4.2.5 Terminal ends of main runners and cross runners shall be prevented from spreading.

4.2.6 Permanent runner end attachment (that is, pop rivets) for grid alignment purposes shall not be permitted.

4.2.7 All ceiling penetrations (columns, sprinklers, etc.) and independently supported fixtures or services shall have a minimum of 3/8-in. [10-mm] clearance on all sides by using suitable escutcheons or perimeter closure details.

4.3 Suspension Wire Application:

4.3.1 Suspension wires that are a minimum of No. 12 gauge [2.70 mm] galvanized, soft-annealed, mild steel wire shall be spaced at 4 ft [1200 mm] on center along each main runner, unless engineering calculations justifying increased spacing are provided.

4.3.2 Each vertical wire shall be attached to the ceiling suspension member and to the support above such that the wire loops shall be tightly wrapped and sharply bent to prevent any vertical movement or rotation of the member within the loops. The wire must be wrapped around itself a minimum of three full turns (360° each) within a 3-in. [75-mm] length. Connection devices to the supporting construction shall be tested in tension and demonstrate a mean ultimate load of 200 lb [92 kg] which will yield an allowable load of 100 lb [46 kg] with a safety factor of 2 per Test Methods E3090/E3090M.

4.3.3 Suspension wires shall not hang more than one in six out of plumb unless countersloping wires are provided.

4.3.4 Wires shall not attach to or bend around interfering material or equipment. A trapeze or equivalent device shall be

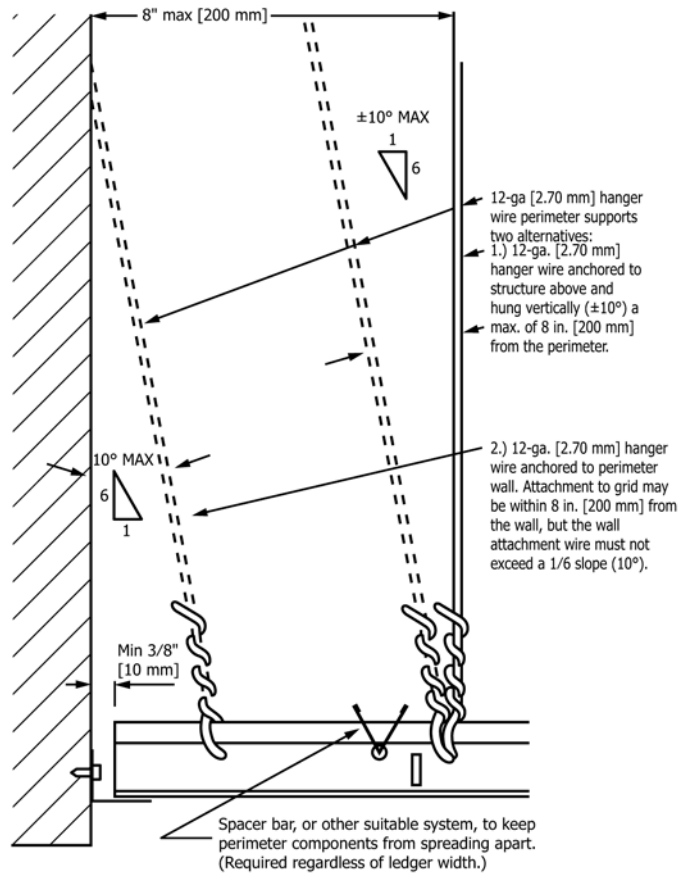


FIG. 1 Category C Treatment of Cross Runners and Main Runners at Terminal Ends When Support Ledge of Perimeter Closure is Less Than Minimum 7/8 in. [22 mm]

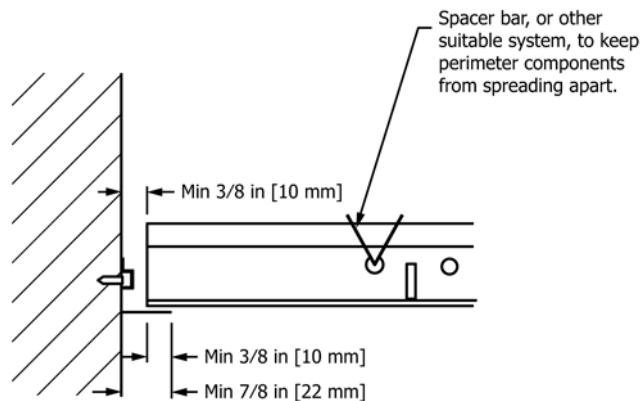


FIG. 2 Category C Treatment of Cross Runners, Main Runners, and Wall Closures at Terminal Ends

used where obstructions preclude direct suspension. Trapeze suspensions shall be sized to resist the dead load and lateral forces appropriate for Category C.

4.4 Light Fixture Application:

4.4.1 All lighting fixtures shall be positively attached to the suspended ceiling system by mechanical means as specified in the National Electrical Code unless independently supported. The attachment device shall have the capacity of supporting 100 % of the lighting fixture weight acting in any direction. A minimum of two attachment devices are required for each fixture.

4.4.2 Surface-mounted lighting fixtures shall be attached to the ceiling system with a positive clamping device that completely surround the supporting members. Safety wires shall be attached between the clamping device and the adjacent ceiling hanger or to the structure above. In no case shall the fixture exceed the design carrying capacity of the supporting members.

4.4.3 Lighting fixtures weighing less than or equal to 10 lb [5 kg] shall have one, No. 12-gauge [2.70 mm] safety wire connected from the fixture housing (not the detachable end plates) to the structure above. It is not necessary for these