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**SUSPENDED GYPSUM BOARD CEILING: 2019 CBC**

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Division of the State Architect (DSA) documents referenced within this publication are available on the [DSA Forms](#) or [DSA Publications](#) webpages.

**PURPOSE**

This Interpretation of Regulations (IR) establishes guidelines for prescriptive suspended gypsum board ceiling systems. These systems represent accepted means of ceiling construction complying with the California Building Code (CBC). This IR does not preclude the use of other systems, including proprietary systems as discussed in Section 1.6 below or custom designed systems, when approved by DSA.

**SCOPE**

This IR is applicable to flat and level suspended gypsum board ceiling systems complying with the following limitations:

- Total ceiling weight shall not exceed 4 pounds per square foot (PSF) including luminaires, services, and devices.
- Ceiling shall consist of no more than one layer of gypsum board not exceeding 5/8 inch in thickness.
- Ceiling shall not be accessible.
- Ceiling shall not support building components other than luminaires, heating/ventilation/air conditioning (HVAC) terminals, flexible sprinkler hose fittings, or other lightweight devices such as strobe lights, occupancy sensors, exit signs, etc. as described herein.

Two basic prescriptive systems are established in this IR for incorporation by design professionals into their construction documents.

- T-Bar System: Refer to Section 2 below.
- Legacy System: Refer to Section 3 below.

These two systems are separate and distinct; the requirements and details of these systems cannot be mixed unless specifically noted herein.

This IR is not applicable to suspended lay-in panel ceilings, which are addressed in *IR 25-2: Metal Suspension Systems for Lay-In Panel Ceiling*.

**BACKGROUND**

Suspended gypsum board ceilings are used to provide flat, monolithic, cost-efficient ceiling surfaces. Rather than support by traditional ceiling joists, suspended systems are supported by the floor or roof level above through regularly spaced wire hangers. Gypsum board materials and construction, including ceiling requirements, are addressed in CBC Sections 2506 and 2508, respectively. The design of suspended ceilings for seismic forces is governed by the American Society of Civil Engineers Standard 7 (ASCE 7): Minimum Design Loads and Associated Criteria for Buildings and Other Structures as modified by CBC Section 1617A.1.21.

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**SUSPENDED GYPSUM BOARD CEILING: 2019 CBC****1. GENERAL****1.1 Materials**

Materials shall comply with CBC Section 2508 and applicable ASTM standards.

**1.1.1** Gypsum board shall be either 1/2 inch or 5/8 inch in thickness.

**1.1.2** Cold formed steel (CFS) sections shall be identified by a product designation, which has been standardized by the American Iron and Steel Institute (AISI) in collaboration with the Steel Stud Manufacturers Association (SSMA).

**1.1.3** Hanger and brace wires shall conform to American Society for Testing and Materials (ASTM) A641 and the material properties required by *IR 25-1: Maximum Allowable Load for Ceiling Wires*.

**1.1.3.1** Hanger wires shall be #12 gauge (0.106 inch diameter) or larger. Turn of wire connections shall consist of a minimum of three turns within a 3-inch length. Loops shall be tightly wrapped and sharply bent to prevent any vertical movement or rotation of the member within the loops in accordance with ASTM E580 Section 5.2.7.2.

**1.1.3.2** Brace wires shall be #12 gauge (0.106 inch diameter) or larger. Turn of wire connections shall consist of a minimum of four turns within a 1½-inch length.

**1.1.4** Compression struts, when required, shall comply with one of the following. Compression struts are required as a component of lateral bracing assemblies per Section 4.2 below or whenever the code-prescribed seismic loads result in a net upward force on the ceiling.

**1.1.4.1** Electrical Metallic Tubing (EMT) material shall conform to the American National Standards Institute (ANSI) C80.3/UL 797 carbon steel with G90 galvanizing. EMT shall have minimum yield strength ( $F_y$ ) of 30 kips per square inch (ksi) and minimum ultimate strength ( $F_u$ ) of 48 ksi.

**1.1.4.2** Galvanized CFS channel shall conform to ASTM A653 material, or other equivalent ASTM standard listed in Section A3.1 of AISI S100 with a minimum yield strength as follows:

**1.1.4.2.1** 43 mil (#18 gauge) material and thinner: 33 ksi.

**1.1.4.2.2** 54 mil (#16 gauge) material and thicker: 50 ksi.

**1.1.5** Post-installed anchors (e.g., expansion anchors, screw anchors, power actuated fasteners, etc.) shall have a current evaluation report acceptable to DSA in accordance with *IR A-5: Acceptance of Products, Materials and Evaluation Reports*.

**1.2 Construction Details**

Typical construction details presented in other resource documents defined in this section are deemed to meet the general requirements of this IR. To be applicable for a specific project the details must be graphically shown on the DSA approved construction drawings. Incorporation by reference is not permitted. Refer to Section 6 below for additional information and requirements relative to project-specific construction documents.

**1.2.1** The T-Bar System outlined in Section 2 below may employ applicable construction notes and details published in Appendix A of IR 25-2. These details are also available in electronic format. Refer to IR 25-2 Section 6.2 for additional information. The details published in IR 25-2 were developed for suspended lay-in panel ceilings and require some modification for conversion to appropriate use with suspended gypsum board ceilings, including the following:

**1.2.1.1** Throughout the details the graphical representation and specification of lay-in panels should be replaced with gypsum board located beneath and screwed into the bottom flange of the T-bar sections.

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**1.2.1.2** Details illustrating the dimension of ceiling grid member ends to adjacent walls at the “free joint” condition (e.g., sheets 2.50, 2.60, etc.) when the lateral force bracing system is used shall be revised to 1-inch clear in accordance with Section 4.2.6 below.

**1.2.1.3** Details illustrating the maximum dimension of hangers from the edge of the ceiling (i.e., wall or expansion/seismic joint) shall be revised to 6 inches.

**1.2.2** The Legacy System outlined in Section 3 below may employ applicable construction notes and details published in the Office of Statewide Health Planning and Development (OSHPD) document OPD-0003-13: 2013 CBC Standard Gypsum Board Ceiling Details for Suspended Joist and Framing Construction. The use of OSHPD Preapproved Details (OPD) is in accordance with IR A-5.

**1.3 Ceiling Support Hangers**

Suspended ceilings constructed in accordance with either Section 2 or Section 3 below require wire hangers as follows:

**1.3.1** Hanger wire material, gauge, and turn of wire connections shall comply with Section 1.1.3 above.

**1.3.2** Hanger wire shall be attached to main runners as defined in Section 2 or 3 below.

**1.3.3** Hanger wire spacing shall not exceed 4 feet on center in both plan directions.

**1.3.4** Hanger wire shall be located at the ends of all main and cross runners within 6 inches of the edge of the ceiling (i.e., wall or expansion/seismic joint) and within one-fourth (1/4) of the length of the end tee, whichever is least. Perimeter wires are not required when the length of the end tee is 6 inches or less.

**1.3.5** Hanger wires shall not be out of plumb by more than 1:6 (horizontal to vertical) unless counter-sloping wires are provided in accordance with ASTM C1858 Figure 1. Counter-sloping wires are not allowed unless detailed on the DSA-approved construction documents.

**1.3.6** Hanger wires shall be separated at least 6 inches from all unbraced components (e.g., ducts, pipes, conduit, etc.) above the ceiling.

**1.3.7** Hanger wires shall be attached to the floor or roof structure above in accordance with ASTM C636. Sheets 4.20 through 4.29 provided in Appendix A of IR 25-2 are acceptable means of connecting hanger wires to the structure.

**1.3.8** Where obstructions occur above the ceiling, trapeze or other supplementary supports are required to maintain the required hanger spacing. Sheets CG6.10 and CG6.20 of OPD-0003-13 show acceptable means of supporting hanger wires at obstructions.

**1.3.9** Provide additional hanger wires as required at expansion joints, discontinuities, breaks, or other special conditions.

**1.3.10** Where post-installed anchors supporting hanger wires are installed in existing concrete, construction embedment depths shall be designed to avoid existing reinforcement. Special care shall be taken to protect the tendons in prestressed concrete.

**1.4 Access Panels**

Access to the space between the ceiling and the floor or roof above is not permitted. A ceiling that is required by the CBC to be accessible shall be designed by the responsible design professional to meet the applicable requirements of CBC Sections 1607A and 2508.1, and ASCE 7 Section 13.3.1.

**1.4.1** Small access panels for the inspection, adjustment or repair of utility switches, valves, sensors, etc. may be allowed if the panel is less than 300 square inches.

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**1.4.2** Small access panels shall have a permanently attached warning label stating the following: "Warning: Do not climb, walk, or crawl on the gypsum board ceiling panels or metal framing. Do not store or stow anything on the gypsum board ceiling panels or metal framing."

**1.4.3** If fire fighter access is required per CBC Section 1209.2 in attics of combustible construction, the prescriptive suspended ceiling systems prescribed in this IR are not applicable, and the ceiling shall be designed and framed for such loading.

**1.5 Ceiling Luminaires, Services and Other Devices**

Suspended gypsum board ceilings shall not support building components other than luminaires, HVAC terminals, flexible sprinkler hose fittings, or other lightweight devices weighing 20 pounds or less such as strobe lights, occupancy sensors, exit signs, etc. Luminaires, HVAC terminals, flexible sprinkler hose fittings, and other lightweight devices are referred to in this section generally as fixtures.

**1.5.1** Fixtures shall be mounted to resist gravity loads in accordance with this section in a manner that will not compromise the ceiling performance. Independent supports as required by Sections 1.5.1.4 and 1.5.1.5 below shall have a capacity to resist four times the weight of the fixture.

**1.5.1.1** No gravity loads other than the gypsum board weight shall be applied to the typical cross runners or cross furring. Additional cross runners or cross furring members may be added to the system and specifically dedicated to the support of fixtures.

**1.5.1.2** Gypsum board shall not support any fixture.

**1.5.1.3** Fixtures weighing 20 pounds or less may be supported by main runners or by supplemental framing connected to the main runners. Fixtures weighing more than 10 pounds shall have a minimum of one #12-gauge safety wire connected from the fixture to the structure above. Safety wires are not required to be taut.

**1.5.1.4** Fixtures weighing 56 pounds or less but more than 20 pounds shall be independently supported to the structure above by not less than two taut #12-gauge wires. Other means of supporting the fixture independent of the ceiling system are acceptable when approved by DSA.

**1.5.1.5** Fixtures weighing more than 56 pounds shall be independently supported to the structure above by not less than four taut #12-gauge wires. Other means of supporting the fixture independent of the ceiling system are acceptable when approved by DSA.

**1.5.2** Fixtures shall be positively attached to the ceiling suspension system by mechanical means to resist a horizontal force equal to the weight of the fixture. The total weight of the suspended ceiling system inclusive of all fixtures resisted by its seismic force resisting system as described in Section 4 below shall not exceed 4 PSF.

**1.5.2.1** A minimum of two screws or approved fasteners are required at each fixture.

**1.5.2.2** Surface-mounted fixtures shall be attached to main runners with positive clamping devices complying with the following:

**1.5.2.2.1** Provide at least two positive clamping devices on each fixture. Provide additional devices for fixtures exceeding 56 pounds or 8 feet in length.

**1.5.2.2.2** Clamping device shall completely surround the supporting ceiling runner.

**1.5.2.2.3** Clamping device shall be made of steel with a minimum thickness of #14 gauge.

**1.5.2.2.4** Rotational spring catches are not compliant.

**1.5.2.2.5** Spacing of clamping device shall not exceed 8 feet.

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**1.5.2.3** When seismic forces are resisted by lateral force bracing assemblies per Section 4.2 below, fixtures shall comply with ASTM E580 Sections 5.3 and 5.4.

**1.5.3** When code-prescribed seismic forces induce lateral movement of the suspended ceiling of ¼ inch or more, penetrations through the ceiling for sprinkler heads and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall comply with one of the following per ASTM E580 Section 5.2.8.5:

**1.5.3.1** Provide a 2-inch oversized ring, sleeve, or adapter through the gypsum board to allow free movement of 1 inch in all horizontal directions.

**1.5.3.2** Provide a flexible sprinkler hose fitting that can accommodate 1 inch of ceiling movement.

**1.5.4** Pendant Luminaires: Comply with *IR 16-9: Pendant Luminaires*.

## **1.6 DSA Acceptance of Evaluation Reports**

At the discretion of DSA, proprietary systems may be accepted as follows:

**1.6.1** Acceptance will be granted on a project-specific basis.

**1.6.2** Proprietary systems must meet the requirements of CBC.

**1.6.3** Proprietary systems must have valid evaluation reports meeting the provisions of IR A-5.

## **2. T-BAR SYSTEM**

### **2.1 Vertical Support System**

**2.1.1** Ceiling suspension system and its components shall comply with ASTM C635, ASTM C645, the applicable sections of ASTM E580, and the product's evaluation report. Ceiling system shall be installed in accordance with ASTM C636 and ASTM E580 Section 5.2.

**2.1.2** Main runner spacing shall not exceed 4 feet on center and the ceiling area supported by each hanger wire shall not exceed 16 square feet. Hanger wires shall comply with Section 1.3 above.

**2.1.3** Main runners shall be heavy duty "T" shaped sections in accordance with ASTM C635.

**2.1.3.1** Heavy duty main runners shall be capable of carrying an equivalent uniform load of 16 pounds per linear foot (PLF).

**2.1.3.2** Wire attachments to main runners shall be made in pre-punched holes or holes drilled in accordance with the manufacturer's installation requirements.

**2.1.4** Cross runners shall be "T" shaped sections with sufficient capacity to support the screw-attached gypsum board and meeting the following requirements:

**2.1.4.1** Cross runners shall be spaced no further than 24 inches on center.

**2.1.4.2** Cross runners shall meet the deflection criteria of ASTM C635 Section 4.2.

**2.1.4.3** Cross runners shall be connected to main runners in accordance with the manufacturer's requirements.

**2.1.4.4** Hanger wires are required at the ends of cross runners greater than 6 inches in length adjacent to the edge of the ceiling (i.e., wall or expansion/seismic joint).

**2.1.5** Main runners, cross runners, splices, expansion devices, and intersection connectors shall be designed to carry a mean ultimate test load of not less than 180 pounds in compression and tension per ASTM E580 Section 5.1.2.

**2.1.6** Main and cross runners shall have a bottom flange width of 1-1/4 inches or larger to provide sufficient attachment of the gypsum board at panel edges.

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**SUSPENDED GYPSUM BOARD CEILING: 2019 CBC****2.2 Seismic Force Resistance**

Suspended gypsum board ceilings using the T-Bar System shall have a system to resist seismic loads in accordance with Section 4 below.

**Exception:** Suspended ceiling systems with an area of 144 square feet or less surrounded by walls that are laterally braced to the structure above do not require lateral bracing assemblies per Section 4.2 below nor diaphragm analysis per Section 4.3 below.

**3. LEGACY SYSTEM****3.1 Vertical Support System**

**3.1.1** Main runner spacing shall not exceed 4 feet on center and the ceiling area supported by each hanger wire shall not exceed 16 square feet. Hanger wires shall comply with Section 1.3 above.

**3.1.2** Main runner size, spacing, and spans shall comply with ASTM C754 Table 7. The main runner most frequently used is a 1-1/2-inch cold-rolled channel conforming to SSMA designation 150U050-54, weighing 0.414 PLF, and spaced no more than 4 feet on center maximum.

**3.1.3** Cross furring shall be 7/8-inch galvanized steel hat channel sections conforming to SSMA designation 087F125-18 and spaced at 24 inches on center maximum.

**3.1.4** Hanger wires shall be saddle-tied to the main runners. Refer to IR 25-2 Appendix A, Sheet 4.29 or OPD-0003-13, Sheet CG2.31 for acceptable saddle tie details.

**3.1.5** Cross-furring shall be saddle-tied to the main runners with at least one strand of #16-gauge or two strands of #18-gauge wire. Refer to OPD-0003-13, Sheet CG2.32 for an acceptable saddle tie detail.

**3.1.6** Main runners shall be spliced by lapping and interlocking flanges and installing two #8 sheet metal screws at each end of splice (four screws total). The lap shall be 12 inches long minimum. Refer to OPD-0003-13, Sheet CG2.31 for an acceptable splice detail.

**3.1.7** Cross-furring shall be spliced by lapping and interlocking the pieces and installing two #8 sheet metal screws at each end of splice (four screws total). The lap shall be 8 inches long minimum. Refer to OPD-0003-13, Sheet CG2.31 for an acceptable splice detail.

**3.2 Seismic Force Resistance**

Suspended gypsum board ceilings using the Legacy System shall have a system to resist seismic loads in accordance with Section 4 below.

**Exception:** Suspended ceiling systems with an area of 144 square feet or less surrounded by walls that are laterally braced to the structure above do not require bracing assemblies per Section 4.2 below nor diaphragm analysis per Section 4.3 below.

**4. SEISMIC FORCE RESISTING SYSTEM**

Suspended gypsum board ceilings shall resist the seismic forces resulting from the mass of the ceiling itself. The ceilings and their seismic force resisting system shall not resist seismic forces resulting from the mass of other components, such as partition walls.

**4.1 General Requirements**

**4.1.1** Seismic loads are permitted to be resisted by either of the systems defined in this Section as follows:

**4.1.1.1** Lateral force bracing assemblies in accordance with Section 4.2 below.

**4.1.1.2** Diaphragm system in accordance with Section 4.3 below.

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**4.1.2** Either or both options may be specified on the DSA-approved construction drawings. If both options are provided on the construction drawings as options, only one option can be used for each separate ceiling area.

**4.1.3** Fire-resistance-rated systems shall be installed per their listing (i.e., Underwriter Laboratories [UL], Factory Mutual [FM], etc.) and the manufacturer's installation instructions, which may dictate the lateral system used.

**4.2 Lateral Force Bracing**

Lateral force bracing assemblies shall comply with ASTM E580 as modified by ASCE 7 Section 13.5.6 and CBC Section 1617A.1.21.

**4.2.1** Lateral force bracing assemblies shall consist of a compression strut and four #12-gauge splayed bracing wires oriented 90 degrees from each other.

**4.2.1.1** For the T-Bar System per Section 2 above refer to IR 25-2 Appendix A, Sheet 2.35.

**4.2.1.2** For the Legacy System per Section 3 above refer to OPD-0003-13, Sheet CG2.10.

**4.2.2** Lateral force bracing assemblies shall be spaced, per Table 1 below for all values of the component importance factor ( $I_p$ ) of the ceiling. Where different brace spacing is specified at various stories, the respective ceiling plan shall clearly indicate the brace spacing.

**4.2.2.1** For the T-Bar System per Section 2 above refer to IR 25-2 Appendix A, Sheets 2.10 through 2.12.

**4.2.2.2** For the Legacy System per Section 3 above refer to OPD-0003-13, Sheets CG2.20 through CG2.22.

**TABLE 1: LATERAL FORCE BRACE ASSEMBLY SPACING**

Design Spectral Acceleration Parameter, ( $S_{DS}$ )	Brace Assembly Spacing	
	$z/h \leq 0.5^a$	$z/h > 0.5^{a,b}$
$S_{DS} \leq 1.15$	12'-0" x 12'-0"	12'-0" x 12'-0"
$1.15 < S_{DS} \leq 1.73$	12'-0" x 12'-0"	8'-0" x 12'-0"
$S_{DS} > 1.73$	8'-0" x 12'-0"	8'-0" x 8'-0"

Footnotes:

- a) Where, as defined in ASCE 7 Section 13.3.1:  
z = height in structure of point of attachment of ceiling with respect to the base.  
h = average roof height of the structure with respect to the base.
- b) It shall be permitted to use the brace assembly spacing for "z/h > 0.5" for the full building height.

**4.2.3** There shall be a brace assembly a distance of not more than one-half (1/2) of the spacing listed in Table 1 above from each surrounding wall, expansion joint, and edge of any ceiling vertical offset. For example, where the brace spacing is 8 feet by 12 feet, the edge distance shall be 4 feet in the direction of the 8-foot spacing and 6 feet in the direction of the 12-foot spacing.

**4.2.4** Bracing wires shall be taut and their slope shall not exceed 45 degrees from the plane of the ceiling.

**4.2.5** Bracing wire material, gauge, and turn of wire connections shall comply with Section 1.1.3 above.

**4.2.5.1** Bracing wires shall be separated at least 6 inches from all unbraced components (e.g., ducts, pipes, conduit, etc.) above the ceiling.

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**4.2.5.2** Screw-type anchors (i.e., screws, lag screws, eye screws, etc.) supporting brace wires and installed in wood structure shall be installed to align as closely possible with the direction of the wire. Clips supporting bracing wires shall be bent and rotated as required to align closely with the direction of the wire.

**4.2.5.3** Splices in bracing wires are not permitted unless detailed on the DSA-approved construction documents. Splices in bracing wires shall develop the wire allowable load. No more than one splice is allowed in each hanger wire. Refer to IR 25-2 Appendix A, Sheet 6.10 for an acceptable wire splice detail.

**4.2.5.4** The attachment of bracing wire to main runner shall not be more than 2 inches away from the compression strut.

**4.2.5.5** Power actuated fasteners in concrete are not permitted to support bracing wires.

**4.2.5.6** Where custom connections are required, attachment of the bracing wires shall be adequate for the load imposed. The ceiling weight shall not be taken as less than 4 PSF for calculating seismic forces in accordance with ASCE 7 Chapter 13.

**4.2.6** Ceiling grid members shall be connected to two adjacent walls and disconnected from the two opposite walls per ASTM E580 Section 5.2.3. Ceiling grid members shall be at least 1-inch clear of the disconnected walls.

**4.2.6.1** If walls run diagonally to ceiling grid system runners, one end of the main and cross runners shall be disconnected and a minimum of 1-inch clear of the wall.

**4.2.6.2** The width of the perimeter supporting closure angle shall be not less than 2 inches. Use of angles with smaller widths in conjunction with proprietary perimeter clips may be acceptable in accordance with Section 1.6 above.

**4.2.6.3** The closure angle shall be attached to the wall directly to studs spaced at no more than 24 inches on center.

**4.2.7** Compression struts shall meet the following requirements:

**4.2.7.1** Struts shall be sized to adequately resist the sum of the vertical component of the bracing wire force and the vertical seismic force. The slenderness ( $kl/r$ ) ratio of struts shall not exceed 300. Sections listed in IR 25-2 Appendix A, Sheet 3.21 meet this requirement for the maximum lengths listed.

**4.2.7.2** Compression strut material shall comply with Section 1.1.4 above.

**4.2.7.3** The strut shall not be out of plumb by more than 1:6 (horizontal to vertical).

**4.2.7.4** Compression struts weighing more than 10 pounds or longer than 10 feet shall be provided with a #12-gauge safety wire connected to the structure above. Safety wires are not required to be taut.

**4.2.7.5** Compression struts shall be separated at least 6 inches from all unbraced components (e.g., ducts, pipes, conduit, etc.) above the ceiling.

**4.2.8** Expansion and seismic separation joints shall be provided as follows:

**4.2.8.1** Expansion joints shall be provided in the ceiling at intersections of corridors and at junctions of corridors and lobbies or other similar areas.

**4.2.8.2** For ceiling area exceeding 2,500 square feet, a seismic separation joint shall be provided to divide the ceiling into areas not exceeding 2,500 square feet in accordance with ASTM E580 Section 5.2.9.

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**SUSPENDED GYPSUM BOARD CEILING: 2019 CBC****4.3 Diaphragm System**

A suspended gypsum board ceiling may be designed as a horizontal diaphragm to resist its own seismic loads as prescribed in this section.

**4.3.1** As prohibited by CBC Section 2508.6.6, gypsum board shall not be used in diaphragm ceilings to resist lateral forces imposed by partitions.

**4.3.2** Horizontal gypsum board ceiling diaphragm proportions shall comply with CBC Section 2508.6.1, including the maximum span-to-depth ratio of 1.5:1.

**4.3.3** There shall be no steps or vertical offsets in the ceiling plane within the span of the gypsum board diaphragm.

**4.3.4** The gypsum board installation shall comply with ASTM C840.

**4.3.5** An allowable diaphragm shear equal to 50 PLF is permitted for allowable stress design when the gypsum board is fastened to the cross furring with Hi-Lo Type S or S-12 bugle head screws complying with the following conditions:

**4.3.5.1** Screw size: #6 (0.136-inch diameter) or larger.

**4.3.5.2** Screw length: 1 inch or 1-1/4 inch.

**4.3.5.3** Screw spacing: 12 inches on center maximum at all gypsum board edges and intermediate supports.

**4.3.5.4** Screw edge distance: 3/8 inch minimum.

**4.3.6** A complete load path for the seismic loads transferred by the gypsum board diaphragm to the primary lateral force resisting system (e.g., diaphragm, shear wall, etc.) must be provided and substantiated.

**4.3.7** Ceiling diaphragm forces may be resisted through walls sheathed with gypsum board fastened in accordance with Section 4.3.5 above, which can be used to resist 50 PLF in the plane of the wall. The maximum height-to-width ratio of gypsum sheathed walls used for this purpose shall not exceed 1:1.

**4.3.8** Details are required to demonstrate the seismic load transfer from the gypsum board ceiling to the primary lateral force resisting system on all four sides of the diaphragm.

**5. EXISTING CEILING ALTERATION****5.1 Cut or Altered**

Where any portion of an existing suspended ceiling is cut or altered, the entire ceiling in the affected space shall be evaluated to the provisions of the current applicable codes, standards, and this IR. When the evaluation identifies a deficiency, the existing ceiling shall be upgraded to conform to the current provisions.

**5.1.1** Where the existing suspended ceiling has lateral force bracing assemblies spaced in compliance with Table 1 above, an evaluation and upgrade of the entire ceiling shall be required only if the area of alteration exceeds 10 percent of the entire ceiling area.

**5.1.2** For the purpose of determining upgrade requirements, the “entire” ceiling in the affected space is defined as the area of ceiling bounded by four walls or a combination of walls and expansion or seismic separation joints.

**5.1.3** With DSA concurrence, other existing lateral force bracing systems may be deemed equivalent to a four-way splay wire and compression post lateral force bracing system.

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Where the ceiling grid is not cut or altered and the scope of work complies with the following, an upgrade of the ceiling, suspension system, and lateral force bracing assemblies is not required:

**5.2.1** Replacement of luminaires or fixtures with units of equal size and equal or lesser weight placed in the same location.

**5.3 Reuse of Existing Ceiling Wires**

Existing ceiling hanger and bracing wires may be reused provided they comply with the following:

**5.3.1** The gauge and spacing of wires must comply with the current applicable codes, standards, and this IR.

**5.3.2** Where a new wire is to be spliced to an existing wire, the design professional in general responsible charge must prepare and obtain DSA approval of a detail defining how the splice is to be made. Detail 6.10 provided in Appendix A of IR 25-2 is an acceptable means of splicing hanger or brace wires.

**5.3.3** Existing hanger and bracing wire assemblies shall be tested in accordance with Section 7.3 below.

**6. CONSTRUCTION DOCUMENTS****6.1 General Requirements**

The items listed in this section are required to be provided in the construction documents where applicable to the project scope. This list includes items common to most projects but is not all-inclusive for every project.

**6.1.1** Additional information and/or details may be required on the construction documents for a specific project for specialty conditions, configurations, products, etc.

**6.1.2** It is not permitted to reproduce this IR on the construction documents as a means to meet these requirements.

**6.2 Ceiling Systems**

When the T-Bar System described in Section 2 above is used, a list of acceptable grid systems must be shown on the construction documents and shall specify the following for each acceptable grid system:

**6.2.1** Manufacturer.

**6.2.2** Product name.

**6.2.3** Evaluation report number.

**6.2.4** Main and cross runner part, model, or catalog numbers.

**6.2.5** Seismic wall clip when applicable.

**6.3 Suspension System**

The ceiling suspension system and its anchorage to the structure shall be fully detailed.

**6.3.1** Where accepted proprietary components are utilized, the details on the construction documents shall be in compliance with all evaluation report requirements.

**6.3.2** Trapeze or other supplementary support members provided so that typical hanger spacing can be maintained while avoiding obstructions shall be shown on the construction documents.

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**SUSPENDED GYPSUM BOARD CEILING: 2019 CBC****6.4 Lateral System**

The system used to resist the seismic load of the suspended gypsum board ceiling shall be fully detailed.

**6.4.1 Lateral Force Bracing Assemblies:** The lateral force bracing system, including bracing wires, compression struts, anchorage to the structure, expansion/seismic separation joints, and other requirements of Section 4.2 above, shall be fully detailed. The bracing assembly spacing at each floor and roof level must be clearly specified.

**6.4.2 Diaphragm:** The diaphragm system requirements of Section 4.3 above shall be specified and fully detailed.

**6.5 Luminaires, Services and Devices**

Anchorage, support, and bracing details for all luminaires, terminals, flexible fire sprinkler hose fittings, and other devices shall be provided in compliance with the requirements of this IR.

**6.6 Partition Walls**

The construction documents shall include partition wall details that demonstrate an independent lateral load path and ensure the partition walls do not impose additional lateral forces on the ceiling.

**6.7 Construction Details**

Typical construction details presented in other resource documents are deemed to meet the general requirements of this IR.

**6.7.1** Refer to Section 1.2 above for cited resources. All qualifications contained in the resource document are also applicable to use in accordance with this IR.

**6.7.2** When details from an appropriate reference document are used, they shall be incorporated into the construction drawings submitted for DSA approval. Incorporation by reference alone is not permitted.

**7. TESTING****7.1 General**

All field testing must be performed in the presence of the project inspector or a special inspector. Slack safety wires required for luminaires, services, or other devices shall be considered hanger wires for testing requirements.

**7.2 New Ceiling Wires**

Installation of new hanger and bracing wires requires testing as follows. These testing requirements shall be indicated on the construction documents.

**7.2.1** Post-installed anchors in concrete shall be tested in accordance with CBC Section 1910A.5.

**7.2.2 Hanger Wires:** Post-installed anchors in concrete used to fasten hanger wires shall be tested at a frequency of 10 percent.

**7.2.2.1** Tension test load shall be 200 pounds minimum.

**7.2.2.2** When allowed by its evaluation report, anchors may be torque tested. Power actuated fasteners shall be tension tested; torque testing is not allowed.

**7.2.3 Bracing Wires:** Post-installed anchors in concrete used to fasten bracing wires shall be tested at a frequency of 50 percent.

**7.2.3.1** Tension test load shall be 440 pounds minimum.

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**7.2.3.2** Power actuated fasteners in concrete are not permitted for bracing wires.

**7.2.4** If any post-installed anchor fails testing additional testing is required in accordance with CBC Section 1910A.5.

### **7.3 Reuse of Existing Ceiling Wires**

Existing hanger and bracing wires to be reused in accordance with Section 5.3 above shall be tested as follows. These testing requirements shall be indicated on the construction documents.

**7.3.1** All existing ceiling hanger wire/anchor assemblies must be field tested to 200 pounds.

**7.3.2** All existing bracing wire/anchor assemblies must be field tested to 440 pounds.

**7.3.3** Where a new wire is spliced to an existing wire, each spliced wire/anchor assembly must be field tested to the loads given for existing assemblies above.

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### **REFERENCES:**

2019 California Code of Regulations (CCR) Title 24

Part 2: California Building Code (CBC), Sections 1617A.1.21, 1910A.5, 2506, 2508

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This IR is intended for use by DSA staff and by design professionals to promote statewide consistency for review and approval of plans and specifications as well as construction oversight of projects within the jurisdiction of DSA, which includes State of California public schools (K–12), community colleges and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

This IR is subject to revision at any time. Please check DSA's website for currently effective IRs. Only IRs listed on the webpage at <https://www.dgs.ca.gov/dsa/publications> at the time of project application submittal to DSA are considered applicable.