Purpose: The purpose of this Interpretation of Regulations (IR) is to provide guidelines for the installation of metal suspension systems for lay-in ceilings, for projects submitted to the Division of the State Architect (DSA) for review under the 2001 California Building Code (CBC). For projects submitted under the 2007 CBC, see DSA IR 25-2.07. For projects submitted under the 2007 of the 2010 CBC, see IR 25-2.07 or IR 25-2.10 respectively.

1. CEILING NOTES: The following notes will be acceptable in plans and specifications for ceiling systems whose total weight, including air conditioning/heating grills and light fixtures, does not exceed two (2) psf. Heavier systems, and those supporting lateral loads from partitions, will require special design details. Also, see IR 25-3 for heavier systems.

1.1 #12 gage (min.) hanger wires may be used for up to and including 4 ft. by 4 ft. grid spacing and shall be attached to main runners.

1.2 Provide #12 gage hanger wires at the ends of all main and cross runners within eight (8) inches of the support or within one-fourth (1/4) of the length of the end tee, whichever is least, for the perimeter of the ceiling area. End connections for runners which are designed and detailed to resist the applied vertical and horizontal forces may be used in lieu of the #12 gage hanger wires, subject to Division of the State Architect (DSA) review and approval.

1.3 Provide trapeze or other supplementary support members at obstructions to typical hanger spacing. Provide additional hangers, struts or braces as required at all ceiling breaks, soffits or discontinuous areas. Hanger wires that are more than 1 in 6 out of plumb are to have counter-sloping wires.

1.4 Ceiling grid members may be attached to not more than two (2) adjacent walls. Ceiling grid members shall be at least 1/2 inch clear of other walls. If walls run diagonally to ceiling grid system runners, one end of main and cross runners should be free, and a minimum of 1/2 inch clear of wall.

1.5 At the perimeter of the ceiling area where main or cross runners are not connected to the adjacent wall, provide interconnection between the runners at the free end to prevent lateral spreading. A metal strut or a #16 gage wire with a positive mechanical connection to the runner may be used. Where the perpendicular distance from the wall to the first parallel runner is 12 inches or less, this interlock is not required.
1.6  Provide bracing assemblies consisting of a compression strut and four (4) #12 gage splayed bracing wires oriented 90 degrees from each other (see Figure 1) at the following spacing:

1. For school buildings, place bracing assemblies at a spacing not more than 12 ft. by 12 ft. on center.

2. For Essential Services Buildings, place bracing assemblies not more than 8 ft. by 12 ft. on center.

3. Provide bracing assemblies at locations not more than one half (1/2) the spacings given above, from each perimeter wall and at the edge of vertical ceiling offsets. The slope of these wires shall not exceed 45 degrees from the plane of the ceiling and shall be taut. Splices in bracing wires are not to be permitted without special DSA approval.

4. Suspended acoustical ceiling systems with a ceiling area of 144 square feet or less, and fire rated suspended acoustical ceiling systems with a ceiling area of 96 square feet or less, surrounded by walls which connect directly to the structure above, do not require bracing assemblies when attached to two adjacent walls.

1.7  Fasten hanger wires with not less than three (3) tight turns. Fasten bracing wires with four (4) tight turns. Make all tight turns within a distance of 1-1/2 inches. Hanger or bracing wire anchors to the structure should be installed in such a manner that the direction of the anchor aligns as closely as possible with the direction of the wire.

**Note:** Wire turns made by machine where both strands have been deformed or bent in wrapping can waive the 1-1/2 inch requirement, but the number of turns should be maintained, and be as tight as possible.

1.8  Separate all ceiling hanger and bracing wires at least six (6) inches from all unbraced ducts, pipes, conduit, etc.

1.9  When drilled-in concrete anchors or shot-in anchors are used in reinforced concrete for hanger wires, 1 out of 10 must be field tested for 200 lbs. in tension. When drilled-in concrete anchors are used for bracing wires, 1 out of 2 must be field tested for 440 lbs. in tension. Shot-in anchors in concrete are not permitted for bracing wires. If any shot-in or drilled-in anchor fails, see CBC, Section 1923A.3.5.

**Note:** Drilled-in or shot-in anchors require special DSA approval prior to use in prestressed concrete.

1.10 Attach all light fixtures and ceiling mounted air terminals, to the ceiling grid runners to resist a horizontal force equal to the weight of the fixtures. Screws or approved fasteners are required.

1.11 Flush or recessed light fixtures and air terminals, weighing less than 56 lbs., may be supported directly on the runners of a heavy duty grid system but, in addition, they must have a minimum of two (2) #12 gage slack safety wires attached to the fixture at diagonal corners and anchored to the structure above. All 4 ft. x 4 ft. light fixtures must have slack safety wires at each corner.

All flush or recessed light fixtures and air terminals weighing 56 lbs. or more must be independently supported by not less than four (4) taut #12 gage wires, each attached to the fixture and to the structure above regardless of the type of ceiling grid system used.
The four (4) taut #12 gage wires, including their attachment to the structure above, must be capable of supporting four (4) times the weight of the unit.

1.12 All fixtures and air terminals supported on intermediate duty grid systems must be independently supported by not less than four (4) taut #12 gage wires each attached to the fixture or terminal, and to the structure above.

1.13 Support surface mounted light fixtures by at least two positive devices which surround the ceiling runner and which are each supported from the structure above by a #12 gage wire. Spring clips or clamps that connect only to the runner are not acceptable.

Provide additional supports when light fixtures are 8 ft. or longer.

1.14 Support pendant mounted light fixtures directly from the structure above with hanger wires or cables passing through each pendant hanger and capable of supporting four (4) times the weight of the fixture. A bracing assembly, per Figure 1, is required where the pendant hanger penetrates the ceiling. Special details are required to attach the pendant hanger to the bracing assembly to transmit horizontal forces.

1.15 Required notes on construction documents:

Classification of ceiling grid (fill in blanks).

Classification of ceiling grid is ______(1)____ duty.

Manufacturer's catalog number - main runner (2) (3) .

Manufacturer's catalog number - cross runner (2) (3).

Manufacturer's catalog number of detail for runner splice (3) .

(1) Fill in either "intermediate" or "heavy".

(2) Runners must be rated for duty listed.

(3) Show manufacturer, duty classification and catalog numbers. Show light fixture and air terminal or grille support details for grid duty classification selected. See Items 1.11 and 1.12 above.

2. ADDITIONAL REQUIREMENTS FOR FIRE RATED CEILINGS:

2.1 Provide Underwriter Laboratory (U.L.) design number or State Fire Marshal (SFM) listing number. The components and installation details must conform in every respect with the U.L. or SFM approval for the design number specified. Custom designs which combine components from different approved designs but have not been tested as a complete assembly are not acceptable.

2.2 For schools and Essential Services Buildings, bracing assemblies are required for each 96 square feet. The first bracing assembly is required not more than four (4) feet from each wall. A minimum of one bracing assembly is required between any two adjacent expansion cut-outs on runners being braced.

2.3 Pop rivets, screws, or other attachments are not acceptable unless specifically detailed on the drawings and approved by U.L. and SFM.

3. ADDITIONAL REQUIREMENTS FOR METAL PANELS: Metal panels and panels weighing more than 1/2 psf, other than acoustical tile, are to be positively attached to the ceiling suspension runners.
4. **SUSPENDED ACOUSTICAL CEILINGS BELOW GYPSUM BOARD CEILINGS:** Where gypsum board or other ceiling finishes are attached to the framing, special details will be required for the vertical hanger wire and lateral bracing wire support connections to the framing.

5. **REUSE OF EXISTING CEILING HANGER WIRES AND SPLAY WIRES:**

   5.1 The gage and spacing of the wires must comply with the current applicable codes.

   5.2 All existing ceiling hanger wires must be tested to 200 lbs. in tension.

   5.3 All existing splayed bracing wires must be field tested to 440 lbs. in tension.

   5.4 If a new wire is to be spliced to an existing wire, the following is required:

   1. The architect or structural engineer in general responsible charge must submit to DSA a detail and specification describing how the splice is to be made.

   2. All new wires, after being spliced to the existing wires, must be field tested per Items 5.2 and 5.3 above.

   3. All field tests must be performed in the presence of the project inspector.

6. **LIST OF DSA PRODUCT ACCEPTANCE FOR SUSPENDED ACOUSTICAL CEILING SYSTEMS**

   **DSA Product Acceptance (PA) Report #**

   | PA-008 | Tectum I and Tectum II - Form Board, Acoustical Board and Suspended Ceiling Tile |
   | PA-022 | Armstrong Cassettes 800 Series Metal Ceiling System |
   | PA-026 | Chicago Metallic Suspended Ceiling System |
   | PA-030 | USG Interior Donn Suspended Ceiling Grid Systems |
   | PA-041 | Armstrong World Industries Suspended Ceiling System |
   | PA-078 | Metaline, Plantostile and Magna T-Cell Suspended Ceiling Systems |

   **Note:** Alternate manufacturers and systems may be submitted for review and acceptance by the Division of the State Architect.
Compression struts:
Steel section with l/r ratio of 200 maximum. Attach to main runners within 2" of cross runner with 2-#12 self-drilling self tapping (SDST) screws and to structure with 2-#12 x 2" screws at wood or 3/16" diameter anchor at concrete/steel. Compression strut shall not replace hanger wire.

**Note:**
See figures 3, 4, 5, 6 for connections of bracing & hanger wire to the structure above.

- Compression strut
- 12 ga. bracing wire w/min. 4 tight turns in 1 1/2" both ends of wire - connect to main runner
- 12 ga. vertical hanger wire at 4'-0" each way (4' oc at main runner) minimum 3 tight turns in 1 1/2" both ends (typical)
- 2" (max) from bracing wires to compression strut and cross runner
Figure 2

ACCEPTABLE HANGER WIRE CONNECTION GRID

Spacers may be slotted angles or channels with "diamond points" of spring steel which snap tight to prevent movement of strut.

12 ga. hanger wire
8" max. or note (1) below

Alternate location w/o nail. Notching permitted only at runner

Min 3 tight turns in 11/2"

Main or cross runner
Acoustic panel

Slotted angle spacer w/horizontal ringshank nail (see note (2) below)

Notes:
(1) 1/4 of the length of the end runner whichever is less.
(2) Nails at the end of horizontal struts are to be placed with nail head toward centerline of span of strut
Figure 3A

ACCEPTABLE DETAILS – WIRE CONNECTIONS TO WOOD FRAMING

(A) Wood Joist or rafter

Three 1½” x 9 ga. staples or 3-stronghold “J” nails at each wire loop

(B) Wood Joist or rafter

1/4” dia. screw eye with full thread embedment (1¼” min.) install in direction of wire

1” min.

3” max.

(C) Wood Joist or block

Three 1½” x 9 ga. staples or three stronghold “J” nails at each wire loop

2 X blkg. w/2-16d common nails at ea. end

(D) At bottom of joist

For bracing wires – fully embed screw eye threads in direction of wire

1/4” dia.
drilled hole

2” min.

Hanger wire
Saddle tie-see (F)

(E) Bracing wire parallel to wood truss

Bracing wire

Hanger wire saddle tie (F)

Brace wire saddle tie per detail (F)

(F) Typical saddle tie

Note: Saddle tie has double loop at support

Hanger wires-3 tight turns and bracing wires 4 tight turns

Saddle tie required for all widths greater than 1/2”
Figure 3B

ACCEPTABLE DETAILS – WIRE CONNECTION AT WOOD FRAMING

Plywood floor/roof sheathing

Wood I-joist

Ceiling splay wire attached to joist bottom flange per (H)

Add 2½" x 20 ga. stud* w/(1) #10 x 1" wood screw to each of 3 joists. Place stud flat and within 6° of splay wire.
*Alternate: 2 x 4 flat with 1-10d or 1-#10 x 3" screw to each of 3 truss bottom flanges

(G) Wood I-joist

Note: Do not insert screw eyes parallel to laminations

1/4" dia. screw eye with 1½" min. penetration align with brace wire

Brace wire with 4 tight turns

(H) Wood I-joist bottom flange

1/4" dia. screw eye with 1½" min. penetration at bottom flange

Hanger wire with 3 tight turns

1" minimum
Figure 4

ACCEPTABLE DETAILS – WIRE CONNECTION TO CAST-IN-PLACE CONCRETE

(A) Vertical hanger wire clip attachment

(B) Splayed bracing wire clip attachment

(C) Hanger wire at C.L.P. concrete

(D) Brace wire at C.L.P. concrete
**Figure 5**

**ACCEPTABLE DETAILS – WIRE CONNECTION TO STEEL FRAMING**

(A) At steel beams

- Steel strap see Fig. 4 detail (B)
- Structural steel member
- Ceiling clip see Fig. 4 detail (A) with shot-in anchor attachment (test for 200 lbs)
- Vertical hanger wire (test for 440 lbs)
- Splayed brace wire with shot-in anchor attachment

(B) At open-web steel joist

- Web member
- Bottom chord
- Vertical hanger wire
- Saddle tie per Fig. 3 A detail (F)
- Splayed bracing wire

Splay wires parallel to joist. Splay wires can not be perpendicular to joist.

(C) At steel roof deck

- Insulation over steel deck
- 20 ga. min. deck
- Bracing wire
- Steel strap 3” wide x 4” long x 12 ga. (minimum)
- 2-#8 x 1/2” self-tapping screws

(D) At steel roof deck

- Insulation over steel deck
- #3 x 12” rebar
- 20 ga. min. deck
- Hanger wire tie to #3 rebar with three wraps around rebar and one wrap around wire

Note: If self-tapping screws are used with concrete fill, set screws before placing concrete
Figure 6

ACCEPTABLE DETAILS – WIRE CONNECTIONS TO STEEL FRAMING

(A) At steel deck with insulation fill

(B) At steel deck with concrete fill

(C) At steel deck with concrete fill

(D) At steel deck with concrete fill

Note: If self tapping screws are used with concrete fill, set screws before placing concrete.
Figure 7
ACCEPTABLE LOCATION OF SLIP JOINTS IN ESB EXITWAYS

(A) Acceptable slip joint at exitways intersection

(B) Acceptable exitways details at essential services buildings (ESB

(C) Plan view

Refer to T-24
Part 2, Sec.
2501A.5

Connected wall

Continuous slip joint

Slip joint

Connected wall

Runner splice

Ledger angle

1/2" CLR

Typical hanger wire at 4'-0" o.c.

with pair of bracing
wires parallel to wall
at 12'-0" o.c. - see sections
1.6 & 1.7 of IR 25-2.01

Splice must be thru conn. - snap conn. unacceptable

Standard ledger angle - specify screw or bolt size (must connect to structure, not finish)

Typical hanger wire, see sections 1.1, 1.2, and 1.7
of IR 25-2.01

1/2" clear slip joint at adjacent

Typical splice

4'-0" o.c.

8" max
see Fig. 2

4'-0" o.c.

8" max
see Fig. 2

Typical hanger wire at 4'-0"

w/one pair of bracing wires parallel to wall
at 12'-0" o.c. - see sections
1.6 & 1.7 of IR 25-2.01

1/2" CLR

Typical hanger

Ledger angle

Connected wall

Runner splice

Wall slip

Splice all joints

Continuous runners

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