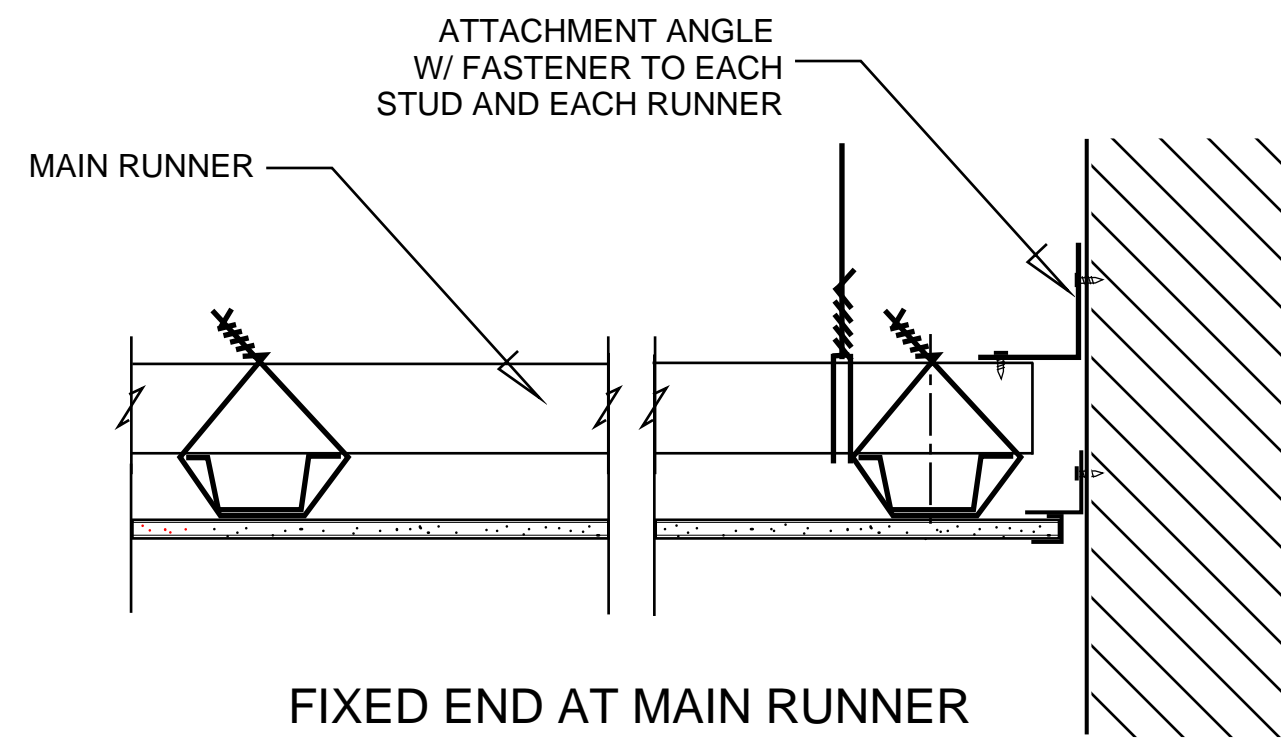
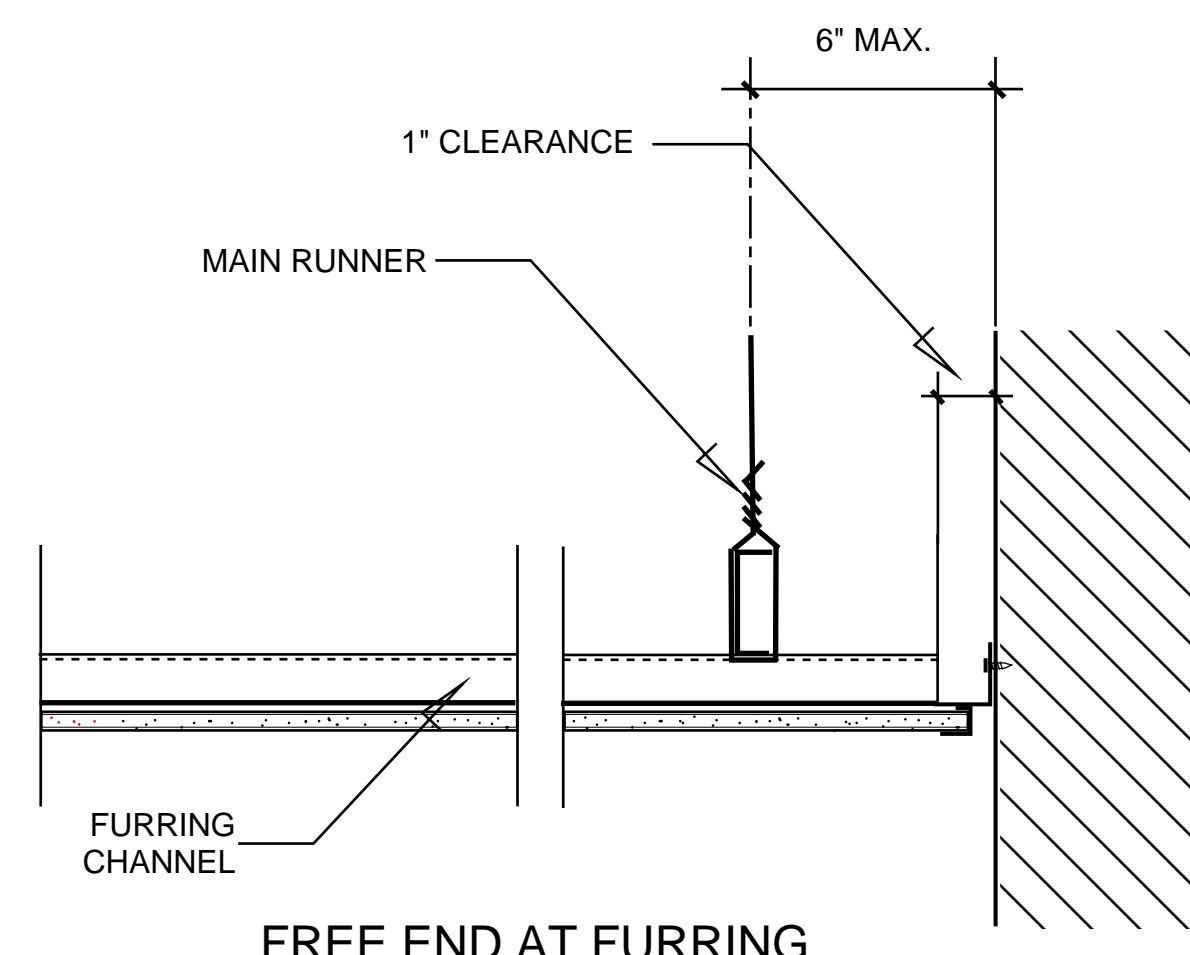


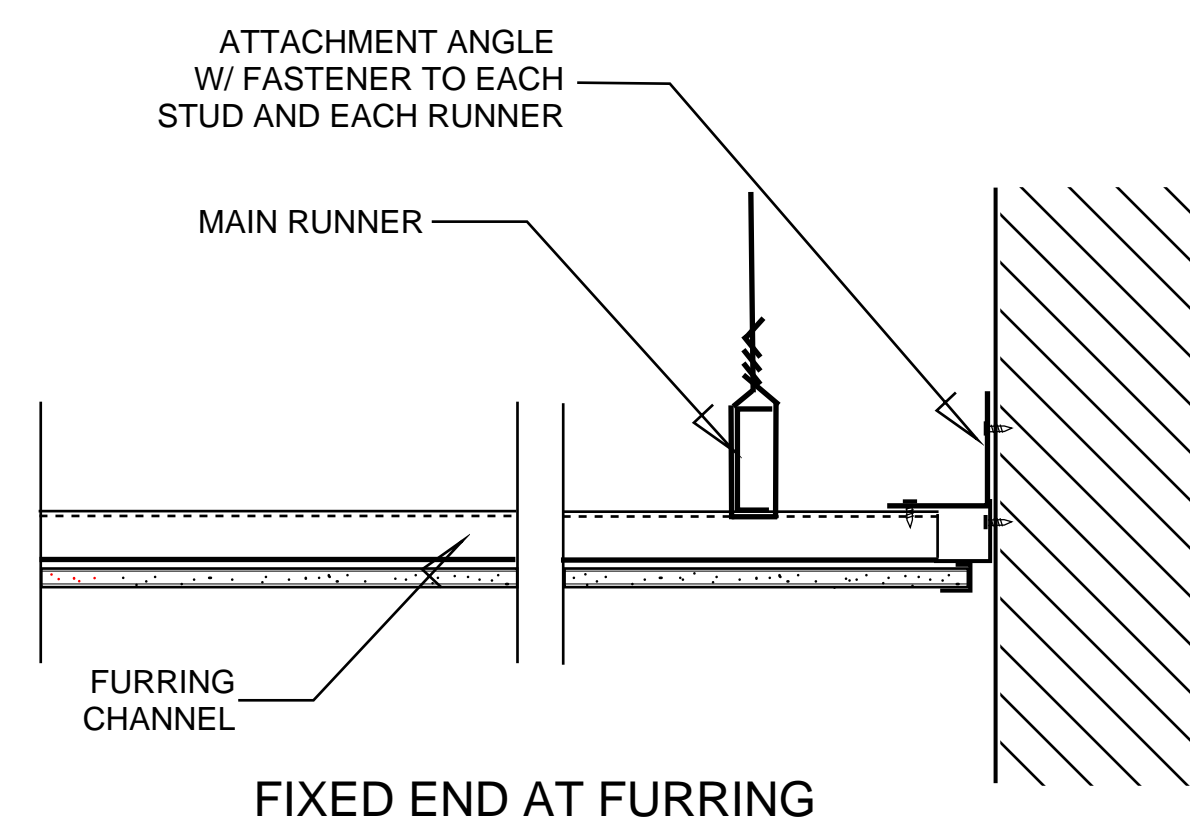
FREE END AT MAIN RUNNER



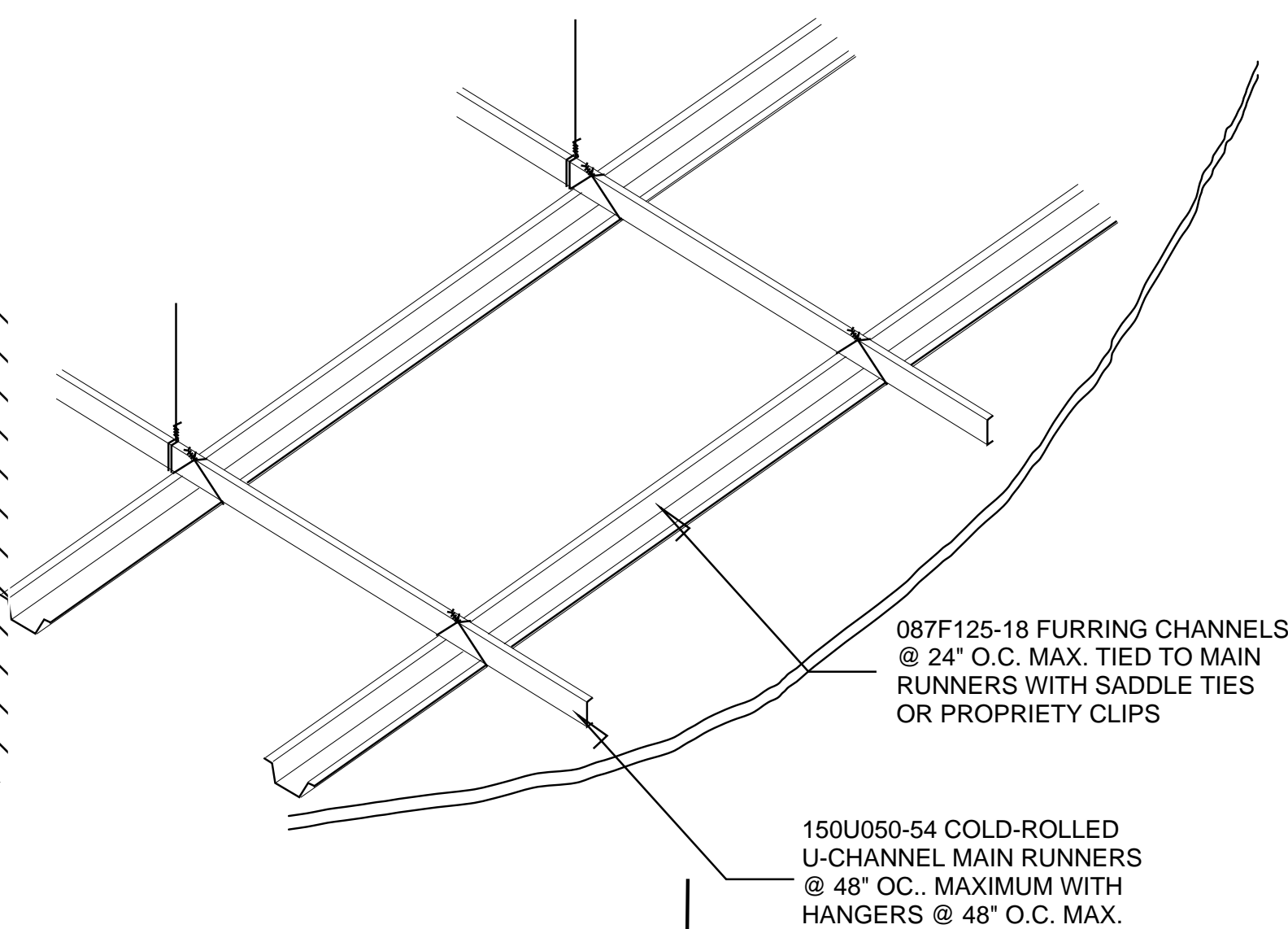
FIXED END AT MAIN RUNNER



FREE END AT FURRING



FIXED END AT FURRING



FURRING CHANNEL W/SADDLE TIE TO MAIN RUNNER AND SADDLE TIED HANGER

Installation of Gypsum Board

- The installation of gypsum board shall comply with ASTM C840-13, *Specification of Application and Finishing of Gypsum Board*.
- Screws for fastening gypsum board products to steel members less than 0.03 inches in thickness shall comply with ASTM C1002. [5.8.2.1]
 - Screws for attaching gypsum board products to cold-formed steel members shall be Type S, self-piercing tapping screws. [4.1.2]
 - The head of the screw shall rest immediately below the gypsum board surface without breaking the paper. [8.2.1; and C840, 6.8 and 7.1.6]
 - Deflection at design load shall not be more than L/240 of the span. [6.11]
- The application of gypsum board shall comply with Section 7.
 - When gypsum board is to be applied to both ceiling and walls, the ceiling shall be applied first to the ceiling, then to the walls. [7.1.3]
 - Where used at edges and ends of gypsum panels, fasteners shall be not more than 1 inch from edges, and at least 3/8 inch from the edges and ends of the panels.
- Screws shall be of sufficient length to penetrate the steel furring a minimum of 3/8-inch. [15.1.1]
- Screw spacing shall comply with C840, 8.5 [15.3.1]. For ceiling applications screws shall be spaced not more than 12 inches on-center.
- Gypsum Diaphragm** [DSA IR-25-3.13]. Per DSA IR-25-3.13 a gypsum diaphragm may be used to resist its own lateral loads (partitions shall be independently supported) where the length-to-width ratio is 2:1 maximum and the maximum shear is 50 plf for 5/8-inch thick gypsum wallboard attached to the framing with 1-1/4 inch Hi-Lo, Type S or S-12 bugle head screws @ 12-inches o.c. with minimum 3/8-inch edge distance at all edges. In addition, a positive connection shall be identified by the EOR.
- Floating Interior Angles Installation Method** [ASTM C840]. Where ceiling joists are used, the ceiling may be installed using the Floating Interior Angles Installation Method of ASTM C840, 19.
 - Application of Ceiling [ASTM C840, 19.2]. In the floating interior angles installation method the ceiling shall be applied first and the first fastener closest to the wall intersection shall be 12-inches for screwed or double nailed applications, or 7-inches for single nailed applications.
 - Wall Construction [ASTM C840, 19.3]. Gypsum wall board shall be applied on the walls to provide support for the floating edges of the ceiling gypsum board. The top fastener of the wall shall be 11- to 12-inches from the top edge of the gypsum wallboard for screw or double-nail applications or 8-inches for single nail applications. At wall vertical angles, the overlapping board shall be applied so as to bring back the underlying board into firm contact with the face of the framing members behind it. Fasteners shall be omitted in underlying board at the intersection.
- Control (Expansion) Joints** [ASTM C840, 20.3].
 - Control joints as provided on the plans [20.2]; and as required by Section 20.3.
 - Control joints in interior ceilings with perimeter relief shall be installed so that spacing between control joints do not exceed 50 linear feet and the total area does not exceed 2500 feet. [20.3.3]
 - Control joints in interior ceilings without perimeter relief shall be installed so that spacing between control joints do not exceed 30 feet and the total area does not exceed 900 square feet. [20.3.4]
 - A control joint or intermediate blocking shall be provided where ceiling members change direction.

DSA IR25-3.13 LATERAL SYSTEM FOR SINGLE-LAYER GYPSUM BOARD SUSPENDED CEILINGS

- Besides provisions for a horizontal diaphragm that is attached to walls or other vertical lateral force resisting elements, suspended ceiling systems larger 144 SF may be laterally braced by the lateral bracing system identified below.
- Lateral force bracing systems consisting of lateral force resisting splayed wires and compression struts similar to the lateral force resisting assemblies provided for suspended ACT and lay-in panel ceiling systems using four (4) #12 splayed bracing wires shall be placed as noted below based upon Table 1.

TABLE 1: LATERAL FORCE BRACE ASSEMBLY SPACING FOR GYPSUM CEILINGS	
Design Spectral Acceleration Parameter, S _{ds}	Brace Assembly Spacing
Less than or equal to 1.15	12'x12' Full building height
Greater than 1.15 and less than or equal to 1.73	8'x12' for z/h greater than 0.5 12'x12' for z/h less than or equal to 0.5
Greater than 1.73	8'x8' for z/h greater than 0.5 8'x12' for z/h less than or equal to 0.5

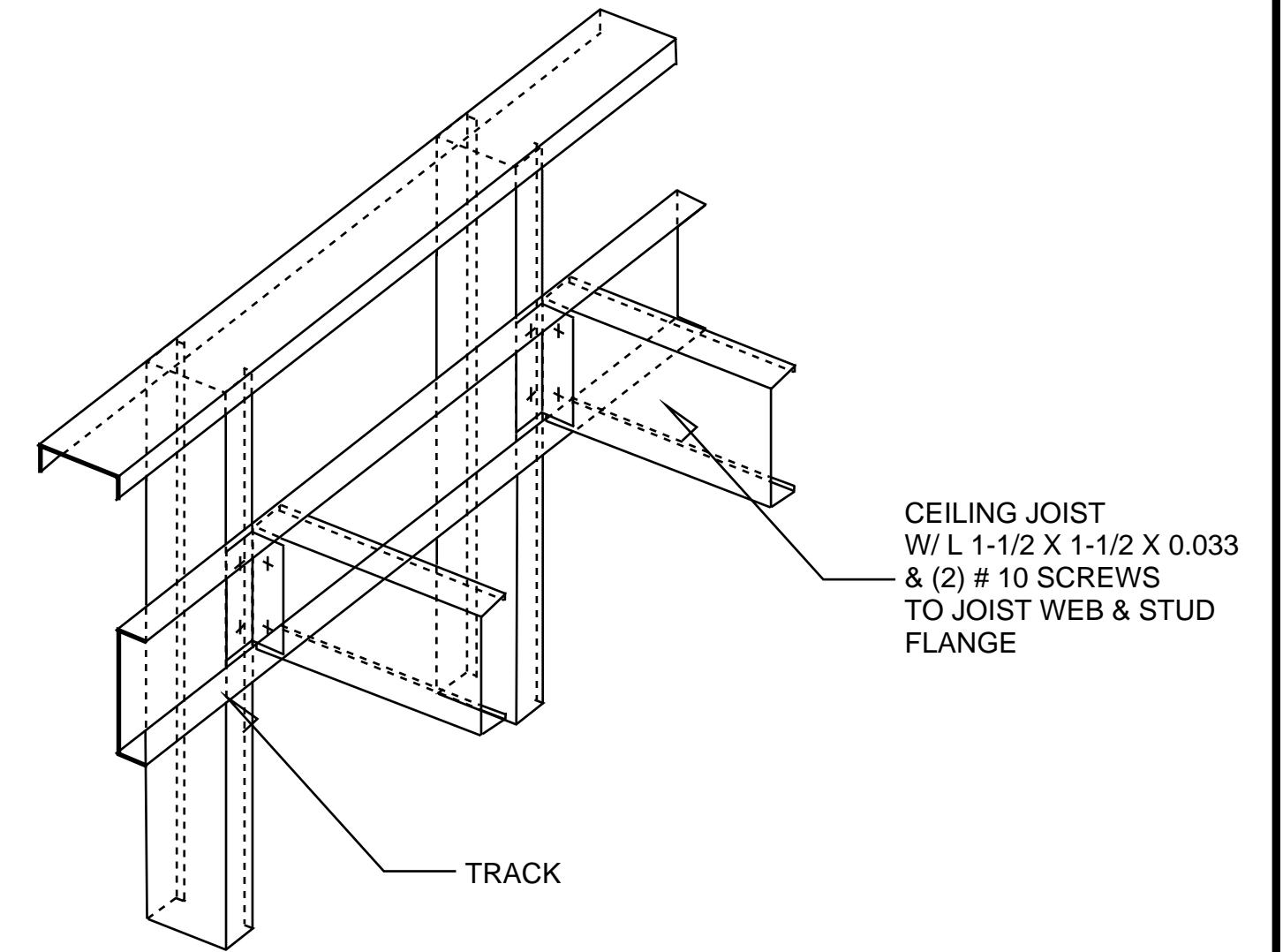
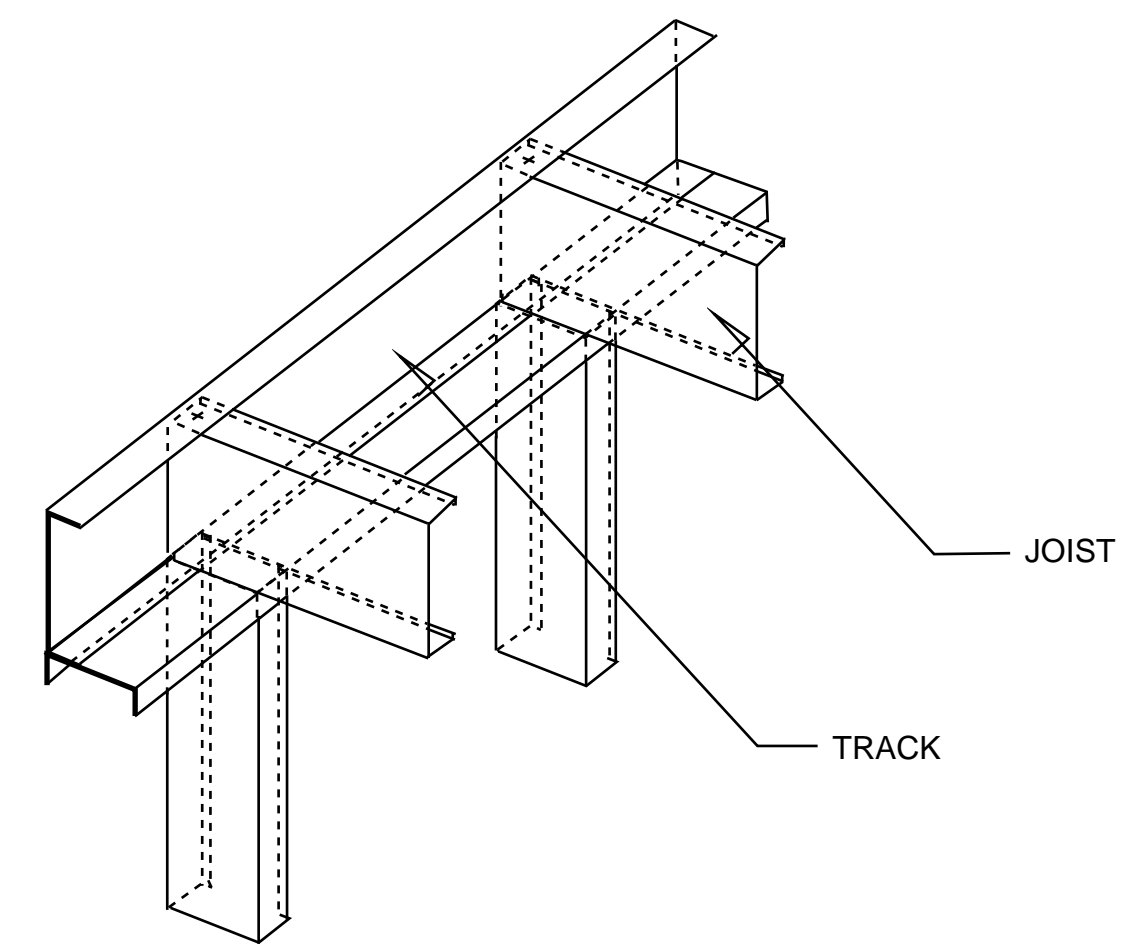
Where, as defined in ASCE 7, 13.3.1:
 Z = height in structure if point of ceiling attachment with respect to the base.
 h = average roof height of the structure with respect to the base

- The first brace shall be placed one-half the distance from the table above from the edges of the ceiling grid. Example: for a 8'x12' spacing the first brace shall be located 4-foot in the direction of the 8-foot spacing and 6-foot in the direction of the 12-foot spacing.
- Ceiling grids shall be attached to two adjacent walls and the other two sides shall be shown to move axially 1-inch.
- Bracing wires shall be splayed 90-degrees and shall have a maximum slope of 45-degrees from horizontal.
- Compression struts shall be as identified for suspended ACT and lay-in panel ceiling systems.

Metal Framing Systems

- Applicable Standards.**
 - Steel Framing Members [ASTM C754-15]
 - Seismic Design [ASCE 7-16, 13.5.6]
 - Installation of the Gypsum Panels [ASTM C840-13]
- Resistance of Single-Ply Gypsum Ceilings to Earthquake Loads.** Single-ply gypsum ceilings shall be surrounded by and connected to walls and/or soffits that are laterally braced to the structure above [ASCE 7, 13.5.6, Exception 2] or shall be shown in compliance with the suspended ceiling provisions of ASCE 7, 13.5.6 for suspended ceilings.

OSHPD or DSA Options. Except as provided within OSHPD-0003-13 for 12-gauge wires, the resistance to earthquake loads may be shown in compliance with OSHPD-0003-13 and/or DSA IR 25-3.13 (Revision 04/08/14) as provided for within ASCE 7-13.1.7.
- The installation of steel framing members that receive screw attached gypsum products shall comply with ASTM C754 where the steel framing and furring members shall comply with ASTM C645. [1.1 and 4.1]
- Details of fire-resistance rated construction shall comply with the listed assemblies. [4.2]
- Where applicable, tie or hanger wire shall be zinc-coated (galvanized) soft-annealed steel or of a material and size having equivalent corrosion resistance and strength. [4.2]
- Where used, rod and flat hangers shall be formed from steel complying with ASTM A336.
- Suspended ceiling systems as identified above shall comply with ASTM C754, Section 6.
 - Main runners for suspended shall comply with Section 6.5 or an approved manufacturer's recommendations.
 - Unless otherwise specified by the design professional, 150U050-54 cold-rolled channels shall be used in an upright position for the main runners to support a maximum 4 psf ceiling when used as a simple span or may be used for a maximum 6 psf ceiling for up to a 4'-10" span where used with two or more spans [ASTM C754, Table 7].
 - Where a manufacturer's assembly is identified, the sizes and spans of main runners shall comply with the recommendation from the manufacturer; where no recommendations are provided, the size and spans of main runners shall comply with Table 7. [6.5.1]
 - Furring members for suspended ceilings shall comply with ASTM C645 and C754, Section 6.6.
 - The minimum depth of rigid furring channels shall be 7/8-inch and the furring channels shall have minimum 1/2-attachment flanges [ASTM C645, 5.3]. (e.g.—087F125-18 for a 4-foot span and 24-inch o.c. spacing)
 - Furring members supporting 5/8-inch gypsum wall board applied perpendicular to the furring members shall be spaced at a maximum of 24 inch o.c. [Table 2; 6.6.1]
 - Furring members shall be securely attached to main runners with special clips; a saddle tie with No. 16 gage wire or a double strand of 18 gage wire; screws; or equivalent means. [6.6.2]
 - Cross furring members along the ceiling perimeter shall be supported by angles or channels attached to the wall.
- Hangers [6.1].
 - Wire, rod or flat hangers shall comply with Table 6. [6.1.1 & 6.1.2] For hanger wires supporting 16 SF of ceiling area, identify minimum No. 9 hanger wires (the provisions for OSHPD-0003-13 that allow 12-gauge wires are not to be applied)
 - Wire placed at 48-inches o.c. shall be saddle-tied to main runners so as to prevent turning or twisting of the member and to develop the full strength of the hanger [6.1.3] and terminate with three (3) complete 360-degree wraps within a distance of 3-inches. Alternatively rod hangers at 48-inches o.c. may be used.
- Where applicable, hangers for suspended ceiling systems from wood construction shall be shown to comply with Section 6.2.
- Where applicable, flat hangers and inserts shall be shown to comply with Section 6.4.
- Intersection of ceiling grid and walls.
 - Ends and sides of main-runners and cross-furring shall not come in contact with abutting masonry or concrete walls or partitions. A clearance of 1 inch shall be provided at the ends and 1/8 inch shall be provided at the sides. [6.5.1]
 - A main runner shall be provided within 6 inches of and parallel to adjacent walls to support the ends of cross furring.
 - The main runner shall be supported by hangers within 6 inches of each end.
- Where main runners or cross furring is spliced, the ends shall be lapped a minimum of 12 inches, the flanges shall be interlocked and the members shall be securely fastened near each end of the splice with screws, or with double loops of minimum No. 16 gage tie wire. [6.5.2]



Section	F _y (ksi)	4psf				6psf			
		Lateral Support of Compression Flange				Lateral Support of Compression Flange			
		Unsupported		Midspan		Unsupported		Midspan	
Joist Spacing (in) oc.		Joist Spacing (in) oc.		Joist Spacing (in) oc.		Joist Spacing (in) oc.			
16	24	16	24	16	24	16	24		
250-S125-18	7'-9"	6'-11"	10'-6"	9'-1"	6'-11"	6'-2"	8'-1"	7'-0"	
250-S125-30	9'-3"	8'-3"	11'-0"	9'-7"	8'-3"	7'-5"	9'-7"	8'-5"	
250-S137-30	10'-6"	9'-5"	11'-6"	10'-0"	9'-5"	8'-5"	10'-0"	8'-9"	
250-S162-33	12'-5"	10'-10"	12'-5"	10'-10"	10'-10"	9'-6"	10'-10"	9'-6"	
250-S162-43	13'-6"	11'-10"	13'-6"	11'-10"	11'-10"	10'-4"	11'-10"	10'-4"	
350-S125-18	8'-6"	7'-6"	11'-5"	9'-11"	7'-6"	6'-8"	9'-11"	—	
350-S125-30	10'-1"	9'-0"	14'-2"	12'-5"	9'-0"	8'-1"	12'-5"	10'-10"	
350-S125-33	10'-5"	9'-4"	14'-8"	12'-10"	9'-4"	8'-4"	12'-10"	11'-3"	
350-S137-30	11'-5"	10'-3"	14'-10"	13'-0"	10'-3"	9'-2"	13'-0"	11'-4"	
350-S162-33	13'-5"	12'-1"	16'-1"	14'-1"	12'-1"	10'-10"	14'-1"	12'-3"	
350-S162-43	14'-9"	13'-2"	17'-6"	15'-3"	13'-2"	11'-9"	15'-3"	13'-4"	
362-S125-30	10'-2"	9'-1"	14'-4"	12'-9"	9'-1"	8'-2"	12'-9"	11'-2"	
362-S125-33	10'-7"	9'-5"	14'-10"	13'-2"	9'-5"	8'-5"	13'-2"	11'-6"	
362-S137-30	11'-6"	10'-4"	15'-3"	13'-4"	10'-4"	9'-3"	13'-4"	11'-8"	
362-S162-33	13'-7"	12'-2"	16'-6"	14'-5"	12'-2"	10'-11"	14'-5"	12'-7"	
362-S162-43	14'-11"	13'-4"	18'-0"	15'-9"	13'-4"	11'-11"	15'-9"	13'-9"	
400-S125-30	10'-5"	9'-4"	14'-9"	13'-2"	9'-4"	8'-4"	13'-2"	11'-9"	
400-S125-33	10'-10"	9'-8"	15'-3"	13'-8"	9'-8"	8'-8"	13'-8"	12'-2"	
400-S137-30	11'-10"	10'-7"	16'-6"	14'-5"	10'-7"	9'-6"	14'-5"	12'-7"	
400-S162-33	13'-11"	12'-6"	17'-10"	15'-7"	12'-6"	11'-2"	15'-7"	13'-7"	
400S162-43	15'-3"	13'-8"	19'-5"	16'-11"	13'-8"	12'-2"	16'-11"	14'-10"	

Table from SSMA Product Technical Guide [ICC-ES ESR-3064P]

CEILING JOIST & SUSPENDED CEILING SYSTEM FOR SINGLE-PLY SCREW ATTACHED GYPSUM

DATE