

DETAILS

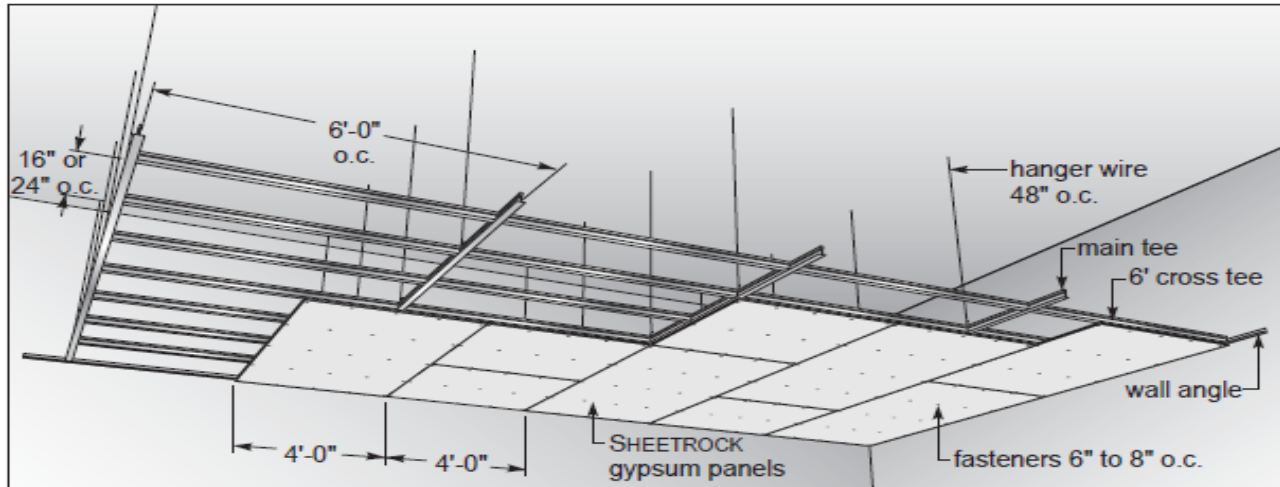
REFERENCES

STANDARDS

EXAMPLES OF DRYWALL SUSPENDED CEILING SYSTEM - NO MIXING COMPONENTS

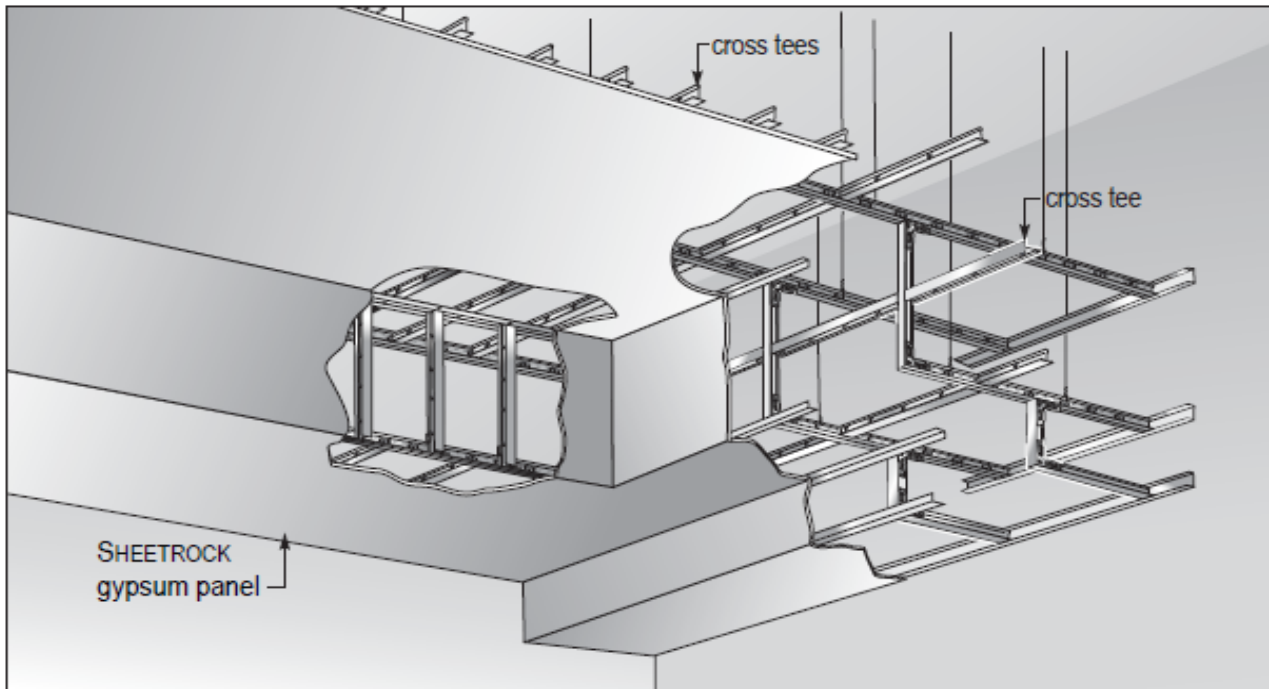
Flat Ceilings

Main tees shall be spaced a maximum of 72" on center and supported with hanger wires spaced a maximum 48" on center. Cross tees, if required, are spaced in accordance with manufacturer's recommendations. For fire-resistive assemblies, the hanger wire, main tees and cross tees shall be spaced in accordance with the assembly design. Searchable fire resistive assemblies with downloadable PDF, CAD or REVIT files are available on usgdesignstudio.com or refer to the UL directory.



Flat ceilings

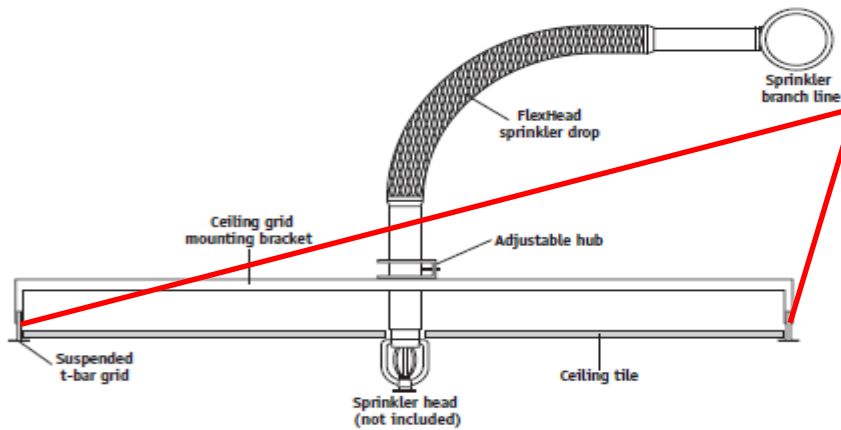
EXAMPLES OF DRYWALL SUSPENDED CEILING SYSTEM - NO MIXING COMPONENTS



Soffits on Ceilings

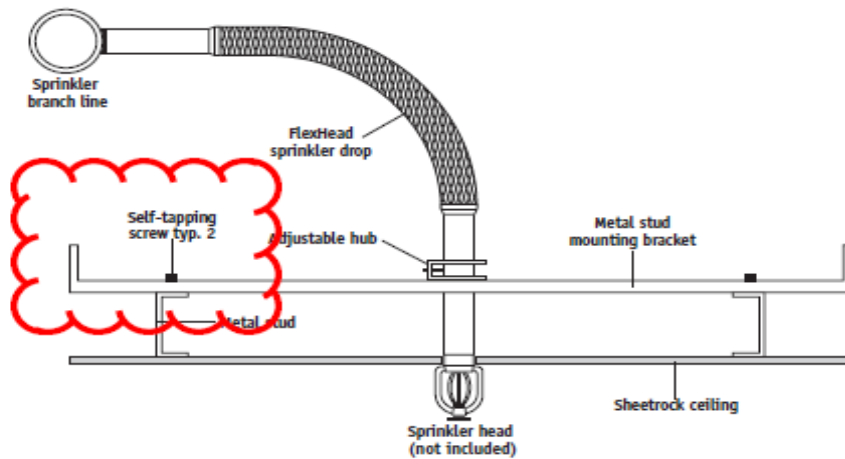
EXAMPLES OF FLEXIBLE SPRINKLER SUSPENDED CEILING SYSTEM ATTACHMENTS

FlexHead Suspended Ceiling Detail



If the "cross-runners" are not the same carrying capacity as the "main-runner" supplementary #12 gauge hanger wires shall be attached at each side.

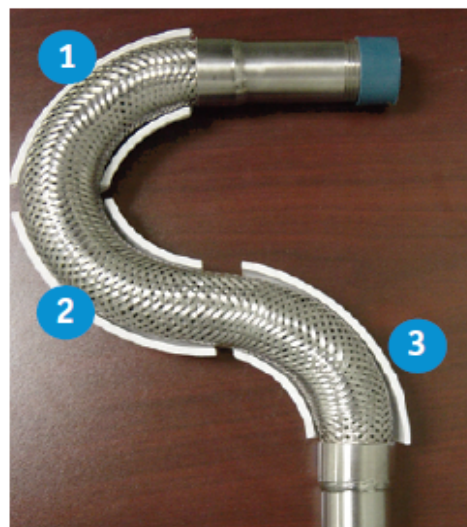
FlexHead Sheetrock Ceiling Detail



FlexHead 3" Bend Radius per UL Guidelines (2 Bends Shown)



FlexHead Shown with 3 Bends



EXAMPLES OF SEISMIC CONNECTORS FOR SUSPENDED CEILING SYSTEMS

SEISMIC JOINT CLIP

Cross Tee

It's simple to install with these easy steps:

How to install the Seismic Separation Joint Clip:

Step One: Install suspension system completely, in a conventional manner.

Step Two: Decide upon which run(s) of Main Runners to create the seismic separation.

NOTE: The Seismic Joint Clip allows for cross tees to move along the axis of the cross tees.

NOTE: Divide 2500 SF by the length of the run of mains in feet. The result will be the maximum spacing, in feet, for the separation joint. Round this result down to the nearest 4' increment when mains are installed 4' on center.

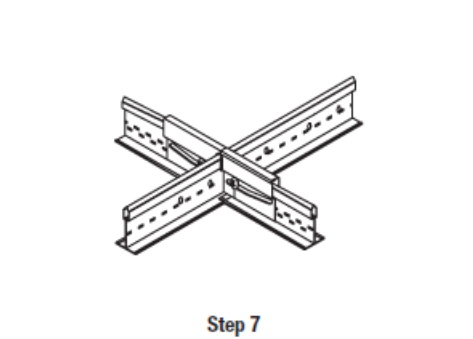
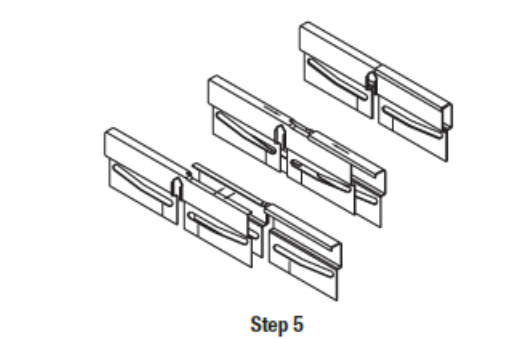
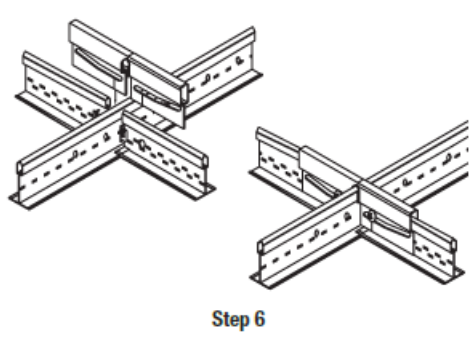
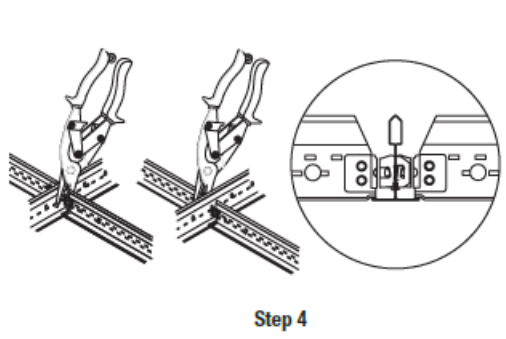
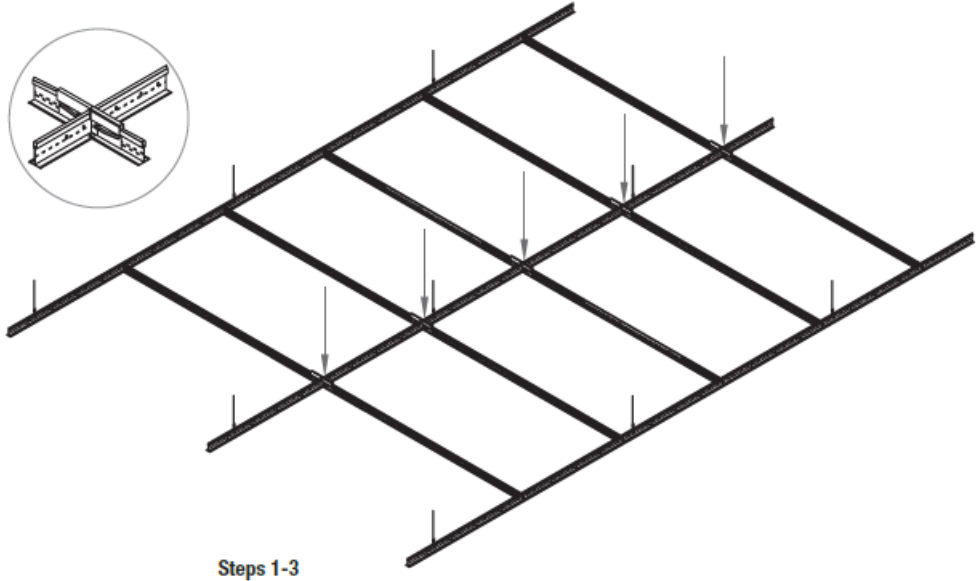
Step Three: Attach two adjacent sides of each section of the divided ceiling to the structure. Where these sections touch the wall, the attachment may be by riveting to the wall molding or by means of the BERC2 clip with a tight screw. Sections that do not touch walls on two adjacent sides must be braced to structure.

Step Four: Cut XL through the end details of cross tees inserted into the Main Runner designated for the seismic separation.
NOTE: This should be done one intersection at a time or the grid system will fall apart.

Step Five: Assemble the two sides of the Seismic Joint Clip into one unit.

Step Six: Snap completed assembly over the bulb of the Main Runner at the intersection of the cross tees.

Step Seven: Insert a 1/4" long #10 screw through slot in clip, into the upper XL clip stake hole. Use vertical stamp mark below the horizontal slot to properly position the screw within the clip. Install one screw from each side of the assembled clip to hold the proper shape. Do not allow screw threads to strip out the stake hole.



EXAMPLES OF SEISMIC CONNECTORS FOR SUSPENDED CEILING SYSTEMS

SEISMIC JOINT CLIP

Main Beam

It's simple to install with these easy steps:

How to install the Seismic Joint Clip – Main Beam.

Step 1: Determine which splices will receive the separation joint by dividing the total area into sections not greater than 2500 sf. Attach a hanger wire within 3" of the splice that will receive the clip.

Step 2: Install complete grid system. Follow typical procedures except that all main beam splices must line up across the space.

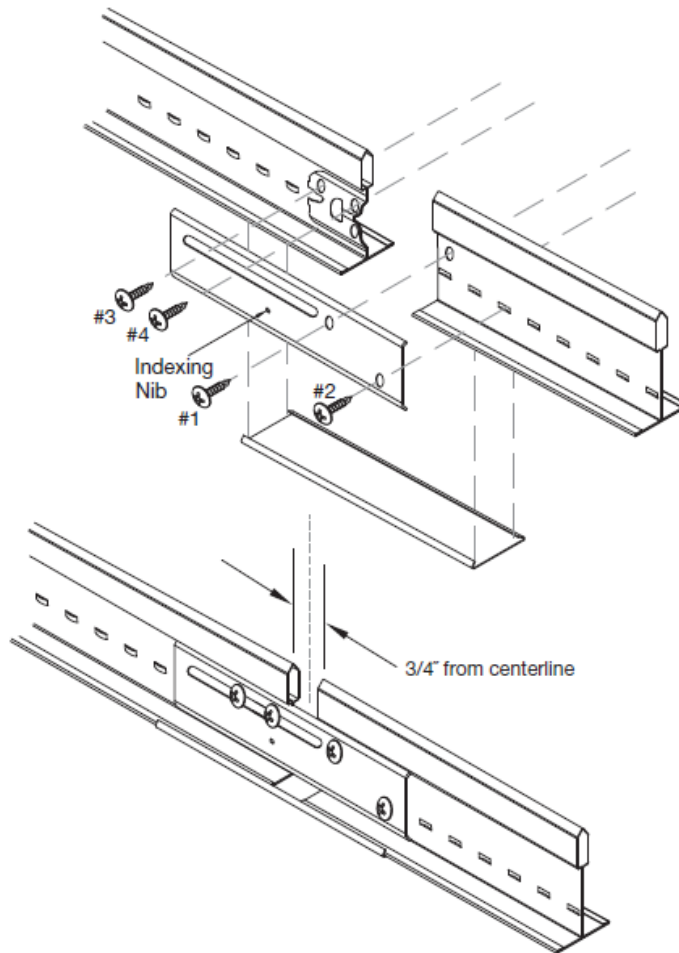
Step 3: Prepare the main beam splice to receive the separation joint clip by cutting the locking tab from the left side of the connection and removing 3/4" from the end of the beam on the right.

Step 4: Install the clip using the screws provided. Screws #1 and #2 install through the holes in the clip and into the right hand main beam.

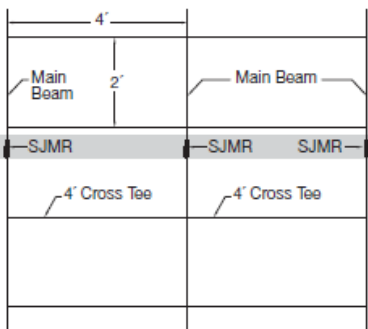
Step 5: Align the indexing nib with the lower hole on the left hand main and insert screws #3 & 4 into the upper holes.

Step 6: Snap the ES4 or ES49 expansion sleeve over the gap at the face of the main beam and crimp the four corners with a pair of pliers.

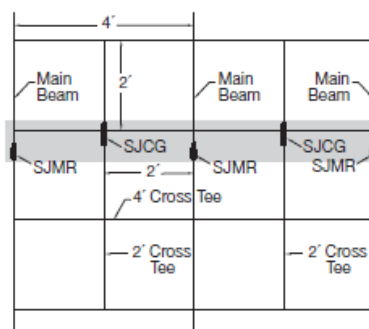
Step 7: Install SJCG cross tee separation joint clips at one end of every cross tee that spans the area of main beam separation. Follow instructions found on the SJCG data page (CS-3815).



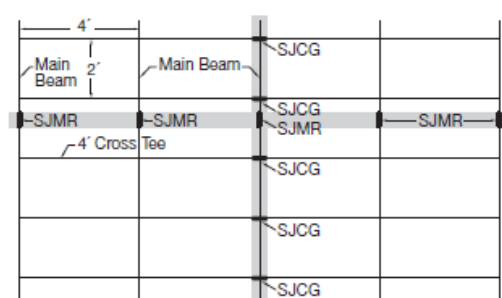
Main Beam in 2 x 4 Layout



Main Beam/Cross Tee in 2 x 2 Layout



Main Beam/Cross Tee in 2 x 4 Layout



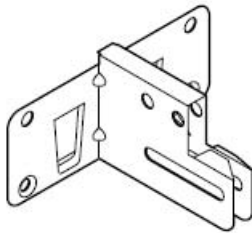
EXAMPLES OF SEISMIC CONNECTORS FOR SUSPENDED CEILING SYSTEMS

Technical Document

Seismic Technical Guide

Perimeter Cross Tees with ACM7 Seismic Clip

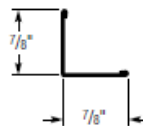
ACM7 Seismic Clip



USG® offers numerous **Donn®** suspension systems cross tees designed to function with the USG ACM7 seismic clip in all seismic design categories A-F. Use this guide to ensure that the connection of the perimeter cross tees with the ACM7 seismic clip functions to meet the required seismic design criteria. Because codes continue to evolve, check with local officials prior to designing and installing a ceiling system.

The ACM7 seismic clip is designed to function with a variety of main tee and cross tee profiles and dimensions. It is common practice to install the clip with cross tees that have a profile height of 1-1/2 in. or greater, however 2 ft. cross tees are produced with a profile height of 1 in. In a 2 ft. x 2 ft. layout, the 4 ft. cross tees are typically utilized at the perimeter and cut to size to meet the perimeter wall. This is an economical method as both ends of the 4 ft. cross tee can be used for cuts smaller than 2 ft. and produces no additional waste versus cutting a 2 ft. cross tee. The following layouts illustrate these differences.

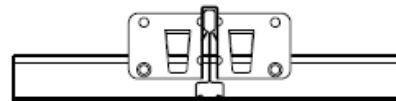
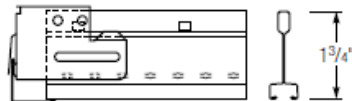
M7



Side

Front

1-3/4 in. Tee Height



EXAMPLES OF SEISMIC CONNECTORS FOR SUSPENDED CEILING SYSTEMS

USG ACM7 Seismic Clip

Perimeter Cross Tee Options

The ACM7 seismic clip is designed to function with a variety of main tee and cross tee profiles and dimensions. It is common practice to install the clip with cross tees that have a profile height of 1-1/2 in. or greater, however 2 ft. cross tees are produced with a profile height of 1 in. and in some instances 2 ft. cross tees are desired at the perimeter. For this application, the ACM7 seismic clip can function with 2 ft. cross tees that have a profile height of 1 in., however the connection is different versus tees that have a profile height of 1-1/2 in. or greater. Use the following guidelines to ensure that the connection of the 2 ft. perimeter cross tees with the ACM7 seismic clip functions to meet the required seismic design criteria.

1. Utilize 4 ft. cross tees for all perimeter tees. **Installation:** Standard

2. Utilize both 4 ft. and 2 ft. cross tees around the perimeter.

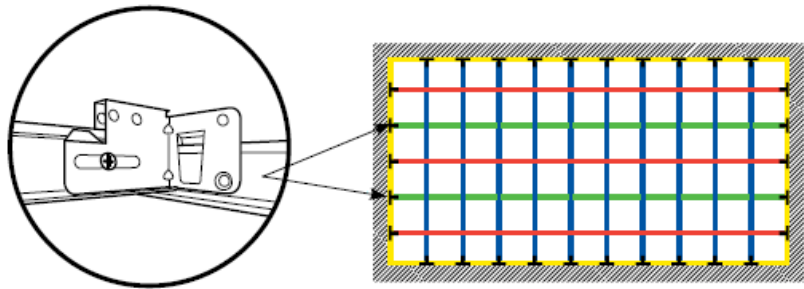
– 4 ft. Cross Tees with the USG ACM7 Seismic Clip: **Installation:** Standard

– 2 ft. Cross Tees with the USG ACM7 Seismic Clip: **Installation:** The following seismic clip installation guidelines apply:

Seismic Designn Category C

Installation: Insert a Type S screw through the center of slot in the ACM7 seismic clip and through the web of the 2 ft. cross tee. The screw will provide vertical support of the tee-ends while allowing lateral movement. Do not tighten this screw as this will restrict the lateral movement of the tee.

Construction:

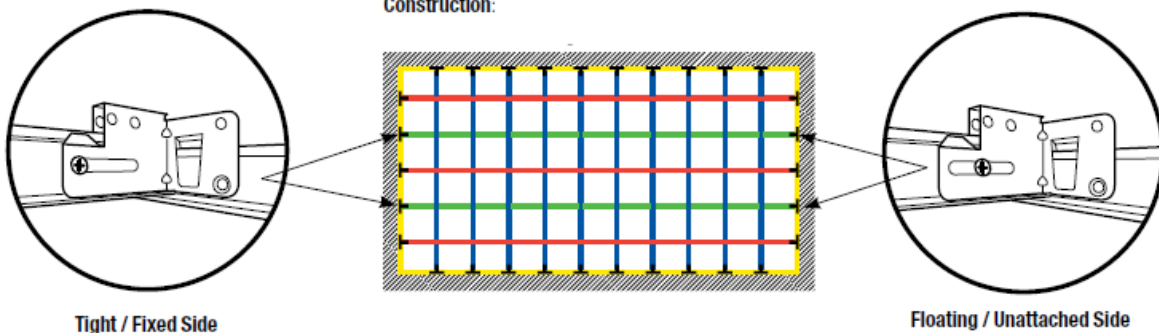


Seismic Disgn Category D, E & F

Installation: On the floating sides insert a Type S screw through the center of slot in the ACM7 seismic clip and through the web of the 2 ft. cross tee. The screw will provide vertical support of the tee-ends while allowing lateral movement. Do not tighten this screw as this will restrict the lateral movement of the tee.

On the tight or fixed sides insert a Type S screw through the end of the slot in the ACM7 seismic clip farthest away from the perimeter and through the web of the 2 ft. cross tee. This fastener will restrict any lateral movement of the tee. It is not necessary to tighten this screw..

Construction:



Tight / Fixed Side

Floating / Unattached Side

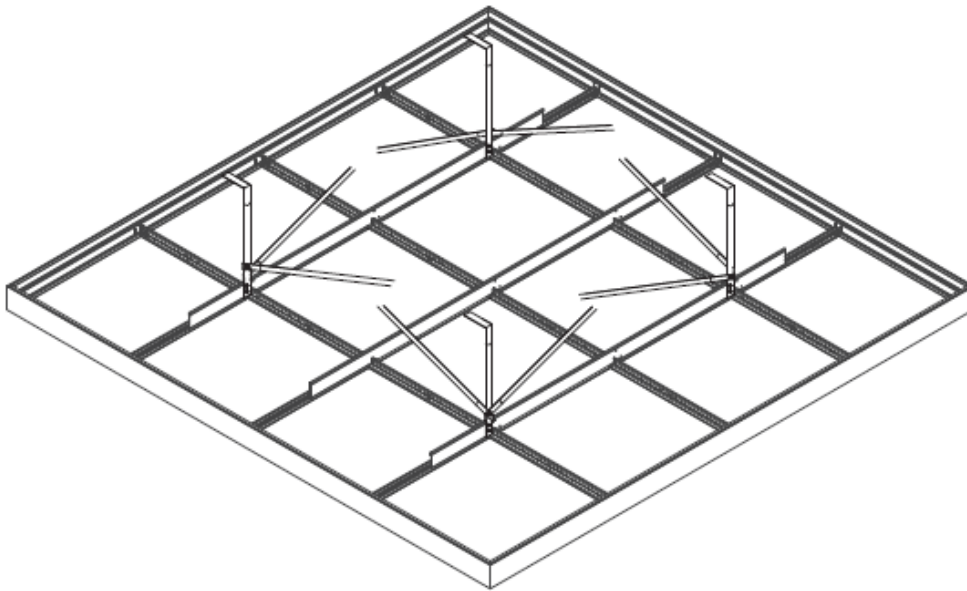
Clouds and Canopies

INSTALLING CLOUDS

Armstrong defines a cloud as a ceiling that is not connected to a wall on any side.

ASCE-7 Design Manual, Section 13 states that the design of architectural components and their supports is required to meet minimum values as calculated in Section 13.3.1 for seismic force and Section 13.3.2 for lateral displacement. Ceilings are a line item on the chart associated with these calculations. Unless specifically exempted by the local authority, it should be assumed that a cloud (architectural component) comprised of grid and panels must be restrained. Part of the formula used in these calculations takes seismic design category into consideration, so the minimum force values will go down or up as the seismic risk changes.

During our testing of cloud ceilings we switched from splayed wires to rigid bracing. The primary reason is so we don't have wires extending beyond the edges of the cloud. We installed a vertical post and two diagonals at the grid intersection closest to each corner of the cloud and then not more than 12 feet in each direction. During testing the plenum is typically 30 inches deep. We have successfully used ½" diameter EMT for post and diagonals on all such tests. The EMT ends are flattened and bent to facilitate attachment to structure and grid. Install the post first, then connect the diagonals to the lower end of the strut just above the grid bulb.



Restraint for a cloud is diagonal bracing to the structure and since clouds are not attached to two walls they must have restraints. In addition to building code requirements, there is a particular installation benefit for a contractor to restrain a ceiling that does not run wall-to-wall. A restrained ceiling is easier to keep straight and square. Some contractors will initially opt to skip this step in an attempt to save money. However, it is not advisable to do so because rework to fix alignment issues can add more labor costs than if the bracing would have been done at the onset.

Typical restraint for a floating ceiling takes the form of rigid diagonal braces that extend from the suspension system members to the overhead structure. Sufficient restraint points must be used to meet the force values required by the code and to prevent movement in all directions. Additionally, the strength of the bracing members must also be matched to the anticipated applied forces. In areas subject to light seismic activity this restraint can often be achieved with sections of wall molding or main beam.

However, as the seismic forces increase so must the rigidity or stiffness of the bracing. When the lateral forces match or exceed the weight of the ceiling assembly or when splay wires are used, a vertical post or strut must be added to prevent the suspension system from lifting. IBC calls for this strut to be added when the project is designated as Seismic Design Category D.