Unit 712 – Advanced Acoustical Ceilings

Carpenters Training Committee for Northern California
CTCNC

Disclaimer

This manual is intended as a supplement to actual hands-on instruction and is designed to teach one or more of the acceptable and recognized methods of performing specific tasks. It is not meant to be, or is it considered, an absolute or complete presentation of the procedures and safety measures related to these tasks.

Work processes and governmental safety regulations can and do change, and it is the employer's responsibility to provide workers with the most recent technical and safety information involving these processes. The guidelines and instructions presented here are not meant to supersede manufacturers' instructions or contractors' jobsite procedures, nor are they meant to replace any current local, state, provincial, or federal safety rules or regulations.

Unit 712 – Advanced Acoustical Ceilings

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Chapter 1

Axiom™ Building Perimeter Systems

Objectives:

Upon completion of this chapter, students will be able to:

1) Define the various components used for a building perimeter system.
2) Explain two methods for installing a building perimeter system.
3) Install a complete building perimeter system.

Introduction

Building perimeter systems are becoming more commonplace in the design of interior work spaces. These systems are typically installed at the exterior windows of both single story and high-rise office buildings as shown in Figure 37. The major component is the aluminum pocket, which often accommodates rolling shades and air distribution functions. In addition, the amount of time and labor is reduced when using these systems as compared to framing, taping and painting conventional drywall pockets. The components used for building perimeter systems are primarily extruded aluminum with a factory applied baked on paint finish.

Figure 1 - Building Perimeter System

Major components

As mentioned before, the building perimeter system is capable of incorporating air distribution for HVAC systems, in addition to providing a termination for drywall and acoustical ceilings. Incorporating these systems primarily includes a variety of specially designed components. Some components can be modified by integrating other aluminum extrusions. These components are explained and diagramed in the flowing sections.

Three-sided perimeter pockets

Three-sided perimeter pockets, see Figure 38, are engineered aluminum pockets designed to be integrated with acoustical and drywall ceilings. The pocket is the main component of a building perimeter system. These pockets have channels, called bosses, designed to accept connector clips and splice plates which provide positive attachment between components and other systems without visible fasteners as shown in Figure 39. In addition to the bosses, each pocket has extruded flanges for attaching the pocket to the structure and to accept acoustical or drywall ceilings. Each perimeter pocket is capable of adding other aluminum components such as face plates, drywall trims, and extensions. The three-sided pocket measures 5" x 5" x 5" and is supplied in 10' – 0" lengths. Custom colors are available; however white is the standard color.

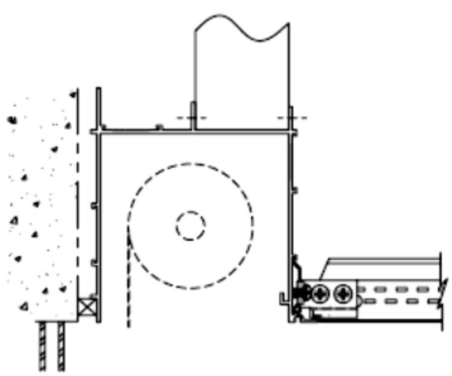


Figure 2 - Three- sided Perimeter Pocket

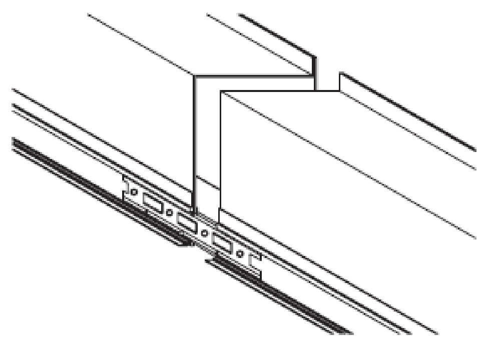


Figure 3 - Boss Channel with Splice Plate

Three-sided corners

Three-sided corners are factory mitered for both inside and outside corners. These corners have the same features as straight pockets. 3-sided corners measure 5" x 5" x 5" and are supplied in a length of 12". See Figure 40. These corners require assembly in the field and are held together with the use of 90º splice clips inserted into the channel bosses.

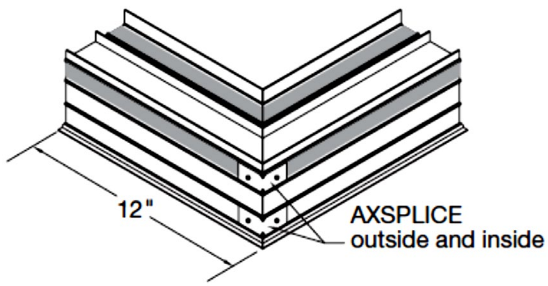


Figure 4 - Outside Corner with Splice Plates

Two-sided perimeter pockets

Two-sided perimeter pockets have the same profile and features as the three-sided pocket except they contain two sides. See Figure 41. These pockets contain the same flanges used to connect the pocket to the structure and to incorporate acoustical or drywall ceilings. Each two-sided pocket is capable of adding the same aluminum components such as face plates, drywall trims' and extensions. Two-sided pockets are available in 5" x 5" and 3" x 6" sizes and supplied in 10' – 0" lengths.

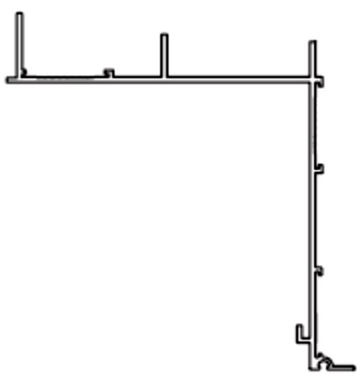


Figure 5 - Two-sided Perimeter Pocket Profile

Two-sided corners

Two-sided corners are factory mitered for both inside and outside corners. These corners have the same features as straight pockets and are field assembled using 90º splice clips. They are only available in the 5" x 5" size and are 12" in length for both inside and outside corner configurations.

Extensions

Each perimeter pocket component is capable of integrating an extension designed to increase the inside dimension of the pocket. These are often used when the top of the exterior windows exceeds the installation height of the ceiling or for elevation changes between the pocket height and the ceiling height. See Figure 42. These extensions are available in 4", 6" and 8" widths and 10' – 0" lengths. Extensions have an integral hook which engages a slot on the outside of the perimeter pocket. A rubber spline is then inserted between the two aluminum components locking the extension in place as shown in Figure 43. Each extension has a flange for integrating acoustical or drywall ceilings.

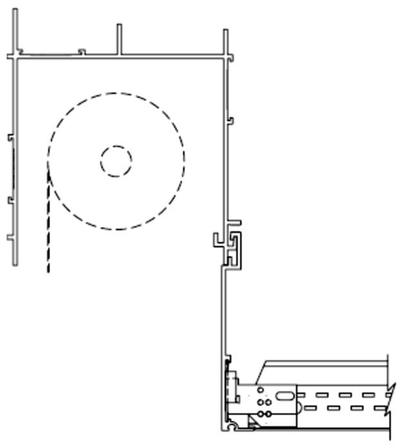


Figure 6 – Installed Extension

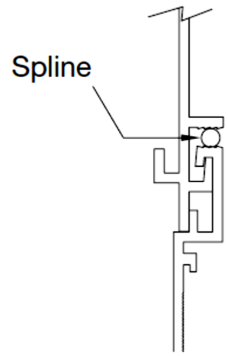


Figure 7 - Inserted Spline

Face plates

Face plates, when used, are integral to the design of the different perimeter pockets or wall clips. Face plates are available slotted or un-slotted, in 4" or 7" widths and in 10' – 0" lengths. Figure 44 shows a slotted face plate. Face plates have the same hook as extension plates and engage the pocket component in the same way. A rubber spline is then inserted between the two aluminum components locking the face plate in place. The biggest difference is the face plate installs horizontally versus vertically for extensions. See Figure 45.

Figure 8 - Slotted Face Plate

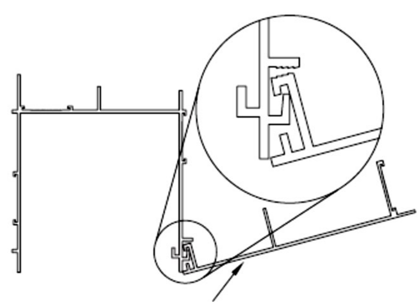


Figure 9 - Face Plate Installation

Face plates can attach to walls or other feature without using a two or three-sided pocket component. A specially designed wall clip can be screw attached to the wall and the face plate locks into the clip exactly the same way as the pocket component. Slotted face plates can be used for integrating the HVAC system into the ceiling system along the perimeter of the building and for providing a horizontal extension when needed. Face plates incorporate a flange for integrating acoustical or drywall ceilings.

Closure clips

Closure clips engage the pocket component or wall clip in much the same way as extensions and face plates. See Figure 46. A hook on the closure clip rests in a slot on the inside of the pocket to reduce the size of the opening or to help conceal a rolling shade or another item. Closure clips can be attached to a wall with the use of a wall clip. Closure clips are 2" wide and 10' – 0" long.

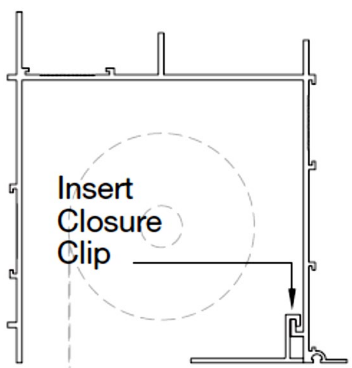


Figure 10 - Installed Closure Clip

Accessories

Accessories include the devices for connecting the pockets and corners together, in addition to the various clips used to integrate both drywall and acoustical ceilings. Other accessories used during installation of the building perimeter system are foam gasket and rubber spline materials. The following section explains each accessory and where they are used during installation.

Splice plates

Splice plates are metal devices which are used to connect and aid in the alignment of multiple pocket components. These plates fit into the channel bosses and are secured to the pocket components with four Allen screws. Typically, three splice plates are installed at each pocket connection and one splice plate is used for connecting extensions and face plates. See Figure 47. These plates can be bent to a 90º angle for inside and outside corner connections.

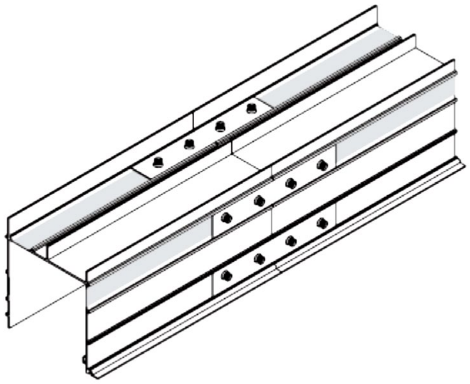


Figure 11 - Splice Plates Installed

Foam gasket

Foam gasket is a closed cell foam material installed along the bottom of the pocket component. See Figure 48. It is compressed against the window system or perimeter structure when the pocket is installed. Foam tape seals the bottom edge of the pocket and visually removes any irregularities between the pocket and perimeter structure. Foam tape is gray in color, supplied in 25'-0" rolls, and has an adhesive tape applied on one side. The release paper is removed and the tape installs directly to the aluminum pocket.

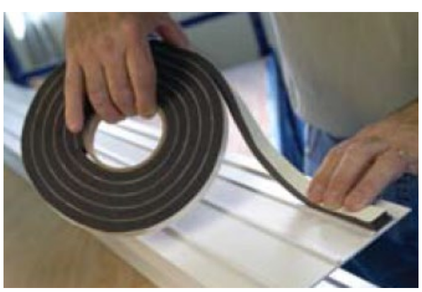


Figure 12 - Installing Foam Gasket

Rubber spline

Rubber spline is a small diameter rubber material used for interlocking extension and face plates to the pocket component. The spline is pressed into place by hand and is trimmed with a utility knife. Rubber spline is provided in 10' – 0" lengths and is black or gray in color.

Perimeter end plate

Perimeter end plates are aluminum and have the same dimension as the pockets. They are used to cap the end of a two or three sided pocket. These components slip inside the pocket and attach using rivets or screws. See Figure 49.

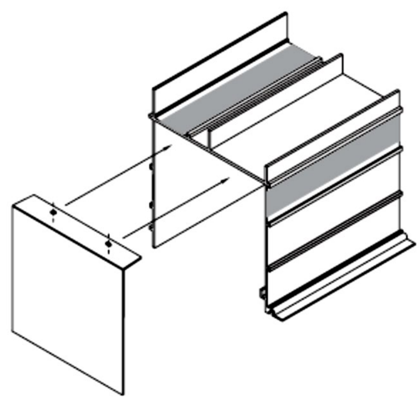


Figure 13 - Perimeter End Plate

T-bar connector clip

T-bar connector clips screw attach to the end of acoustical main beams, cross tees or drywall grid main beams or cross tees. The connector clip attaches to the pocket, extension or face plate component with a factory supplied screw integral to the clip. See Figure 50. This clip provides a positive compression connection between the pocket and adjacent acoustical or drywall ceiling without having an exposed fastener protruding from the pocket. The channel boss used for splice plates is used to attach the t-bar connector clip.

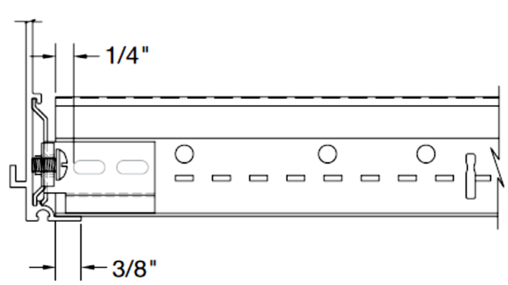


Figure 14 - T-bar Connector Clip

Beam end retaining clip for seismic

Beam end retaining clips are used on the end of acoustical main beams, cross tees or drywall grid main beams or cross tees. The biggest difference between this clip and a t-bar connector clip is the allowed movement for seismic considerations. This clip is screw attached to the grid component, but the screws are slightly loosened to allow movement. The beam end retaining clip is twisted into the channel boss with pliers, securely locking the clip in place, before it is attached to the grid. See Figure 51.

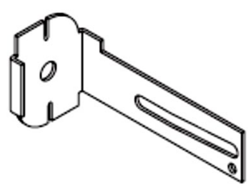


Figure 15 - T-bar Connector Clip

Drywall bottom trim

Drywall bottom trim is used to cap off the exposed edge of the drywall as it terminates along the bottom edge of the pocket. This trim has a tapeable flange that is mudded and finished along with the drywall as shown in Figure T055. The trim is attached using drywall screws, inserted through the trim and drywall into the supporting drywall suspension member. This trim is provided in 10' – 0" lengths and is for 5/8" drywall.

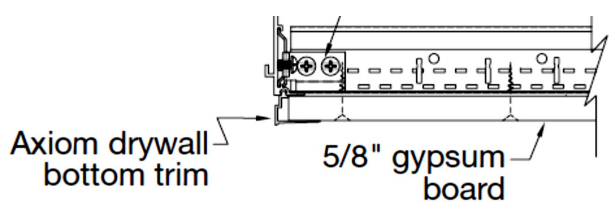


Figure 16 - Drywall Trim Installed

Installation of the building perimeter system

There are two separate methods for installing the building perimeter system. One method uses metal studs to support the perimeter pocket and the other uses a direct attachment method. Both methods have similarities and are discussed in the following section.

The installation height and dimension from the perimeter wall for the three-sided or two sided perimeter pocket is determined from the reflected ceiling plan, section drawings or an elevation. In most instances, the bottom of the perimeter pocket matches the installation height of the adjacent acoustical or drywall ceiling. However, this installation height of the building perimeter system can vary based on the type of acoustical ceiling tile and suspension system being integrated. The face flange of the acoustical ceiling suspension members can rest directly on the integral flange of the building system component or the ceiling suspension members can have a 1/4" to 3/8" upwards offset depending on the type of ceiling tile or suspension member being used. See Figure 53.

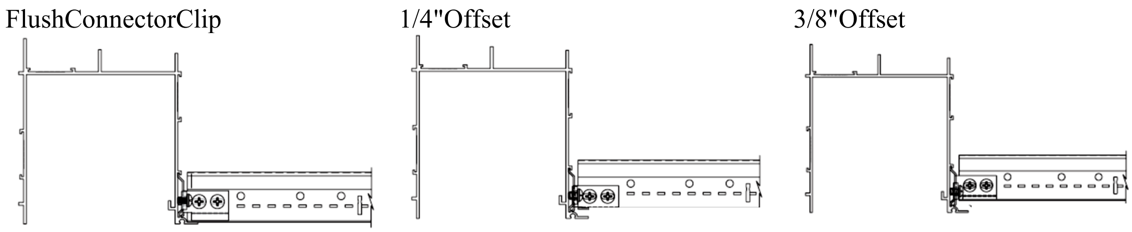


Figure 17 - T-bar Connector Clip Placements

Extensions must be taken into account when determining the actual installation height of the pocket as well as any floor finishes. It is important to level the perimeter pocket system to a tolerance of 1/16" over a distance of 15' – 0". This is especially true when roller shade mechanisms are installed inside the pocket.

The aluminum pockets have integrated flanges on the top to accept 2 ½" metal studs. These flanges serve the same purpose as a track. Metal studs are attached to the structure above and to the flanges of the pocket. This installation method provides support for the perimeter pocket and is considered a free floating attachment. See Figure 54. Diagonal bracing is installed to the structure and framing which secures the pocket system in place. The spacing and gauge of the metal stud framing should be specified by the architect and detailed in the construction drawings.

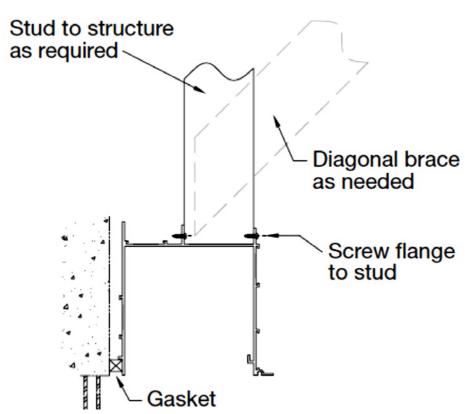


Figure 18 - Free Floating Metal Stud Installation

A line is snapped on the floor to locate the outside edge of the building perimeter pocket and the corners. A dry line or laser is used to align the outside edge of the pocket. When metal studs are used, the top track for the metal studs is aligned to the floor layout with the use of a laser and attached to the structure. The studs are dropped from the top track on layout and should extend past the installation height of the pocket. The metal studs are cut to length using the laser set to the calculated height between the bottom of the pocket and the top of the pocket where the stud attaches.

Another installation method is to secure the pocket directly to the perimeter structure with the appropriate fastener through wood blocking or shims. Shims or blocking is used to correct any irregularities in the wall and to allow for the offset of the foam gasket. Fasteners are screwed through an extruded flange on top of the pocket, through the blocking and into the wall framing or perimeter window system. See Figure 55.

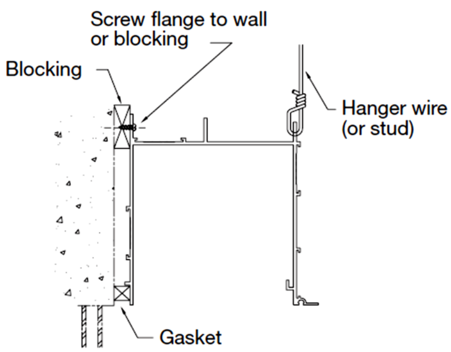


Figure 19 - Direct Attachment Installation

In addition to the fasteners, a wire or metal stud is used to support the front edge of the pocket for the direct attachment method. It is recommended to predrill holes in the front extruded flange to accept hanger wires when they are used. Hanger wires are installed either 16" or 24" on center as specified by the architect. These holes should be drilled at a minimum of ¼" down from the top edge of the flange to provide the necessary load-bearing requirements.

All hanger wires can be installed prior to or after the pocket component. It is recommended to install the hanger wires as plumb as possible and the wires should extend 12" past the installation height to provide enough wire to make the three wrap tie. The location of the bend in the hanger wires is determined using a similar calculation as the metal stud installation. It is critical to keep the outside edge of the pocket aligned with the floor layout and level during installation.

Both installation methods require the installation of a foam gasket along the bottom edge of the pocket. The foam gasket will compress and seal the bottom edge of the pocket along the building perimeter. The gasket will visually correct any irregularities along the wall and is typically supplied by the manufacturer of the aluminum pocket. The foam gasket is applied to the pocket components before installation.

The corner pockets are set first and the 10' – 0" straight pocket sections are installed between the fabricated corner sections. The factory corners are shipped in two pieces and require assembly on the job. Splice plates are bent to a 90-degree angle and inserted into the channel trim bosses on the mitered pieces. Each straight section is spliced together with splice plates supplied by the manufacturer. The splice plates have Allen® screws that are tightened against the outside face of the pockets securing the two pieces together. It is best to slide the splice plates completely into the channel boss on one of the pockets. When the next pocket is aligned, the splice plate is slid over halfway into the channel boss of the adjoining piece and the screws tightened. It is important not to over tighten these screws. The face is easily deformed when the screws are over tightened. It will be necessary to field cut the final pieces to fit. Use a saw equipped with a 10"-12" carbide blade with a minimum of 80 teeth. When using a saw to cut components, use wax as lubrication and apply it to the blade to minimize the friction of the cut.

When installing extensions and face plates onto the pockets, the splices should be offset from the splices in the pocket components. This provides for a stronger assembly and aids in the alignment of the different components. The following procedures detail the installation of both methods, in addition to the integration of other perimeter building system components.

Procedure - Installing a Perimeter Pocket Using Metal Studs

1. Determine the pocket layout dimension and installation height from the drawings.
2. Snap a chalk line on the floor locating the outside edge of the pocket component.
3. Mark the starting and stopping points of the pocket.
4. Install the 2 ½" top track to the structure above, using the appropriate fasteners, aligned with the chalked layout line.
5. Mark the stud layout on the top track.
6. Measure, cut and install the 2 ½" studs on layout, securing both stud flanges to the top track.
7. Cut each stud to length, allowing for a ¼" of adjustment, using a laser set to the adjusted installation height.
8. Apply the foam gasket material to the bottom edge of pocket components.

9. Clamp the fabricated inside or outside pocket corner assemblies to the metal studs, if used.
10. Insert three splice plates in the channel bosses of the next full-length pocket component.
11. Raise the pocket into place and insert the studs into the flanges.
12. Clamp the flanges of the pocket component to a metal stud on each end.
13. Engage the corner pocket assembly with the full length pocket installed in step 11.
14. Slide the splice plates halfway over into the bosses of the corner assembly.
15. Confirm the joint between each component is closed and tighten the screws on each splice plate.
16. Mark the stud layout on the outside flange of the pocket assembly.
17. Laser level the bottom of the pocket assembly.
18. Screw attach each stud on layout to both flanges of the pocket assembly.
19. Confirm alignment with the chalked layout and diagonally brace the assembly as specified in the drawings.
20. Continue the installation until complete.

Procedure - Installing a Direct Attached Perimeter Pocket

1. Determine the pocket layout dimension and installation height from the drawings.
2. Snap a chalk line on the floor locating the outside edge of the pocket component.
3. Mark the starting and stopping points of the pocket.
4. Attach blocking material to the wall, shimming as necessary, with the appropriate fastener.
5. Drill pilot holes for the fasteners every 16" to 24" along the back flange of each pocket component.
6. Drill holes in the top front flange for installing hanger wires not to exceed 48" on center.
7. Install the hanger wires to the structure using the appropriate fastener, matching the on center layout produced in step 6.
8. Apply the foam gasket to the bottom edge of each pocket component.
9. Temporarily secure the fabricated inside or outside corner pocket assembly to the blocking if used.
10. Insert three splice plates in the channel bosses of the next full-length pocket component.
11. Raise the pocket into place and temporarily secure the pocket to the blocking.

12. Engage the corner pocket assembly with the pocket installed in step 9.
13. Slide the splice plates halfway over into the bosses of the corner assembly.
14. Confirm the joint between each component is closed and tighten the screws on each splice plate.
15. Laser level the bottom of the pocket assembly and attach to the blocking using the appropriate fasteners.
16. Insert and tie the hanger wires using a three wrap tie.
17. Continue the installation until complete.

Procedure - Installation of Face Plate or Closure Clip Using a Wall Clip

1. Determine the face plate layout dimension and installation height from the drawings.
2. Snap a chalk line on the wall representing the top edge of the wall clip using a laser set to the installation height.
3. Align the wall clip with the chalk line and attach to each wall stud using the appropriate fastener.
4. Repeat step 3 completing the installation of the wall clip, field cutting the last wall clip as necessary.
5. Engage the face plate/closure clip hook with the slot in the wall clip.
6. Lower the face plate into place.
7. Repeat step 5 and 6 until complete field cutting the last face plate/closure clip as necessary.
8. Continue the installation until complete.

Procedure - Installation of Extensions

1. Determine the required extension width and length offsetting any pocket component splices a minimum of 12".
2. Insert a splice plate into the channel boss when adjoining with another extension.
3. Tilt the extension plate to engage the top hook of the extension with the lower outside slot on the pocket component.
4. Lower the extension place until vertical.
5. Insert a rubber spline between the extension hook and pocket slot.
6. Repeat steps 2 – 5 for installing additional extensions, engaging and fastening each splice plate.
7. Continue the installation until complete.

Procedure - Installing a Face Plate onto a Pocket Assembly

1. Determine the required type of face plate and length offsetting any pocket component splices a minimum of 12".
2. Insert a splice plate into the channel boss when adjoining with another face plate.
3. Tilt the face plate to engage the top hook of the plate with the lower outside slot on the pocket component.
4. Lower the face place until horizontal.
5. Insert a rubber spline between the face plate hook and pocket slot.
6. Repeat steps 2 – 5 for installing additional extensions, engaging and fastening each splice plate.
7. Continue the installation until complete.

Chapter 1

Study Guide

Directions:

Answer the following questions using the bubble answer sheet.

1. Beam end retaining clips allow for seismic movement.
   A. True
   B. False

2. The aluminum pockets have integrated flanges on the top to accept ___ " metal studs.
   A. 1 5/8
   B. 2 1/2
   C. 3 5/8
   D. 4

3. Each perimeter pocket component is capable of integrating an extension designed to increase the _________ dimension of the pocket.
   A. overall
   B. inside
   C. outside
   D. width

4. When installing extensions and face plates onto the pockets, the splices should be offset from the splices in the pocket components.
   A. True
   B. False

5. Pockets have channels, called _________, designed to accept connector clips and splice plates.
   A. slots
   B. anchors
   C. extrusions
   D. bosses

6. A closure clip to reduces the size of the pocket opening or helps conceal a rolling shade or another item.
   A. True
   B. False

7. The installation height of the building perimeter system can vary based on the type of acoustical ceiling tile and suspension system being integrated.
   A. True
   B. False

8. It is important not to over tighten the splice plate Allen® screws because the component face is easily __________ when the screws are over tightened.
   A. deformed
   B. broken
   C. marked
   D. cracked

9. The 10' – 0" straight pocket sections are set first and the fabricated corner sections are installed between the pockets.
   A. True
   B. False

10. Building perimeter face plates install vertically and extensions install horizontally.
    A. True
    B. False

11. Factory supplied ________ require assembly in the field and are held together with the use of 90º splice clips inserted into the channel bosses.
    A. pockets
    B. extensions
    C. corners
    D. plates

12. ________ face plates can be used for integrating the HVAC system into the ceiling system along the perimeter of the building.
   A. Solid
   B. Perforated
   C. Slotted
   D. Angled

13. Perimeter pockets require the installation of a foam gasket along the bottom edge.
   A. True
   B. False

14. The spacing and gauge of the metal stud framing supporting a pocket should be specified by the _________ and detailed in the construction drawings.
   A. plumber
   B. architect
   C. inspector
   D. installer

15. The pocket is the main component of a building perimeter system.
   A. True
   B. False

16. _______ _______ are metal devices which are used to connect and aid in the alignment of multiple pocket components.
   A. Closure clips
   B. Connector clips
   C. Retaining clips
   D. Splice plates

17. In addition to the fasteners, a hanger wire or metal stud is used to support the front edge of the pocket for the direct attachment method.
   A. True
   B. False

18. It is recommended to install the hanger wires as plumb as possible and the wires should extend _____" past the installation height to provide enough wire to make the three wrap tie onto the pocket.
    A. 6
    B. 8
    C. 10
    D. 12

19. T-bar connector clips are twisted into the channel boss with pliers, securely locking the clip in place, before they are attached to the grid.
    A. True
    B. False

20. ________ splice plates are installed at each pocket connection and one splice plate is used for connecting extensions and face plates.
    A. Two
    B. Three
    C. Four
    D. Five

21. Extensions have an integral hook which engages a slot on the outside of the perimeter pocket.
    A. True
    B. False

22. Splice plates can be bent to a 90º angle for inside and outside corner connections.
    A. True
    B. False

23. Rubber ________ is a small diameter rubber material used for interlocking extension and face plates to the pocket component.
    A. spline
    B. rope
    C. gasket
    D. rod

24. The t-bar connector clip attaches to the pocket, extension or face plate component with a factory integrated screw, creating a compression connection.

    A. True
    B. False

25. It is important to level a perimeter pocket system to a tolerance of _____" over a distance of 15' – 0".

    A. 1/16
    B. 1/8
    C. 1/4
    D. 1/2

Chapter 2

Linear Wood Panel System

Objectives:

Upon completion of this chapter, students will be able to:

1) Identify and define linear wood panel system components.
2) Layout a linear wood panel ceiling system.
3) Install a linear wood panel ceiling system.

Introduction

Linear wood panel systems are an alternative ceiling system most often used in high-end commercial buildings and other venues. This system incorporates solid wood slat panels attached to backer boards or wooden dowels. These wood panels are constructed with popular wood and fasten to a heavy duty rated 15/16" exposed grid system. See Figure 23. A variety of finishes, such as semi-gloss or paint, is available.

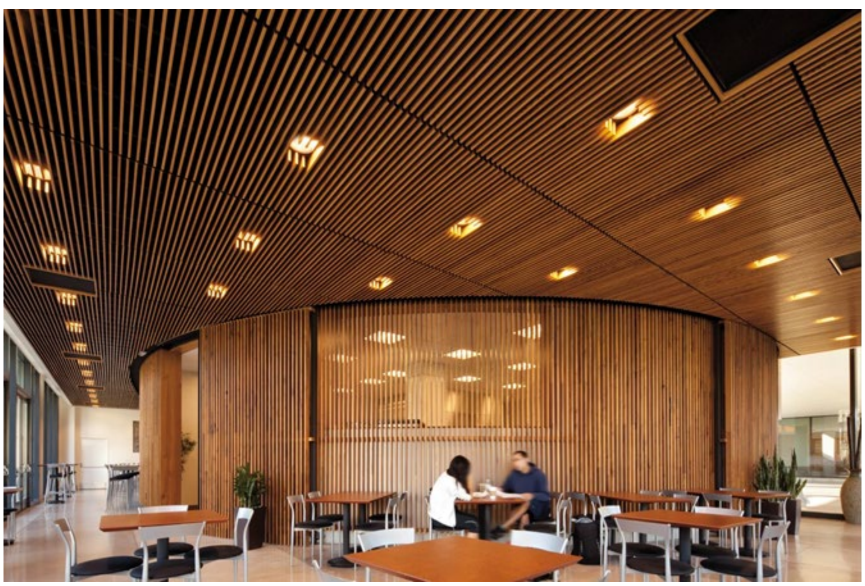


Figure 20 - Linear Wood Panel Ceiling

Components

The major component is the 12" x 95" wood panel. These panels are manufactured with solid wood slats connected together with wooden dowels, backer boards, or a combination of both. Wood panels are manufactured with 3 to 8 slats per panel and the slats can range in height from 2 ¼" to 5 ¼" depending upon the preference of the architect. These panels attach to an exposed grid system with metal spring clips as shown in Figure 24, in addition to screws or tie wire. Metal spring clips snap onto the exposed face flange of the grid components as shown in Figure 25 for both backer boards and dowel panels.

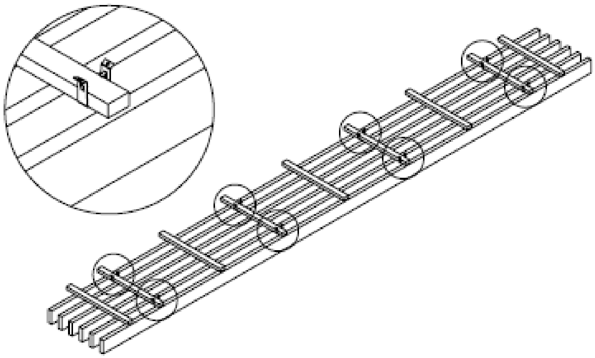


Figure 21 - Linear Wood Panel Connection Locations

Figure 22 - Backer Board and Dowel Clip Connections

In addition to the wood panels, wood trim components are often combined to cover the exposed edges of the panels. Ledger trim covers the horizontal leg of wall molding as shown in Figure 26. Junction trim can be used between the panel ends and end caps can be used to cover the exposed panel ends. Both trim profiles are shown in Figure 27.

Typical heavy duty 15/16" grid components are installed in a 24" x 24" grid pattern to support the wood panels. The grid system is recommended to be ordered with a black paint finish. A specific main beam layout is required to align with the dowels or backer boards of the wood panels because the wood panels install perpendicular to the main beams.

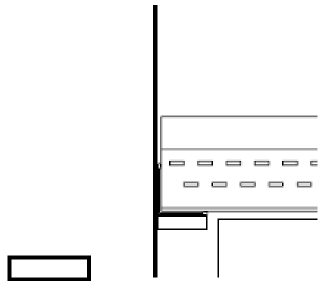


Figure 23 - Ledger Trim

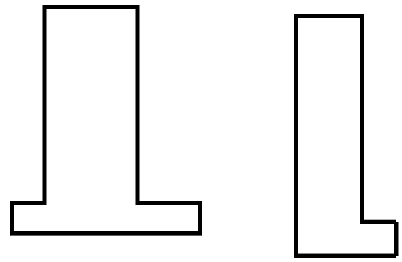


Figure 24 - Trim Profiles

Installation

The installation of the 15/16" exposed grid proceeds as any installation would for seismic category D, E, and F and will not be discussed in this section. However, the grid system must be level within 1/4" in 10' and must be square within 1/16" in 2'. Installations which do not meet these criteria will produce unacceptable panel alignment. In addition, the first main beam must be located at 12 1/2" from the wall perpendicular to the panel installation direction as shown in Figure 28.

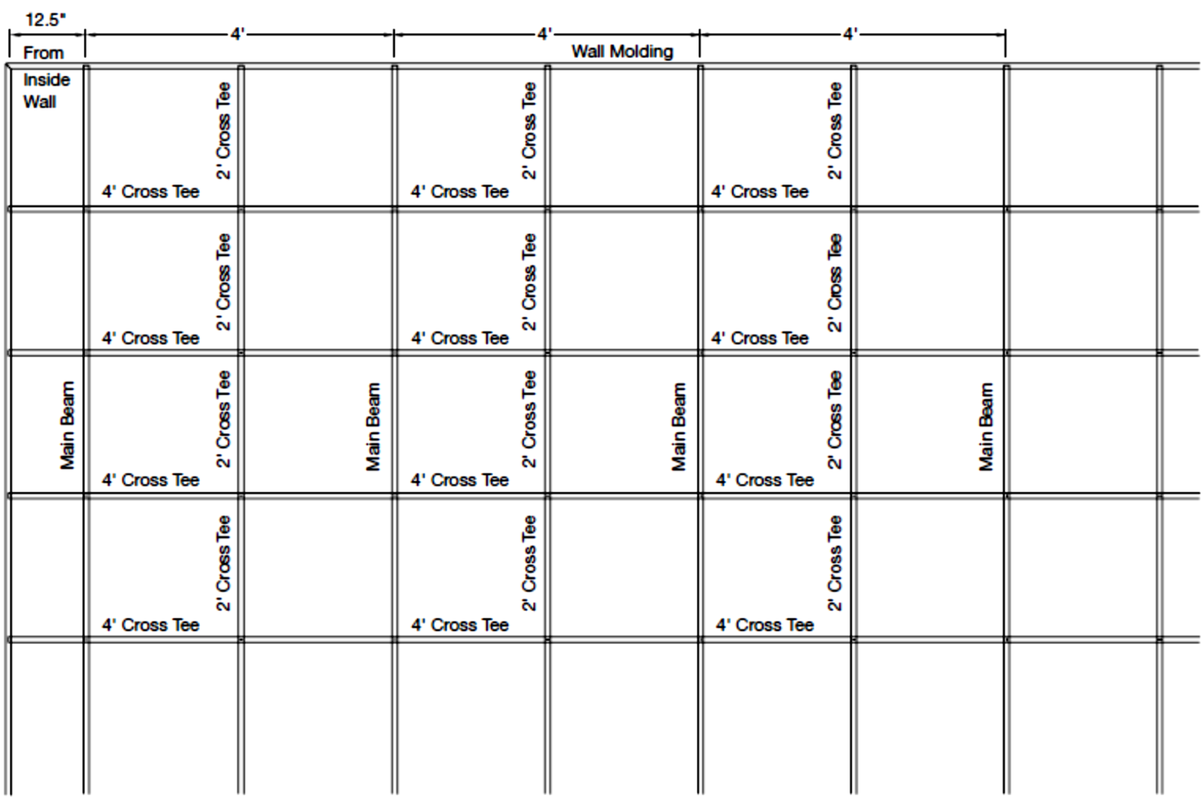


Figure 25 - Grid Layout

Planning for the wood panel installation must take into account the overall width of the room. This would be the measurement between the walls parallel to the long side of the wood panels when installed. For example, the architect specifies a 1" reveal between the wall and the first slat and the room measures 14' – 0" wall to wall. The first step is to locate the center of the room; in this case, it would be 84" when measured from either wall.

The installation starts from the center of the room out in both directions. The wood panels may require cutting and removing of slats to maintain the required reveal. These panels measure 12" overall, however the slat width and the space between the slats will vary based on the number of slats contain in each panel.

It is recommended to install a dry line for the initial run of wood panels along the panel ends to maintain aligned ends. Another dry line is installed to align the long edge of the panels as they are installed across the room. The placement of these dry lines can vary based on the reveal being specified by the architect or by the preference of the installer. Installing a strip of wood which measures the same as the reveal can be used as a gauge block to maintain the reveal.

Installation of the wood panels starts with the male side of the panel facing towards either wall. The installation proceeds across the room mating the male edge to the female edge. The panel is raised into position against the grid system, aligned and the spring clips pushed around the backer board or dowel onto the face flange of the grid components. See Figure 29.

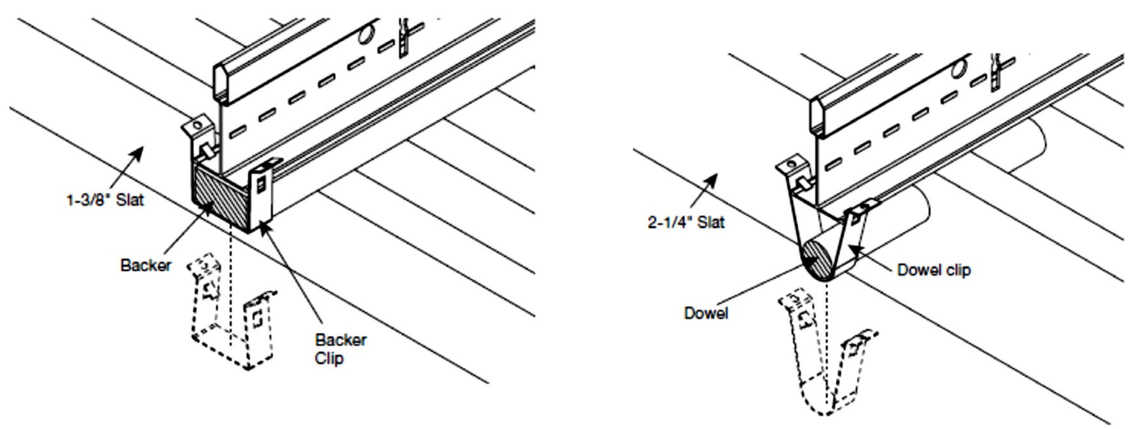


Figure 26 - Backer Board and Dowel Clip Connections

Two clips are required at each location for a total of eight clips per panel as shown in Figure 30. Both tabs on the spring clip must engage the face flange as shown in Figure 31. Panels typically require cutting for length to maintain the 1" reveal when the panel abuts the opposing wall.

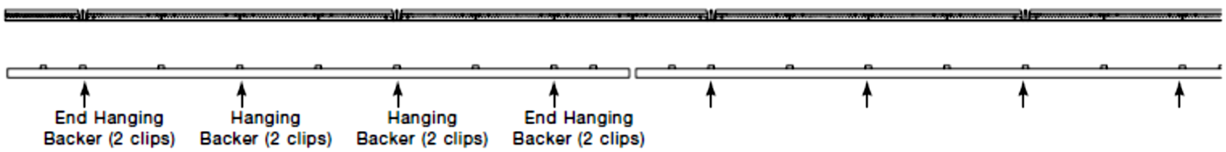


Figure 27 - Clip Locations

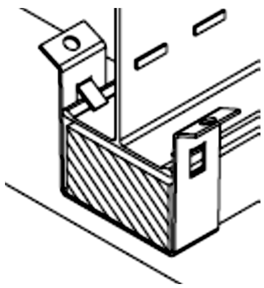


Figure 28 - Engaged Tabs of Clip Onto Face Flange

For installations in Seismic Design Categories D, E and F, the panels must be mechanically or wire attached to the grid system. A minimum of eight screws per panel is required. Pilot holes should be drilled into the backer boards to prevent splitting of the backer board and #6 x 1 ¼" fine threaded drywall screws used for each connection as shown in Figure 32. When doweled panels are used, the metal spring clips are wire attached to the grid components with 18 gauge tie wire as shown in Figure 33. These tie wires must be completed as the installation of each wood panel progresses.

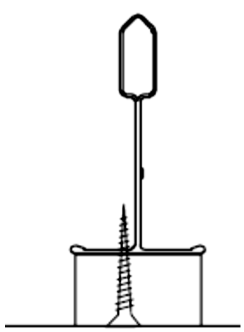


Figure 29 - Mechanical Screw Connection

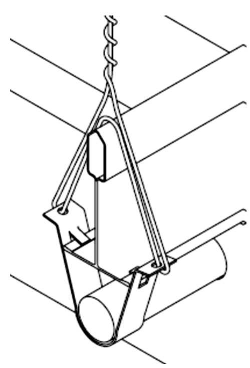


Figure 30 - Wire Tied Connection

A small circular saw is used to cut panels to length and a saber saw or coping saw is used to cut penetrations for fire sprinklers and can lights. A straight edge should be clamped to the wood slats to produce straight, clean and accurate cuts and these panels must be oriented so the same end is cut each time for the length. It is recommended to sand and stain the edges to match the wood finish when cut edges are exposed to view.

Procedure – Wood Panel Installation

1. Gather the necessary installation information from the construction drawings.
2. Calculate the installation height of the grid ceiling based on the overall height of the wood panel.
3. Confirm the room measures correctly for the specified reveal along the long side of the panels.
4. Install the grid ceiling starting with a main beam 12 ½" from the wall which is perpendicular to the long direction of the wood panel.
5. Determine the center of the room based on the installation direction of the wood panels.
6. Install dry lines in both directions for panel alignment.
7. Start the wood panel installation working from the center of the room out in both directions, mating male to female edges.
8. Attach the wood panel to the grid system based on the seismic category of the area.
9. Repeat steps 7 and 8 for the next row of panels across the room, using a spacer to maintain the reveal between rows.
10. Attach trim if required, see trim procedure.
11. Cut any penetrations accurately and precisely, applying the proper finish to match the panel finish.
12. Cut the panels to length when they abut the opposing wall or other structure, maintaining the specified reveal.

Trim Installation

Trim installation is an option for the designer or architect and is not required for all installations. The reflected ceiling plan and ceiling details should be checked to confirm if trim components are used. Junction trim is installed progressively as the installation proceeds. Junction trim is supplied in one height and is used for all slat heights. Once the first row of panels is completed, the shorter flange of the junction trim is placed against the ends of the panel slats and 1 ½" 4d finish nails are used every 16" to attach the trim to the panel ends. The trim may require measuring and cutting to length before installation. When splicing, always measure to the center of a slat, and attach the trim pieces at the end of a slat member. Nails should be applied with a pneumatic nail gun and a compound miter saw should be used to cut all trim components. The next row of panels install into the deeper side of the trim as shown in Figure 34. This allows the wood panels to free float and allows for expansion and contraction.

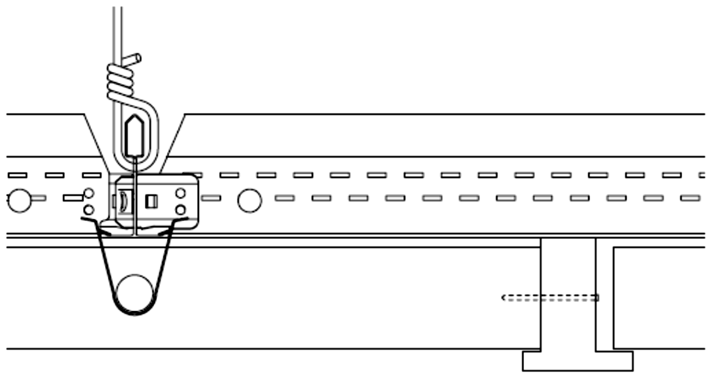


Figure 31 - Junction Trim Application

End caps can be used as trim for the panel edges when the wood ceiling does not go wall to wall or to trim around a fixture as shown in Figure 35. End caps are available in multiple sizes depending on the height of the slats. Follow the construction details for the extent of the end cap trim. Cloud wood panel ceilings most often have picture framed end caps applied around the entire perimeter of the wood panel system.

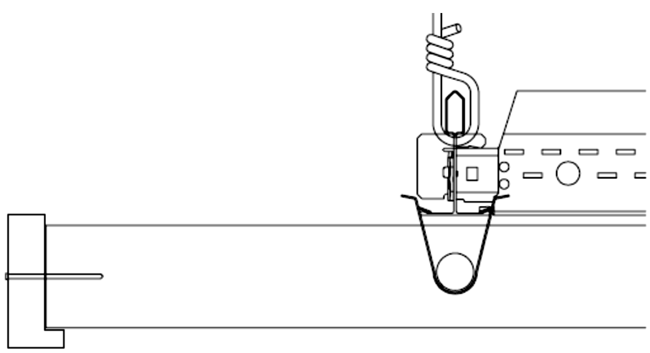


Figure 32 - End Cap Application

Ledger trim is applied to the wall molding as shown in Figure 36. This trim can be adhesively applied or attached from the top using ¼" screws inserted through the wall molding into the ledger trim. The backer boards or dowels will need to be trimmed flush with the slat when installing ledger trim along the bottom flange of the wall molding.

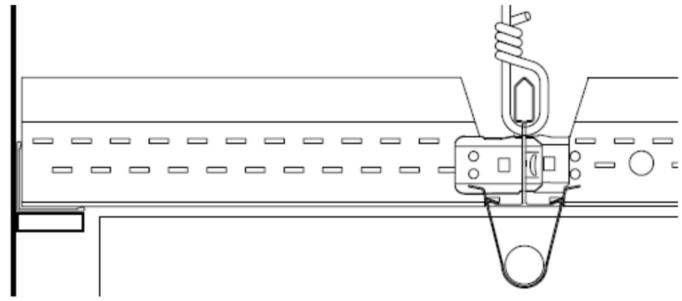


Figure 33 - Ledger Trim Application

Procedure - Trim Installation

1. Gather the necessary installation information from the construction drawings.
2. Complete the installation of the first row of wood panels.
3. Measure and cut the trim to length with the proper bearing on the end of the slats.
4. Align and orientate the junction trim with short flange facing the first row of wood panels.
5. Attach the junction trim to the end of the slats, 16" on center, using a pneumatic nail gun with 1 ½" 4d finish nails.
6. Install the next row of wood panels.
7. Repeat steps 4 and 5 for any junction trim.
8. Install end cap trim and ledger trim as detailed, if necessary.

Chapter 2

Study Guide

Directions:

Answer the following questions using the bubble answer sheet.

1. Heavy duty 15/16" grid components are installed to support linear wood panels.
   A. True
   B. False

2. For linear wood panel installations in Seismic Design Categories D, E, and F, the wood panels must be ___________ or wire attached to the grid system.
   A. mechanically
   B. clip
   C. glue
   D. staple

3. Trim installation is an option for the designer or architect and is not a requirement for all installations.
   A. True
   B. False

4. Linear wood panels are manufactured with solid wood slats connected together with wooden dowels, ________ boards, or a combination of both.
   A. metal
   B. backer
   C. stretch
   D. ceiling

5. Junction trim is installed progressively as the wood panel installation proceeds.
   A. True
   B. False

6. When linear wood dowelled panels are used, the metal spring clips are wire attached to the grid components with ____ gauge tie wire
   A. 16
   B. 18
   C. 20
   D. 22

7. Linear wood panels attach to an exposed grid system with metal spring clips in addition to screws or tie wire.
   A. True
   B. False

8. Linear wood panel metal spring clips snap onto the exposed ______ ______ of the grid components
   A. double bulb
   B. staked clip
   C. face flange
   D. cross tee

9. The reflected ceiling plan and ceiling details should be checked to confirm if linear wood trim components are used.
   A. True
   B. False

10. It is recommended to install a(n) _______ _______ along the panel ends for the initial run of wood panels to maintain aligned ends.
   A. junction trim
   B. spacer block
   C. end cap
   D. dry line

11. Linear wood panels are manufactured with 3 to 8 slats per panel and the slats can range in height from 2 ¼" to 5 ¼" depending upon the preference of the architect.
   A. True
   B. False

12. The exposed grid system for a linear wood panel system must be level within ____" in 10' and must be square within ____" in 2'.

A. 1/8, 1/8
B. 1/4, 1/2
C. 1/8, 1/16
D. 1/4, 1/16

13. A wood panel installation starts along the longest wall of the area.

A. True
B. False

14. A wood panel installation proceeds across the area mating the male edge to the female edge.

A. True
B. False

15. The first main beam for a wood panel installation must be located at ____" from the wall perpendicular to the longest dimension of the panel.

A. 10 1/4
B. 11
C. 12
D. 12 1/2

16. Wood panels attach to the grid system at each location where the backer or dowel aligns with the grid system.

A. True
B. False

17. Installation of 15/16" exposed grid must meet seismic category D, E, and F requirements for wood panel ceilings.

A. True
B. False

18. Ledger trim covers the horizontal leg of wall molding.

A. True
B. False

19. Heavy duty 15/16" grid components are installed to support the wood panels in a 24" x 48" grid pattern.
    A. True
    B. False

20. A minimum of ________ screws per panel is required in Seismic Design Categories D, E and F when using 95" wood panels with backer boards.
    A. six
    B. eight
    C. ten
    D. twelve

Chapter 3

Prelude® XL Max™ Data Grid

Objectives:

Upon completion of this chapter, students will be able to:

1) Identify and define Prelude® XL Max™ data grid components.
2) Layout a Prelude® XL Max™ data grid ceiling.
3) Install a Prelude® XL Max™ data grid system with ceiling tiles.

Introduction

This chapter introduces the Prelude® XL Max™ data grid ceiling. This ceiling is engineered to support cable trays and other items used in data centers. This is a major advantage over other ceiling systems. Typical ceilings are independent of the structural supports necessary for cable trays. Therefore, the support systems must be installed prior to the grid ceiling and the grid is installed around the support system. Eliminating the support system and the additional grid labor is a major schedule advantage and cost savings for the data center end user. This chapter discusses the unique components and installation of a Prelude® XL Max™ data grid ceiling.

Components

This segment explains the various components and accessories required for installing a data grid system. These components include the double bulb main beam, double bulb cross tee, and structural wall molding. Other accessories include intersection, hanging and splice clips. It is important for the installer to follow the manufacturer's instructions or the load carrying capabilities of the system can be compromised. The following information is adapted from Armstrong® Ceiling Systems instructions and drawings.

Substitution of any component, other than what has been designed by the manufacturer is not recommended. Seismic connection details are available from Armstrong® Ceiling Systems for seismic categories D, E and F and are addressed in general in the following information. In all instances, it is mentioned to have the architect or engineer of record design any connection not clearly detailed on the project drawings and to confirm the loads imposed on the data grid is in accordance with the load charts provided by the manufacturer.

Main Beam

The main beam is available in a length of 144" with a staked on clip at each end for connecting to other main beams. The web height measures 2.44" with a double bulb profile for load carrying capabilities. In addition, the face flange measures 15/16" and is available in various custom colors. White is the standard color for main beams and cross tees. The rout spacing is 6" from each end and 12" on center along the length of the main beam. See Figure 1.

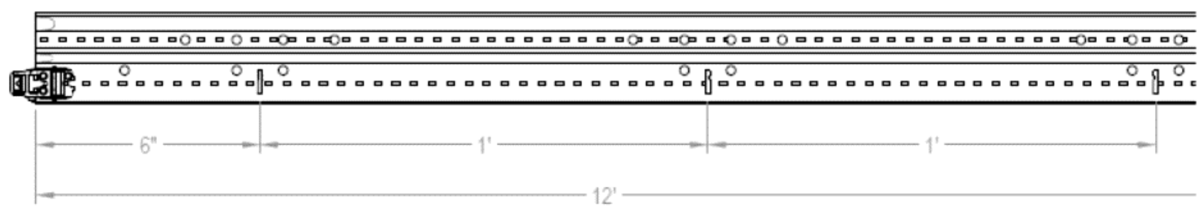


Figure 34 - XL Main Beam

Cross Tee

Cross tees are available in 24" and 48" lengths. Cross tees also contain a staked on clip at each end for secure connections to main beams and other cross tees. Cross tees have the same web height, double bulb profile and face flange width as main runners. Rout spacing is 12" on center along the web of the 48" cross tees. See Figure 2.

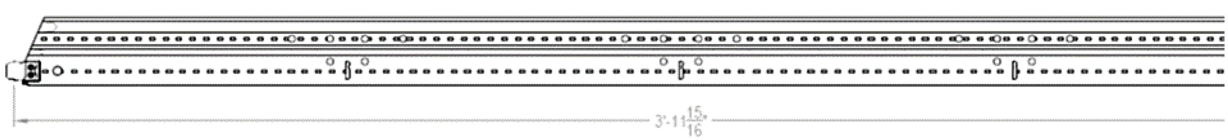


Figure 35 - XL 4' Cross Tee

Wall Molding

Data grid wall molding is a structural wall molding with a hemmed vertical wall leg. Wall molding measures 144" in length, with the wall leg measuring 15/16" and the exposed flange being 7/8" wide. See Figure 3. As with any structural wall molding, it must be attached to each wall stud or structure not to exceed 24" on center with an approved fastener. Thereupon, connections to concrete or other CMU walls require an engineer approved connection.

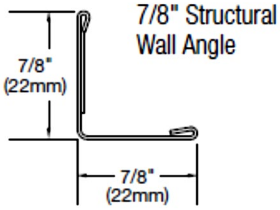


Figure 36 - Structural Wall Molding

Lateral Support Bar

Lateral support bars install above the main beams and cross tees along the float walls. This component must attach to the wall studs or structure not to exceed 24" on center with an approved fastener. A factory applied punch out, in the shape of the top bulb, is placed along the bottom edge at 6" intervals. The bar is slid onto the top bulb of the main beams or cross tees as shown in Figure 4. Lateral support bars are required in seismic categories D, E, F.

Figure 37 - Lateral Support Bar

Accessories

Accessories, such as clips and connectors, are described in this section. These include a: intersection hanging clip, supplemental hanging clip, top lock main beam splice clip, intersection joint clip, cross tee adapter clip, Prelude XL Max® hold down clip, Prelude XL Max Load Connector and 3/8" threaded rod. The threaded rod is used to suspend the data grid in lieu of 12 gauge hanger wire. Each accessory listed has a specific function regarding the load carrying capability of the data grid system. All of the accessories are labeled and detailed in Figure 5 for reference.

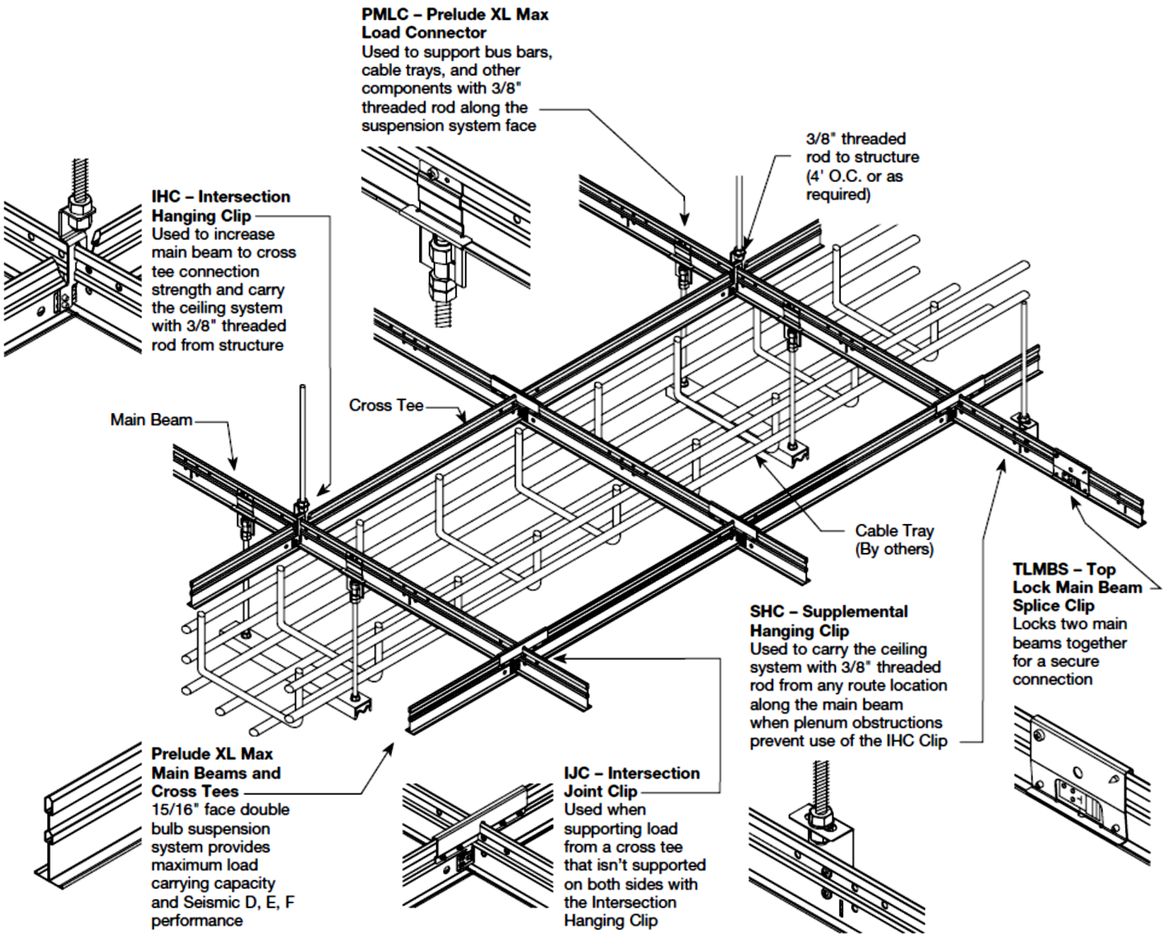


Figure 38 - XL Max System Overview

Intersection Hanging Clip

The intersection hanging clip, IHC, is used to increase the connection strength between the main beam and cross tee, as well as carry the ceiling system using a 3/8" threaded rod connection. These clips must be slid onto the main beam prior to the cross tees being installed. An IHC clip is located at each threaded rod location unless a supplemental hanging clip is used. See Figure 6. Supplemental hanging clips are explained below. Each IHC clip is attached to both intersecting cross tees with two 1/8" diameter blind steel rivets per cross tee, totaling four rivets per clip. It is important to make sure the head of the rivet extends through the clip and head of the rivet expands onto the IHC clip. See Figure 7. The connection between the IHC clip and the threaded rod is made using one 3/8 - 16" heavy hex nut and one 3/8 - 16" heavy hex Locknut as shown in Figure 8.

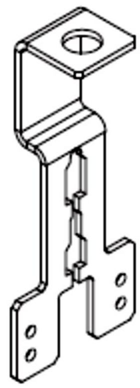


Figure 39 - Intersection Hanging Clip (IHC)

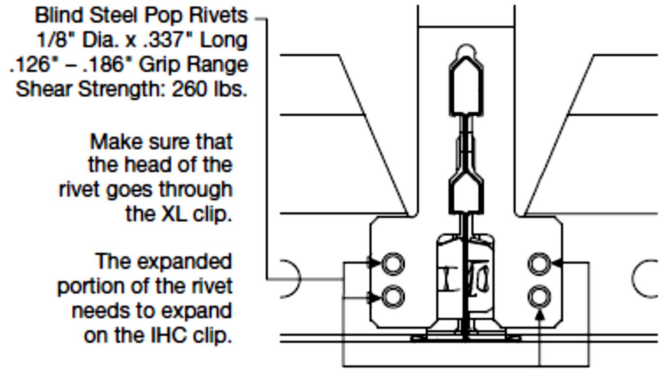


Figure 40 - IHC Rivet Connection

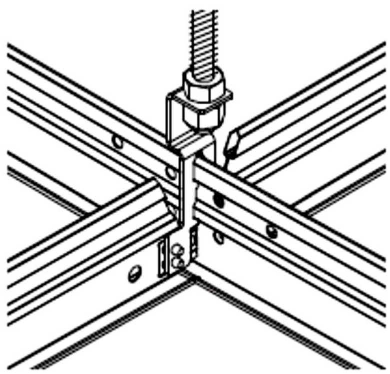


Figure 41 - IHC Connection to Grid

Supplemental Hanging Clip

The supplemental hanging clip, SHC, is used with 3/8" threaded rod from any location along the main beam when plenum obstructions prevent the use of an IHC. For example, if the desired location of a hanger rod, placed on the typical 4' - 0" on center spacing cannot be achieved, a supplemental hanging clip must be used to secure the main beam to the threaded rod. See Figure 9. The supplemental hanging clip is attached to the main beam with two M5 x 6mm pan head machine screws along with thread locker adhesive. Two holes are available on each side of the rout locations for attaching the SHC. The connection to the threaded rod must include two 1/8" thick x 7/8" wide flat washers of Grade C – 1010 case harden steel and one 3/8 – 16" heavy hex nut and one 3/8 – 16" heavy hex Locknut when installing the SHC clip. See Figure10.

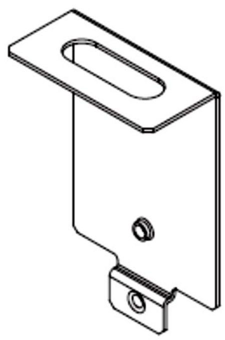


Figure 42 - Supplemental Hanging Clip (SHC)

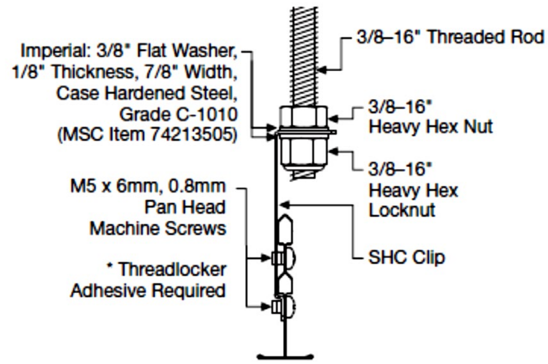


Figure 43 - SHC Connection to Main Beam

Top Lock Main Beam Splice Clip

The top lock main beam splice clip, TLMBC, is used at every main beam to main beam connection. This clip, see Figure 11, reinforces the staked on clip connection between the two main beams. The splice clip is applied over the top of the double bulb and is secured with two #8 x ½" truss head sharp point screws. It is important to insert each screw through the larger pilot hole, into the web and into the smaller pilot hole on the opposite side. Two steel rivets are installed into the clip, through the main beam web and into the clip on the opposite side as shown in Figure 12. A threaded rod must be located within 6" of the TLMBC connection. A SHC is used to attach the threaded rod to the main beam.

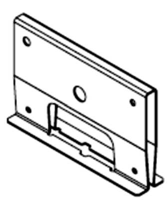


Figure 44 - Top Lock Main Beam Splice Clip (TLMBC)

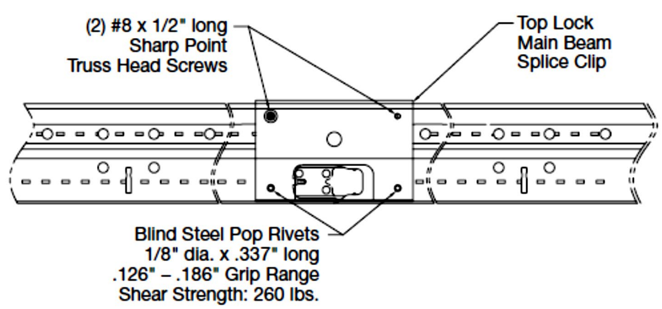


Figure 45 - TLMBC Installation

Intersection Joint Clip

The intersection joint clip, IJC, must be used to connect every main beam to cross tee intersection and every 4' cross tee to 2' cross tee intersection unless the connection has been reinforced with an intersection hanging clip. See Figure 13.

Four M5 machine screws with thread locking compound are used to attach this clip as shown in Figure 14.

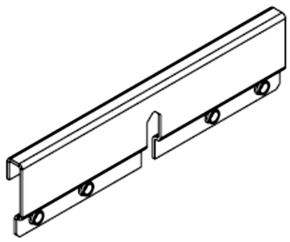


Figure 46- Intersection Joint Clip (IJC)

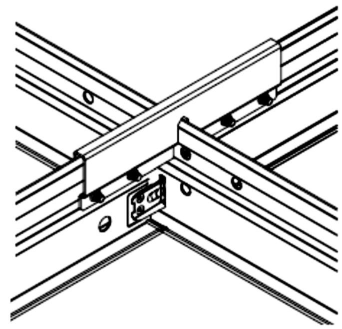


Figure 47 - Installed IJC

Cross Tee Adapter Clip

The cross tee adapter clip, XTAC, is connected to each cross tee and main beam where they terminate at the structural wall molding. See Figure 15.Two #8 truss head screws connect the clip to the structural wall molding and two 1/8" steel rivets are used to attach the XTAC clip to the web of the component as shown in Figure 16. Do not apply these clips at the float walls.

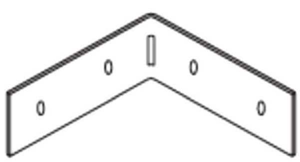


Figure 48 - Cross Tee Adapter Clip (XTAC)

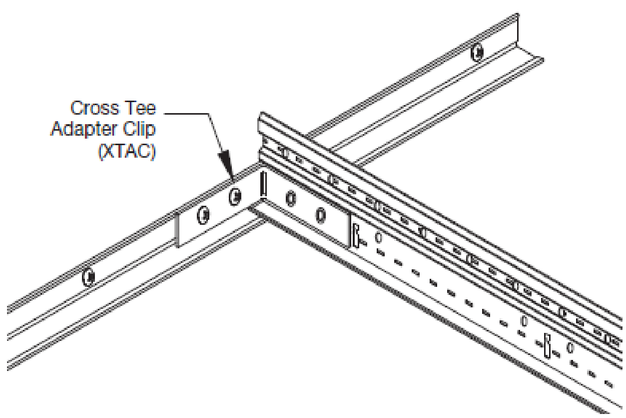


Figure 49 - Installed XTAC

Prelude XL Max Hold Down Clip

The Prelude XL Max hold down clip, PMHDC, attaches to the top bulb of the suspension system and holds the ceiling tiles in place preventing ceiling tile movement, primarily uplift. These hold down clips are installed during the ceiling tile installation phase. See Figure 17.

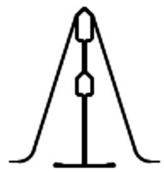


Figure 50 - Prelude XL Max Hold Down Clip (PMHDC)

Prelude XL Max Load Connector

The Prelude XL Max Load Connector, PMLC, is used to support bus bars, cable trays and other components with 3/8" threaded rod along the suspension system face flange. These clips are mounted after the grid is installed and after the cable trays or bus bars have been laid out. See Figure 18. This two piece clip slides open and engages onto the face flange of the main beam or cross tee. The clip is mechanically secured to the web of the main beam or cross tee using one #8 truss head sharp point screw as shown in Figure 19. The screw must be inserted into the larger pilot hole of the clip, screwed through the web of the component and into the smaller pilot hole on the other side of the clip.

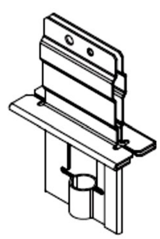


Figure 51 - Prelude Max Load Connector (PHLC)

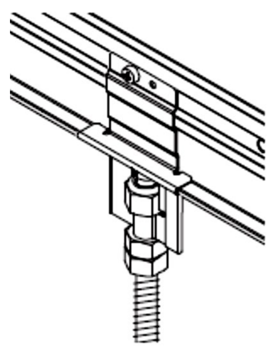


Figure 52 - Installed PHLC

When the load connector is installed within 3" of a threaded rod connection as shown in Figure 20, the system can carry single point loads up to 300 pounds. When the load connector is installed onto a 4' cross tee as shown in Figure 21, the system can carry a single point load of up to 93 pounds.

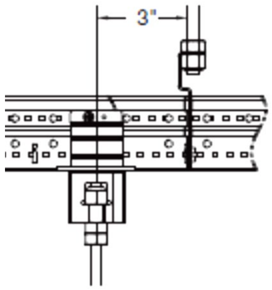


Figure 53 – Maximum 300 Lbs. Connection Location

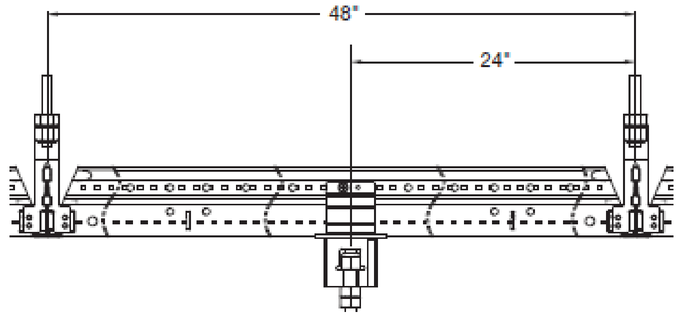


Figure 54 – Maximum 93 Lbs. Connection Location at Cross Tee

Installation of the Data Grid

The data grid is designed to be installed with 3/8" threaded rod attached to the structure. However, it may be easier to initially install and level the data grid using minimum 12 gauge hanger wires and then replace the hanger wires with 3/8" threaded rods. This decision would be made based on the job site conditions. If the structure above the data grid cannot be reached safely or without damaging the grid, it should be installed as directed by the following information. In addition, follow all installation instructions for the each component in the succeeding information as described previously in the Accessories section.

Layout

Lay out the floor within the space, marking the locations of the hanger rods, after determining the ceiling border sizes. The 3/8" threaded hanger rods must not exceed 4' on center and are located at a node point. Keep in mind, a threaded rod must be located within 6" of the connection between the main beams.

Mark the initial main beam and cross tee locations on the two walls above the wall molding elevation. Note any overhead mechanicals preventing a plumb thread rod installation. When plumb threaded rod drops are not possible, a trapeze or sub-framing is required. This sub or trapeze framing must be engineered to support the designed loads. Always follow the locations and direction of the threaded rod, hangers, main beams, cross tees of a drawing designed by a specifying architect/engineer.

Wall Molding

Installation of the grid begins with the structural wall molding. Refer to the finish plan, for any floor finishes which may affect the final installation height of the ceiling, such as raised computer flooring. Determine the high point on the floor or use a benchmark for setting the grid elevation. Finally, set up a laser and adjust the beam to the top of the wall molding and use this as the reference line during the molding installation. Screw attach the double hemmed leg of the structural wall molding to the wall studs or structure at a maximum 24" on center, with 1¼" truss head, self-tapping screws or other approved fasteners.

Installation of the Threaded Rod

Transfer the floor marks for the threaded rod to the structure above using a laser. Install the 3/8" threaded rod hangers into the overhead structure per the recommendations from the anchor manufacturer. Threaded hanger rods must be installed plumb and should extend a minimum of 12" below the finished height of the ceiling.

The 3/8" hanger rods are marked at the final installation height, making the necessary adjustment for IHC connection, using the laser. Cut the threaded rods at the marked location using a bolt cutter or band saw. It may be necessary to use a die to reset the threads. The IHC allows for a certain amount of up and down adjustment, so accuracy when cutting the rods is necessary, but not absolutely critical.

Starting the Installation of the Data Grid

Mark the location of the cross tees and main beams on the wall molding, slide the IHCs onto the main beams where the threaded rods are located. Thread two nuts onto the threaded rods, with the IHC between, as shown in Figure T080. It is understood, the main beams are being checked for level, using a laser as a reference, as the installation progresses. Tighten the 3/8"-16 nuts on each side of the IHC until metal to metal contact is made and then turn an additional quarter turn with a wrench. Thread locking compound is required unless a Locknut is used in accordance with the detail. Install the full and cut cross tees, including 2' cross tees for 2' x 2' patterns, as they would be installed on any standard suspension system and square the system. All cross tees and main beams are connected to the structural wall molding using an XTAC, with two 1/8" steel pop rivets and two #8 truss head screws.

Continue the initial two main beam runs, with all cross tees, until reaching the opposing walls. Install two 1/8" steel pop rivets at each IHC to main beam intersection, totaling four rivets. Pop rivets must be inserted through the existing holes in the cross tee staked clip, then into the IHC. Install an IJC at all cross tee to main beam connections not utilizing an IHC. Attach the IJC to the main beam and cross tees using three #8 truss head screws.

Install a TLMBS, onto each main beam coupling and secure the connection using four #8 truss head sharp point screws. The TLMBS is required at every main beam splice location in the field of the installation. The TLMBS must be positioned to connect two cross tees to the main beam. Insert the screw from the larger pilot- hole into the smaller hole on the other side of the clip.

Proceed with the installation as a typical grid system based on the special parameters of this system. The remaining XTACs, IJCs, TLMBSs and 12 gauge hanger wires can be connected after the grid system has been installed and leveled.

Installing Supplemental Hanging Clips

When a desired location for the threaded rod to the structure cannot be achieved using the IHC, due to obstructions in the plenum space, a SHC must be used to secure the main beam to the threaded rod as described earlier in the accessories section. In addition, trapeze framing is a requirement when using SHCs. SHCs require the use of two 3/8" flat washers, 7/8" in width and made of C – 1010 case hardened steel, as well as one 3/8" – 16 hex nut and one lock nut. The machine screw connections to the main beam must have a thread locking compound applied.

Verifying Connections

Once the main beam and cross tee connections have been made, as well all connector clips, each connection should be checked. All rivet connections must be made with steel rivets 1/8" diameter x .337 long, having a shear strength of 260 pounds. Do not use aluminum rivets. All machine screws require a locking compound, in addition to the double hex nut connections, unless one of the hex nuts was a lock nut. The cable try installation can begin once the data grid is complete.

Seismic Considerations for Categories D, E, and F

Data grid ceiling components are heavy duty rated and the connection strength between the main beams and cross tees has a minimum strength of 180 pounds in tension and compression. Lateral force bracing, seismic pods, are required for ceilings greater than 1000 square feet. Seismic pods are placed every 144 square feet, starting no more than 6' from any two adjacent walls.

Lateral force bracing consist of four splay wires placed 90° from one another in plan view, and a maximum of 45° from the horizontal plane of the ceiling. Lateral force bracing must be placed within 2" of a node grid. In addition, a compression post is placed in the middle of the splay wires. A compression post can consist of a telescopic component or a rigid metal stud. Always follow the seismic pod detail for size and gauge of the metal stud which can vary depending upon the height above the ceiling to the structure above. All connections for splay wires and the compression posts must be capable of individually supporting 250 pounds. Check the structural drawings for the specified connection fasteners.

Two adjacent sides of the data grid must be allowed to float and cannot be fastened to the structural wall molding. A lateral support bar is installed to support the terminal ends of the main beams and cross tees along these two walls. The lateral support bar must be attached to the wall studs, with 1 ¼" truss head screws, no more than 24" on center.

Perimeter wires are not required along the float walls or the rigid attached walls, because of the lateral support bar and the XTAC connection. Light fixtures weighing greater than 10 pounds, but less than or equal to 56 pounds, require two 12 gauge hanger wires connected to the fixture housing on opposite diagonal corners and connected to the structure.

Finally, when the ceiling exceeds 2500 square feet, an engineer of record should specify the placement of any seismic separation joint locations. Follow all details applicable to the placement and installation of the seismic separation joint.

Installation of the Cable Tray

The installation of the cable tray consists of the Prelude XL Max® load connections, threaded rods, and the cable tray assembly. Determine the location of the cable trays, bus bars or other equipment according to the reflected ceiling plan or shop drawings. It is best to measure from grid connections to locate the PMLCs instead of snapping a chalk line. Chalk lines can be hard to remove once the clip is aligned with the chalk line and attached.

The PLMCs are slid open and placed over the face flange of the suspension system. One #8 sharp pointed screw is placed through the hole in the clip, into the web of the grid member, and through the hole on the opposite side of the PMLC. This process is repeated at all PLMC locations. A completed connection is shown in Figure 22.

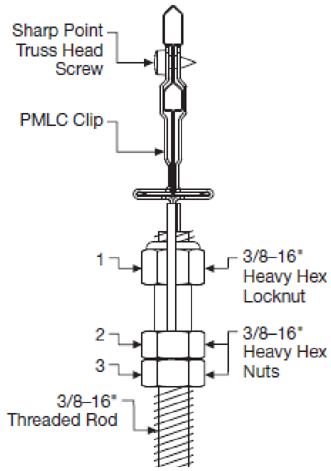


Figure 55 - Installed PMLC Connection

Depending upon the type and manufacturer of the cable tray system, installation of the 3/8" threaded rod and connections can vary. However, the final installation height will need to be determined, in addition to the length of the threaded rods connecting to the PMLCs. All threaded rod connections to the PMLCs must contain one locknut and two hex nuts as shown in Figure 22 above. The threaded rods should be cut to length before installation. Follow the cable tray manufacturer's instructions for the cable tray connection to the threaded rods.

Procedure – Prelude XL Max Data Center Ceiling System Installation

1. Gather the necessary installation information from the reflected ceiling plan.
2. Set the laser to the installation height of the ceiling.
3. Install the structural wall molding, aligned to the laser, at all perimeter walls using the appropriate fastener attached to each stud not to exceed 24" on-center.
4. Lay out the initial main beam location and cross tee locations based on the ceiling border dimensions.
5. Install dry lines to align with a main beam rout hole and to align with the edge of the main beam.
6. Lay out the threaded rod locations for each main beam 4'-0" on-center, in addition to a threaded rod within 6" of each main beam-to-main beam connection.
7. Install each threaded rod using the appropriate connection method to the structure as recommended by the manufacturer, extending the threaded rod a minimum of 6" below the installation height of the ceiling.
8. Cut each threaded rod 3 1/4" above the installation height of the ceiling using the laser as reference.

9. Reset the threads on each threaded rod using a die holder.
10. Cut the initial main beam to length measuring from a rout hole which minimizes waste.
11. Install IHC onto the main beam for each threaded rod connection.
12. Loosely connect each IHC to the threaded rod using hex nuts and a locknut.
13. Adjust the main beam to level using the laser as a reference.
14. Tighten the nuts until metal-to-metal contact is made and then turn an additional ¼ turn with a wrench.
15. Install another main beam, cut to length, 4'-0" away from the first main beam.
16. Repeat steps 11-14 for the next main beam.
17. Install 4'-0" cross tees every 2'-0" on-center starting at the rout for the border dimension.
18. Install a cross tee, cut to length, along the perimeter wall.
19. Align the main beam to the dry line and clamp the cut cross tee to the perimeter wall molding.
20. Confirm the grid is square, adjust as necessary.
21. Install the remaining cut cross tees along the perimeter wall.
22. Attach a cross tee adapter clip to each main beam and cross tee location at the wall molding, using two screws and two steel rivets.
23. Install the next section of grid, securing the components to the established grid.
24. Install a TLMBS clip onto each main beam coupling using two #8 truss head sharp point screws and two steel rivets.
25. Install four steel rivets at each IHC clip location, being sure the head of the rivet goes through the IHC.
26. Install IJC at every cross tee to main beam intersection using four M5 machine screws and thread locking compound.
27. Continue the installation until complete, leaving the grid unattached at two adjacent walls.
28. Install a lateral support bar onto all unattached main beams and cross tees on the float walls.
29. Attach the lateral support bars to the wall studs using 1 ¼" truss head screws.
30. Install hanger wires for light fixtures following light layout on reflected ceiling plan, if required.
31. Install seismic pods every 144 square feet starting 6' from two adjacent walls.

Procedure – Installation of the Cable Tray

1. Gather the necessary installation information from the drawings.

2. Lay out the location of the cable trays on the ceiling system according to the drawings.
3. Lay out the location of the PMLCs based on the layout performed in step 2.
4. Attach the PMLC to the face of the suspension system making sure the two halves of the clip fully engage the flange of the grid and are interlocked together.
5. Align the clip with the layout performed in step 3 and attach the clip using one #8 truss head sharp point screw.
6. Repeat steps 4 and 5 for all PMLC locations.
7. Cut the threaded rod to length based on the installation height of the cable tray.
8. Install the threaded rod, hand-tightening the hex nuts 1 and 2 until metal-to-metal contact is made.
9. Turn the hex nuts in step 8 an additional ¼ turn with a wrench.
10. Hand-tighten locknut 3 until metal-to-metal contact is made and then turn an additional ¼ turn with a wrench.
11. Repeat steps 8 – 10 for all other threaded rod connections.
12. Install the cable tray following the installation instructions from the manufacturer.
13. Install the ceiling panels after all inspections have been completed.

Installing Ceiling Tile

Installation of the ceiling tile is completed after all overhead inspections have been completed for the trades working above the ceiling. Both flat lay in and tegular tiles are popular choices for data center ceilings. In most instances, the architect will specify a low particulate type of tile or finish due to the sensitive nature of the computer equipment within the room.

Tegular tile requires the cut edges to have a field applied tegular cut to prevent future sagging. In addition, light weight tile, weighing less than 1 pound per square foot, will require hold down clips. These clips apply over the top bulb of the grid components and are applied due the tile installation phase.

Chapter 3

Study Guide

Directions:

Answer the following questions using the bubble answer sheet.

1. It is important for the installer to follow the manufacturer's instructions or the load carrying capabilities a data grid system can be compromised.
   A. True
   B. False

2. Lateral support bars must attach to the wall studs or structure not to exceed ____" on center with an approved fastener.
   A. 8
   B. 10
   C. 12
   D. 24

3. All threaded rod connections to the PMLCs must contain one locknut and two hex nuts.
   A. True
   B. False

4. The ________, is used to increase the connection strength between the main beam and cross tee, as well as carry the ceiling system using a 3/8" threaded rod connection for the data grid.
   A. PMLC
   B. SHC
   C. IHC
   D. TLMBC

5. The Prelude XL Max Load Connector is a two piece clip which slides open and engages onto the face flange of the main beam or cross tee for the data grid.
   A. True
   B. False

6. The ________ is used at every main beam to main beam connection for the data grid .
   A. PMLC
   B. SHC
   C. IHC
   D. TLMBC

7. The _______ must be used to connect the ends of two cross tees to the main beam where they intersect unless this intersection has been reinforced with an intersection hanging clip for the data grid.
   A. IJC
   B. SHC
   C. PMLC
   D. TLMBC

8. The data grid 3/8" threaded hanger rods must not exceed ____' on center and are located at a node point.
   A. 2
   B. 3
   C. 4
   D. 6

9. The single unhemmed leg of the data grid structural wall molding attaches to the wall studs or structure at a maximum 24" on center, with 1¼" truss head, self-tapping screws or other approved fasteners.
   A. True
   B. False

10. When installing threaded hanger rods, they must be installed plumb and should extend a minimum of _____" below the finished height of the ceiling.
   A. 8
   B. 10
   C. 12
   D. 24

11. The machine screw connections for a SHC must have a thread locking compound applied.
    A. True
    B. False

12. All data grid rivet connections must be made with steel rivets 1/8" diameter x .337 long, having a shear strength of 260 pounds.
    A. True
    B. False

13. Lateral support bars for data grid is required in seismic categories D, E, F.
    A. True
    B. False

14. The data grid main beam web height measures _____" with a double bulb profile for load carrying capabilities.
    A. 2.44
    B. 2.64
    C. 2.75
    D. 3.00

15. Each data grid ______ is attached to both intersecting cross tees with two 1/8" diameter blind steel rivets per cross tee, totaling four rivets per clip.
    A. PMLC
    B. SHC
    C. IHC
    D. TLMBC

16. An XTAC is connected to each cross tee and main beam where they terminate at the structural wall angle, except for the float walls.
    A. True
    B. False

17. Rout spacing is 12" on center along the web of the 48" data grid cross tees.
    A. True
    B. False

18. Threaded rod is used in lieu of 12 gauge hanger wire as the major suspension support for data grid support.

   A. True
   B. False

19. When overhead mechanicals prevent a plumb thread rod installation, a trapeze or sub-framing is required.

   A. True
   B. False

20. The data grid ________ is used to support bus bars, cable trays and other components with 3/8" threaded rod along the suspension system face flange.

   A. PMLC
   B. SHC
   C. IHC
   D. TLMBC

21. Installation of the ceiling tile is completed after all overhead _________ have been completed for the trades working above the ceiling.

   A. components
   B. inspections
   C. wires
   D. straps

22. The data grid main beam rout spacing is ___" from each end and ___" on center along the length of the main beam.

   A. 2, 4
   B. 4, 6
   C. 3, 6
   D. 6, 12

23. The data grid XTAC is a two piece clip which slides open and engages onto the face flange of the main beam or cross tee.

   A. True
   B. False

24. Data grid wall molding is a _________ wall molding with a hemmed vertical wall leg.
    A. straight
    B. structural
    C. shadow
    D. transition

25. The data grid supplemental hanging clip is used with 3/8" threaded rod from any location along the main beam when plenum obstructions prevent the use of an IHC.
    A. True
    B. False

26. A threaded rod must be installed within ___" of a main beam to main beam connection.
    A. 6
    B. 8
    C. 10
    D. 12

27. Seismic pods are placed every _____ square feet, starting no more than 6' from any two adjacent walls.
    A. 96
    B. 100
    C. 144
    D. 200

28. Tegular tile requires the cut edges to have a field applied tegular cut to prevent future sagging.
    A. True
    B. False

29. The data grid TLMBC applies over the top of the main beam double bulb and is secured with two #8 x ½" truss head sharp point screws and two steel rivets.
    A. True
    B. False

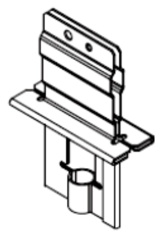
30. The data grid PMHDC attaches to the top bulb of the suspension system and prevents ceiling tile movement.
    A. True
    B. False

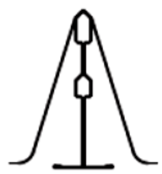
Exercise #1

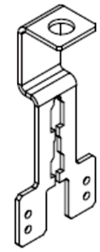
Manufacturer Installation Methods

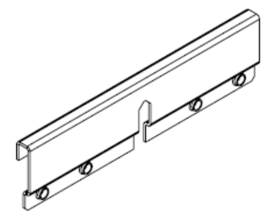
Directions:

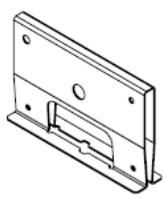
Use the table to match the abbreviation with the data grid accessory and the required manufacturer installation method.

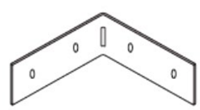
A. 

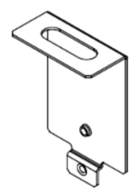
B. 

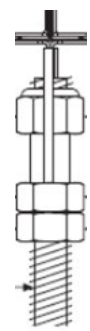
C. 

D. 

E. 

F. 

G. 

H. 

Manufacturer Installation Method:

1. This is attached to both intersecting cross tees with two 1/8" diameter blind steel rivets per cross tee, totaling four rivets per clip and the threaded rod using one 3/8 - 16" heavy hex nut and one 3/8 - 16" heavy hex Locknut.

2. This is attached to the main beam with two M5 x 6mm pan head machine screws along with thread locker adhesive and to the threaded rod using two 1/8" thick x 7/8" wide flat washers of Grade C – 1010 case harden steel and one 3/8 – 16" heavy hex nut and one 3/8 – 16" heavy hex Locknut.

3. This is applied over the top of the double bulb and secured with two #8 x ½" truss head sharp point screws and two steel rivets, with each screw inserted through the larger pilot hole, into the web and into the smaller pilot hole on the opposite side.

4. This two piece clip slides open and engages onto the face flange of the main beam or cross tee and is mechanically secured to the web of the main beam or cross tee using one #8 truss head sharp point screw.

5. This attaches to the top bulb of the suspension system and holds the ceiling tiles in place preventing ceiling tile movement.

6. This is used to connect every main beam to cross tee intersection and every 4' cross tee to 2' cross tee intersection with four M5 machine screws and thread locking compound, unless an IHC is present.

7. This threaded rod connection must contain one locknut and two hex nuts.

8. This attaches with two #8 truss head screws to the structural wall molding and two 1/8" steel rivets to the web of the component.

Table:

Abbreviation	Installation Method	Data Grid Accessory
SHC		
PMLC		
XTAC		
Lower PMLC rod connection		
PMHDC		
IJC		
IHC		
TLMBS		