Structural Ceiling

# Tate Grid User Installation Reference Guide

THIS INFORMATION MUST BE SHARED WITH ALL SERVICE PROVIDERS WHO INTEND TO SUSPEND SERVICES FROM THE TATE GRID SYSTEM

**NOTE: ALL CONNECTIONS TO GRID SHOULD BE TIGHTENED TO 20 IN-LBS TO 30 IN-LBS OF TORQUE.**

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Installation Guide

# Safety Guidelines

## THIS INFORMATION MUST BE SHARED WITH ALL SERVICE PROVIDERS WHO INTEND TO SUSPEND SERVICES FROM THE TATE GRID SYSTEM

Tate Grid is a structural ceiling system designed to support static vertical loads. When installing services to the bottom 3/8"-16 threaded channel, the following instructions must be adhered to:

1. Tate Grid is limited to a maximum point load of 380 lbs or distributed load of 50 lb/ft2.
   a. Exceeding these values may cause a failure in the system.

2. Do not torque the threaded rod or bolts above 30 in-lbs. Over torquing will damage the threads of the 3/8"-16 slot reducing the load capacity of the Tate Grid System.
   a. Failure to adhere to this may result in the shearing of bottom slot threads reducing the load capacity of the Tate Grid system.

3. Equal care must be taken during the installation of the Tate Grid to not exceed the 30 in-lbs torque limit on the top screws connecting the Tate Grid to the suitable connector.
   a. Failure to adhere to this may result in the shearing of top slot threads reducing the load capacity of the Tate Grid system.

4. Only screws supplied by Tate should be used on the top slot.
   a. Failure to adhere to this may result in the reduction of the load capacity of the Tate Grid system.

5. There must be at least 5/8 in. thread engagement between threaded rod or bolt supporting the suspended service(s).
   a. Failure to adhere to this may result in the reduction of the load capacity of the Tate Grid system.

6. Do not impose a dynamic load on the connection to Tate Grid. During installation of supported services, bracing is required to prevent dynamic load on the Tate Grid ceiling.
   a. Moment forces imposed on the Tate Grid system may cause failure of the connection between the services and the Tate Grid system.

7. All bottom thread fixings should be completed with suitable washers.

8. Tate Grid is NOT a walk-on ceiling.

9. In certain conditions the loading capacity of the Tate Structural Ceiling System may be greater than the loading capacity of the building structure and/or means of attachment to the building structure. Consult with a licensed structural engineer to obtain site specific recommendations regarding the attachment of the Tate Structural Ceiling System and any associated loading to the building structure.

10. Structural ceiling systems as a whole shall be analyzed and designed to local codes by a qualified engineer.

11. Contractors attaching data center infrastructure to the bottom of Tate Grid such as but not limited to Cable Trays, Electrical Busways, Containment Panels, etc. shall be aware of the above safety guidelines and the risks associated with over torque bolts, overloading the system and applying dynamic loads the Structural Ceiling System.

THIS INFORMATION MUST BE SHARED WITH ALL SERVICE PROVIDERS WHO INTEND TO SUSPEND SERVICES FROM THE TATE GRID SYSTEM

## Introduction

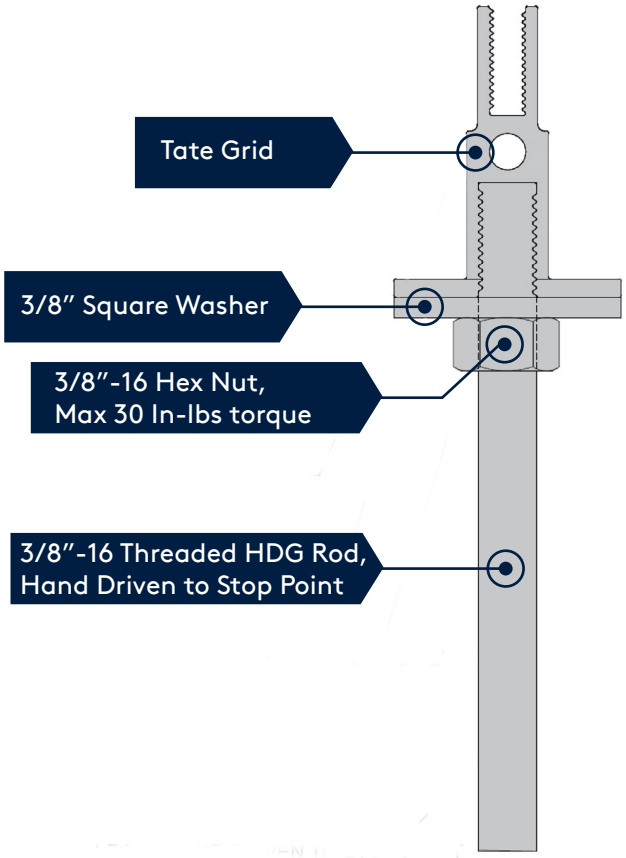
**Thank you for choosing Tate Grid. The purpose of this guide is to provide you with a reference for typical installation situations. We would be interested in hearing any comments you have on this installation manual, product, or overall experience. Please call or email Technical Services: Phone: 410-799-4200, Email: TateInfo@tateinc.com**

## Safety

**Tate Grid is a structural ceiling system designed to support static vertical loads. When installing services to the bottom 3/8"-16 threaded channel, the following instructions must be adhered to:**

1. Do not torque the threaded rod or bolts above 30 in-lb. Over torquing will damage the threads of the slot reducing the load capacity of the Tate Grid system
2. There must be at least 5/8" thread engagement between threaded rod or bolt
3. Be sure all bolts, nuts, and threaded rods are properly tightened down as described in this guide.
4. Do not impose a dynamic load on the connection to Tate Grid. During installation of supported services, bracing is required to prevent dynamic load on the Tate Grid ceiling.
   a. Moment forces imposed on the Tate Grid system may cause failure of the connection between the services and the Tate Grid system.
5. All bottom thread fixings should be completed with suitable washers.
6. Do not put a load on the system until the installation is complete
7. Tate Grid is NOT a walk-on ceiling
8. 2 or more people are required for handling some of the pieces for this system
9. Wear personal protective equipment (PPE) when drilling, cutting, or installing. PPE includes gloves, safety eyeglasses, hard hats, etc.

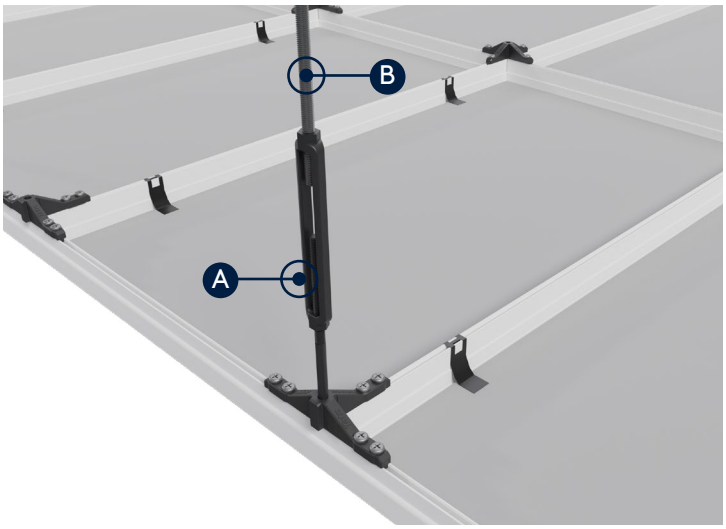
## Suitable Connection Methodology



# 1. Building Connections

## Tate Scope of Supply:

**Tate supplies Grid components up to the turnbuckle (A), suitable drop rod and building connections (B) must be sourced by others.**




Tate Grid hanging method from steel building

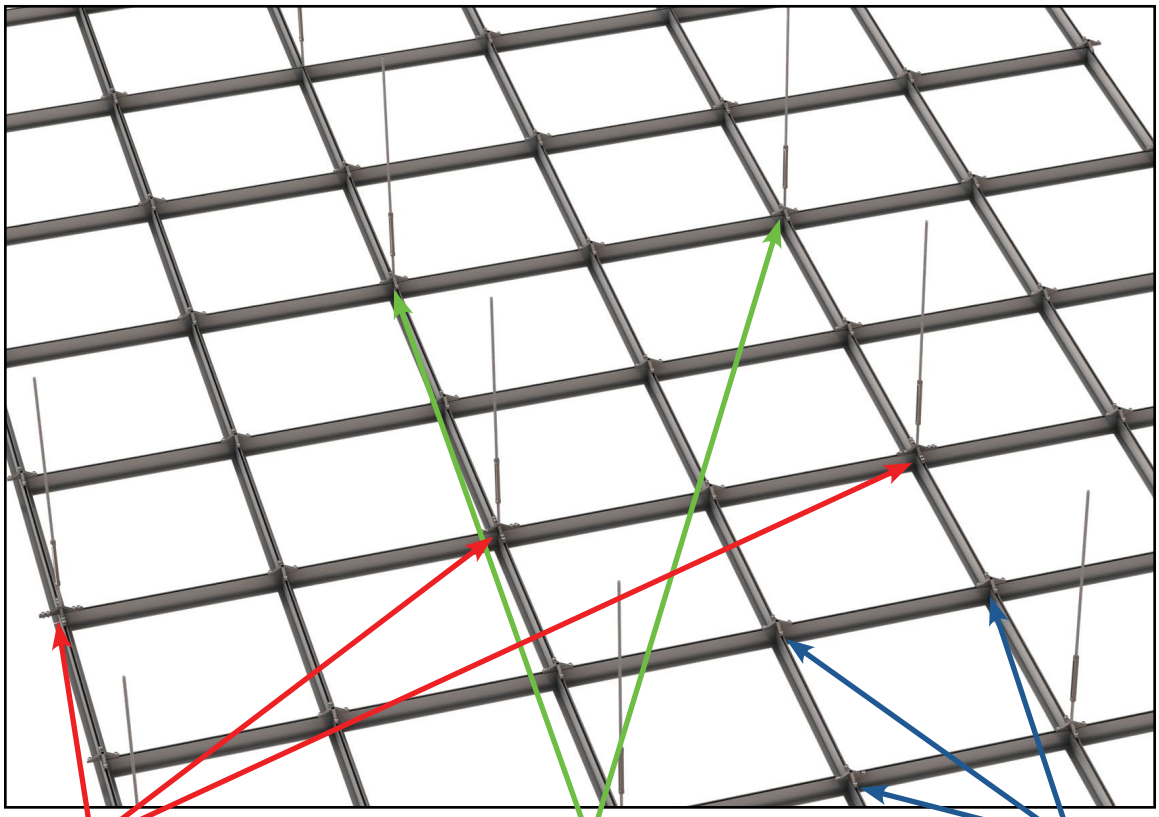
Tate Grid hanging method from concrete building

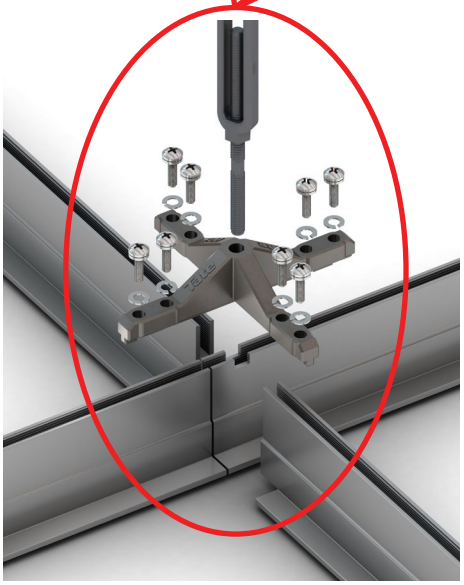
**The Tate Grid system may be hung either directly from structural steel or the above concrete slab.**

## Drop Rod Frequency:

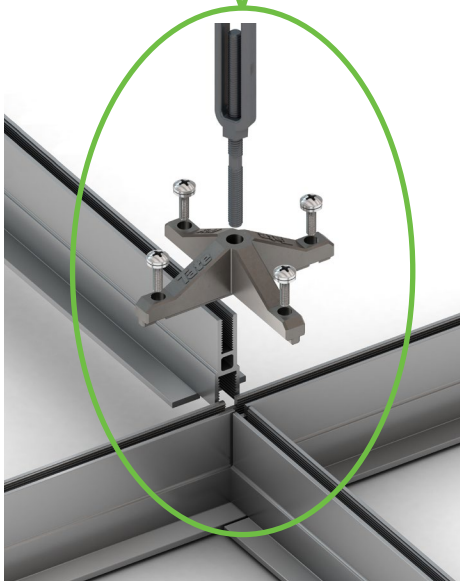
**Tate Grid requires connections every 4′ x 4′ nominal on center, and always along the perimeter.**

# 2. General Layout & Part Numbers

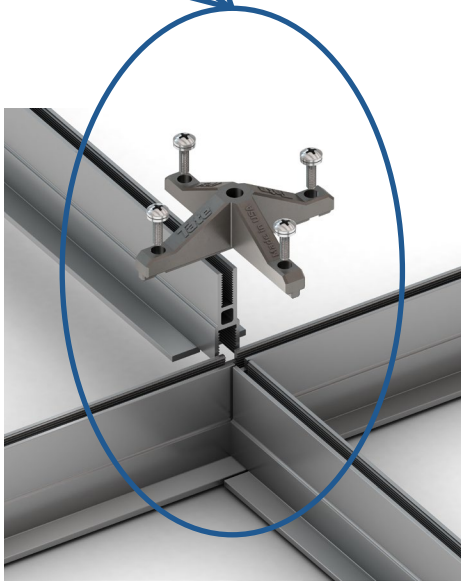




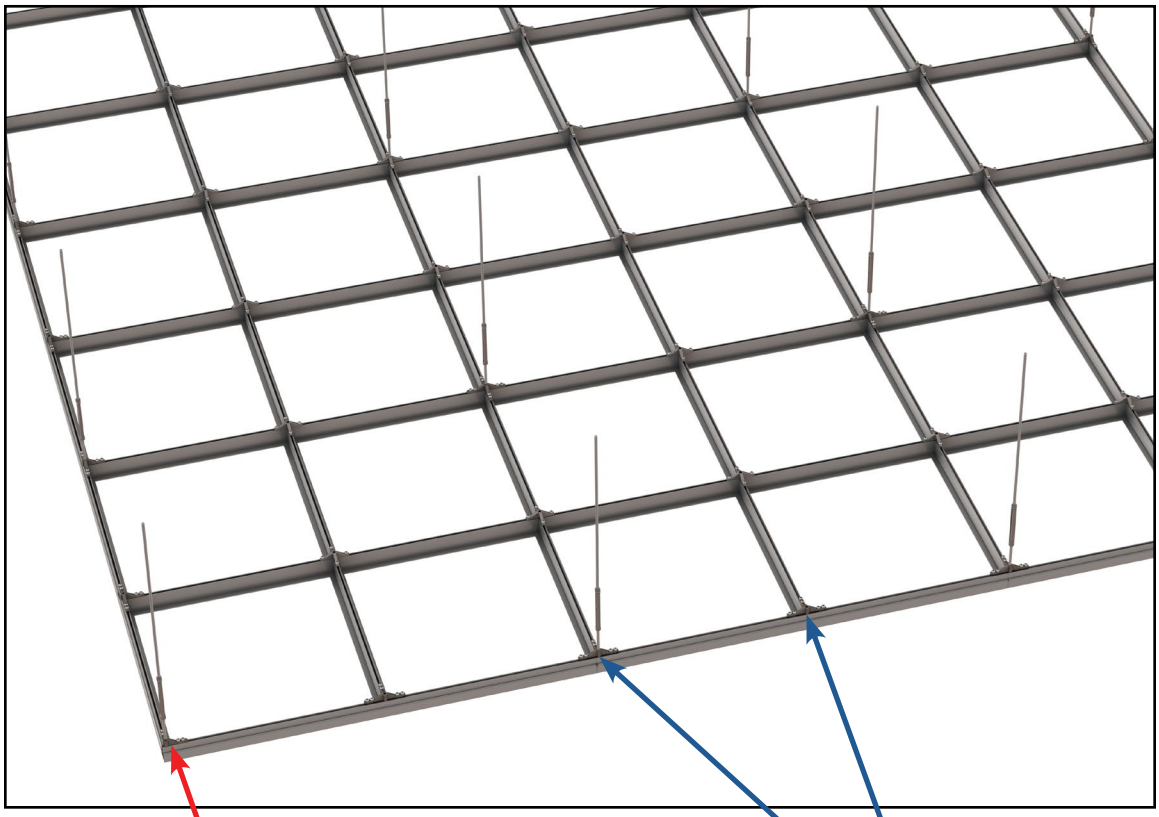
**Joints of Main Runners**
Turnbuckle & Starter Rod (PN28361)
XL Connector (PN39564)
1/4"-20 Screw with 1/4" Lock Washer (PN41788)

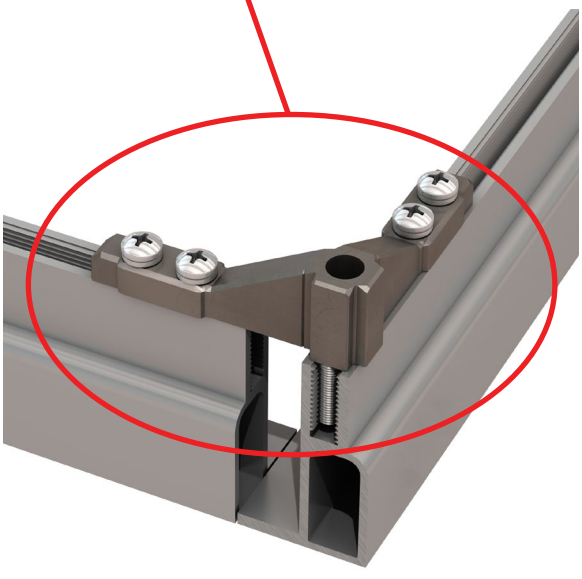


**Turnbuckle Drops mid-Main Runner**
Turnbuckle & Starter Rod (PN28361)
Field Connector (PN39553)
1/4"-20 Screw with 1/4" Lock Washer (PN41788))

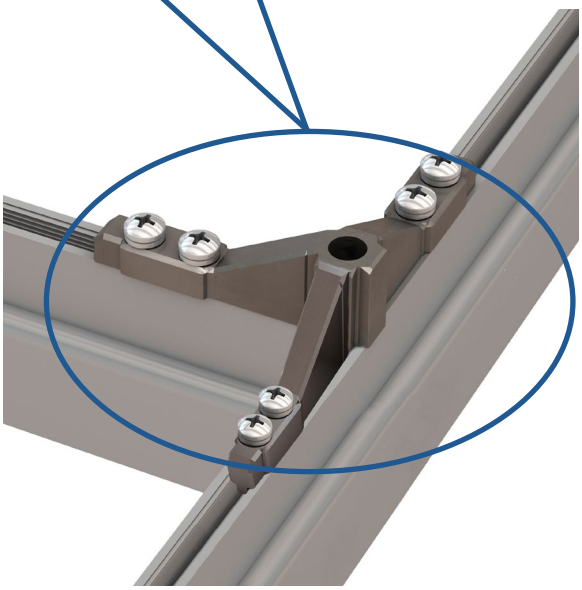


**Structural Tee Connections**
Field Connector (PN39563)
1/4"-20 Screw with 1/4" Lock Washer (PN41788)





**Two Leg Corner Connector**
Two leg corner connector (PN45421)
1/4"-20 Screw with 1/4" Lock Washer (PN41788)



**Three Leg Perimeter Connector**
Three leg perimeter connector (PN45420)
1/4"-20 Screw with 1/4" Lock Washer (PN41788)

# 3. Connector Details

## Tate Grid Connector Types

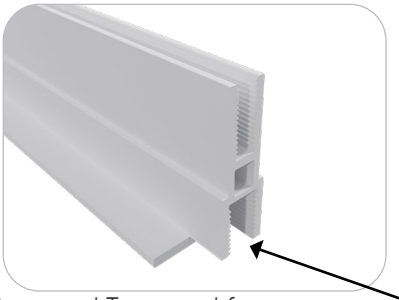
**Note: Every connection can be anchored using a starter rod and turnbuckle.**

Field Connector

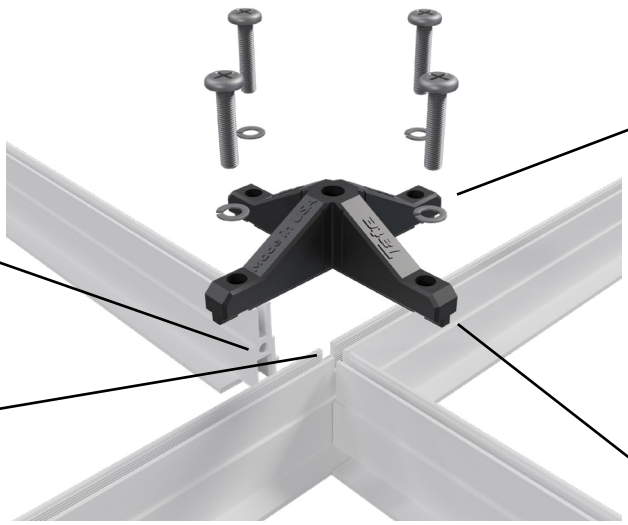
XL Connector
Main Runner Splice

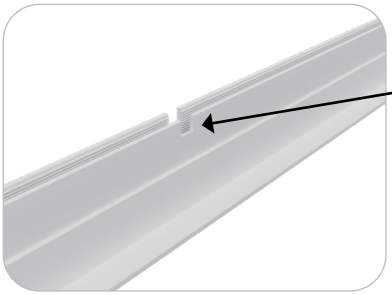
Perimeter Connector
Easily cut for along walls

## Field Connector Detail (PN39553)



Structural Tee coped for easy installation and stronger connections



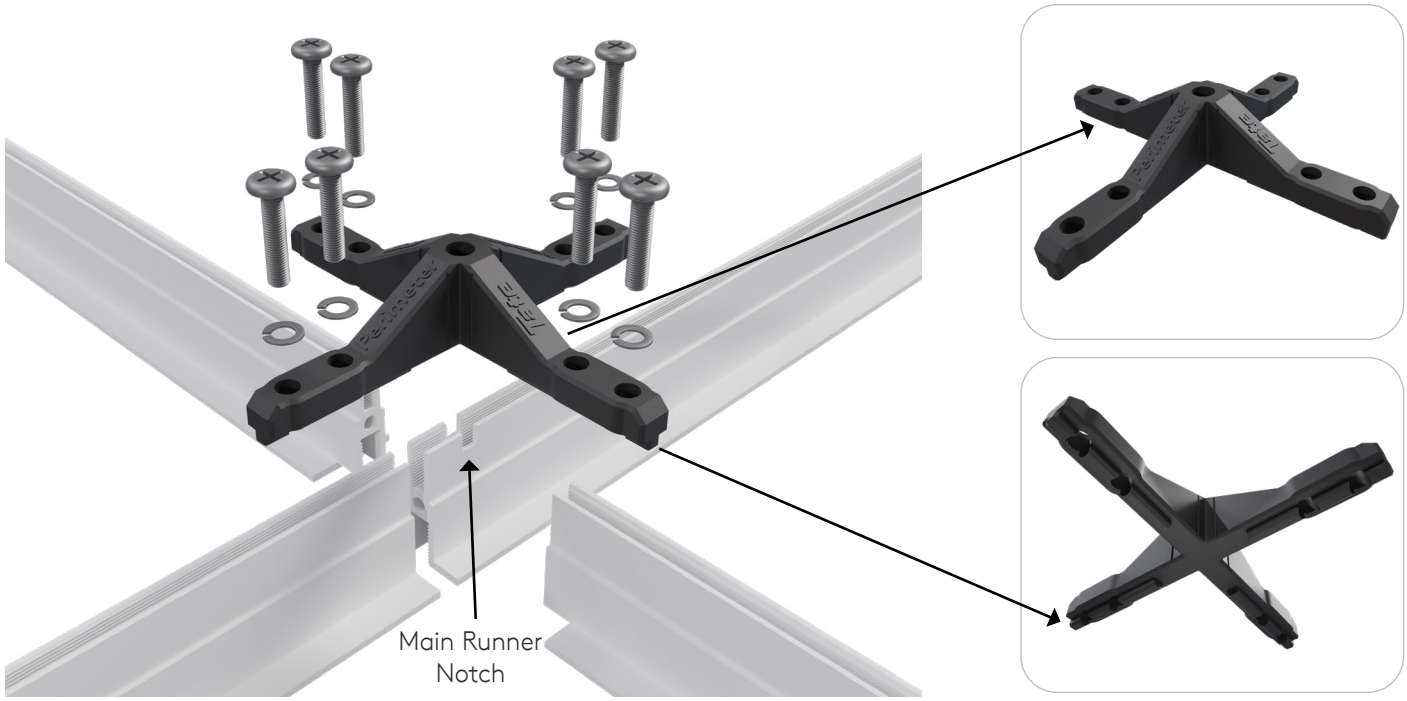


Main Runners notched to positively position connectors on center every time

Ribs on connector to align with grid and prevent racking

## XL Connector (Main Runner End Joint) (PN39564)

**The XL Connector is designed for additional support at the end of each Main Runner.**




## Perimeter Connector Detail (PN39563)

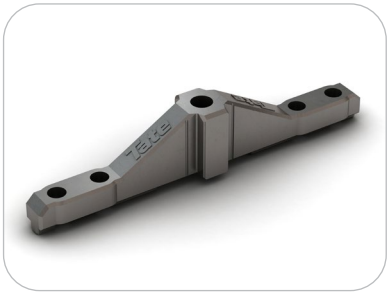
Top View

Bottom View

Perimeter Connector can be cut on site to be used in various locations to connect grid together.

PN45421

PN45420



# 4. Notch Details

## Structural Tee & Main Runner Notches

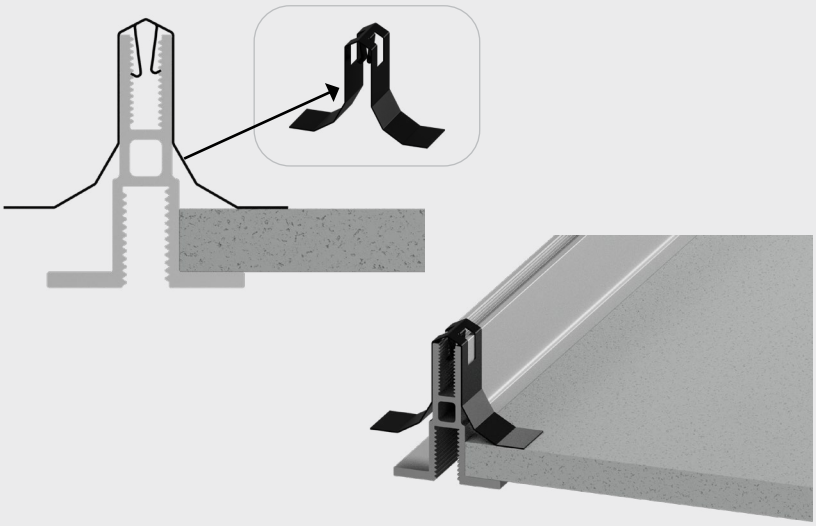
The main runners are not symmetric, they must all be oriented in the same direction. Be sure that all runs of main runners are oriented in the same direction or the grid will not align properly.

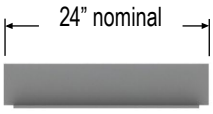
All Structural Tees and Main Runners are notched every 24" on center for proper alignment and spacing of the connectors.

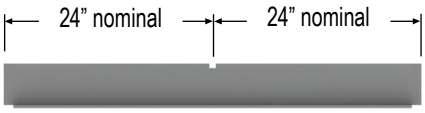
For 2'x2' grid systems, the 4' tees should first be installed between the main runners and oriented such that the witness notches at the ends of the 4' tees are all oriented in the same direction. Ensure that the 2' tees will align properly and parallel to the mains.

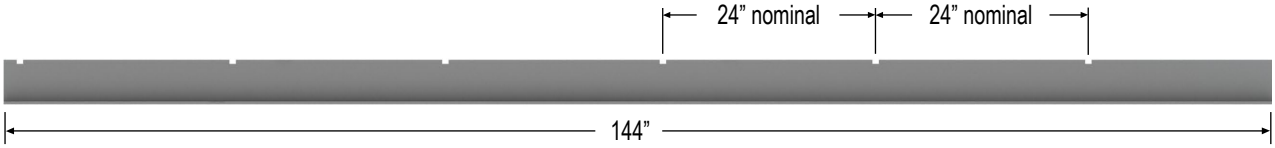
### HOLD DOWN CLIPS

- Hold down clips can be provided with the Tate Grid system as an option.
- Two hold down clips are recommended per tile.
- Hold down clips are installed by pressing them into the top thread by hand or lightly tapping them with a mallet.
- Hold down clips are designed for use with 1/2" - 1" thick ceiling tiles
- PN44403






24" & 48" Structural Tees have coped ends which allow the grid to rest on the longer sections for stronger connections.

48" Structural Tees and 12' Main Runners are notched every 24" on center for proper alignment and spacing of the connectors.

*Note: Structural Tee and Main Runner dimensions are nominal and are adjusted for custom-sized ceiling grid designs*

# 5. Perimeter Details

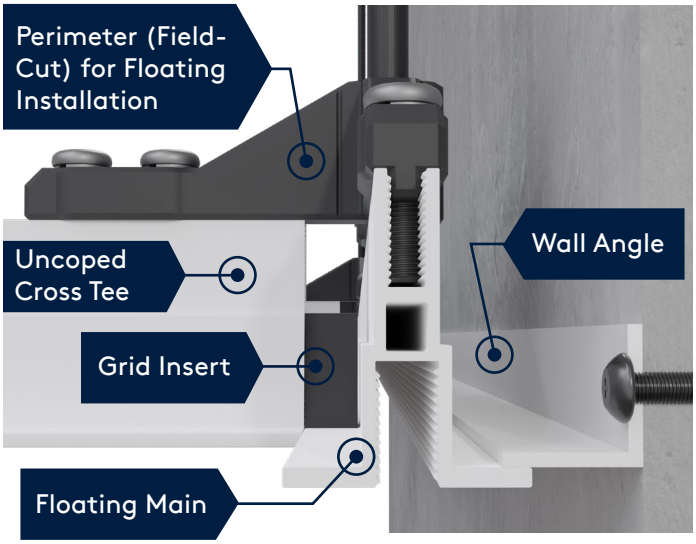
## Perimeter Options:

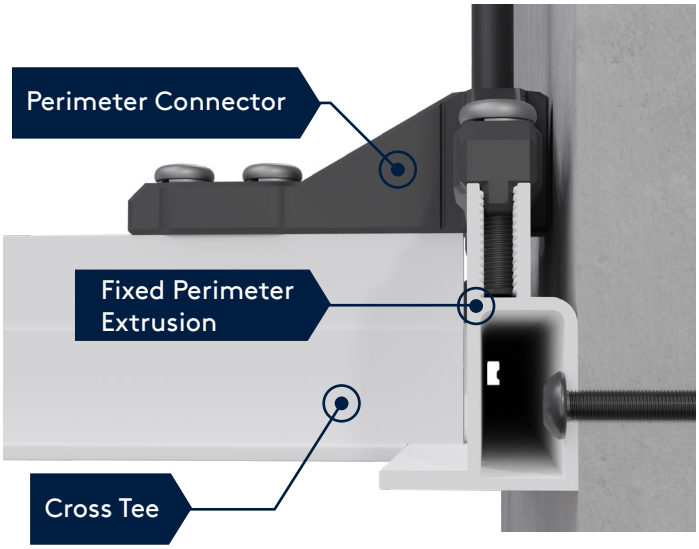
The Tate profile should run along all perimeters and should be anchored every 4′. This serves multiple purposes:

- An engineering purpose as it ensures no part of the system is cantilevered.
- An installation purpose as the notches every 24″ on the profile help you set out during installation.
- It also has aesthetic and air sealing benefits as the tiles sit better in this design.

If this design is not followed, the members of Tate Grid terminating at the wall may not be structurally sound and may deflect and fail under load.

There are two options when installing Tate Grid at the perimeter of a data hall: Floating and Fixed. Floating perimeters utilize standard Main Runner components which can also be used in other areas of the data hall. Fixed Perimeter details utilize special 12′ Fixed Perimeter Angles and typically don't require hangers in the case where the connection to the wall is engineered for the purpose of carrying the rated capacity of the grid.




## Floating Installation Detail

Main Runners are utilized when installing with a floating detail. When installing with a floating perimeter, Perimeter Connectors can be utilized to take advantage of the notches and ribs that align extrusions and prevent racking.

Additionally it is recommended to utilize a Wall Angle attached to the perimeter.

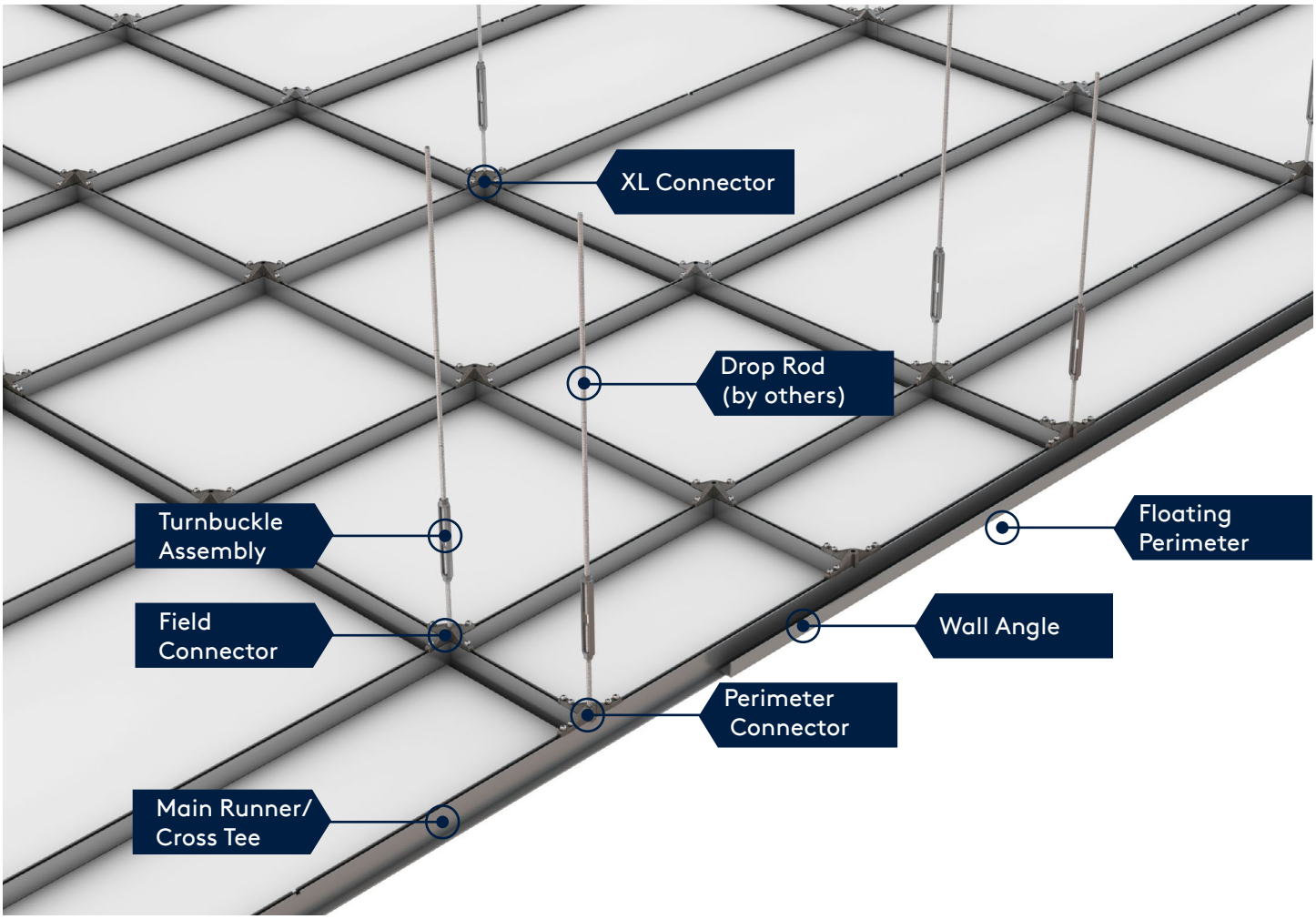
## Fixed Installation Detail

Perimeter Extrusions are designed to create a fixed perimeter detail. Perimeter Extrusions can be cut on-site to desired length when assembled along perimeter walls. Perimeter Extrusions can be bolted to the wall with appropriate fasteners for the wall type.

Note, pre-drilling is recommended and through holes are suggested for simpler light fixture or drop ceiling tile installation.

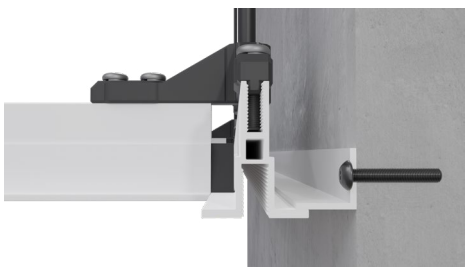
# 5. Perimeter Details

## Standard Floating Perimeter Detail




## Tate Grid End Insert

The Tate Grid End Insert is used for additional support at the end of the uncoped Tate Grid Structural Tee.



# 6. Ceiling Assembly

## Bolt Torque

All bolt connections to the top slot of the grid should be tightened flush to a washer with a **between 20 in-lbs and 30 in-lb of torque**, using a torque limiting screw gun or ratchet similar to:



All bolt or nut connections to the bottom slot of the grid should be tightened flush to a washer or mounting bracket **between 20 in-lbs and 30 in-lb of torque**, using a torque limiting screw gun or wrench similar to:


## Thread Engagement

When threading bolts or threaded rod into bottom slot to hang equipment, ensure that the bolt or rod is long enough to fully engage the depth of the slot entirely or thread tear-out could be possible. Any less than 75% (5/8”) engagement could cause thread tear-out at less than rated loads for the system.

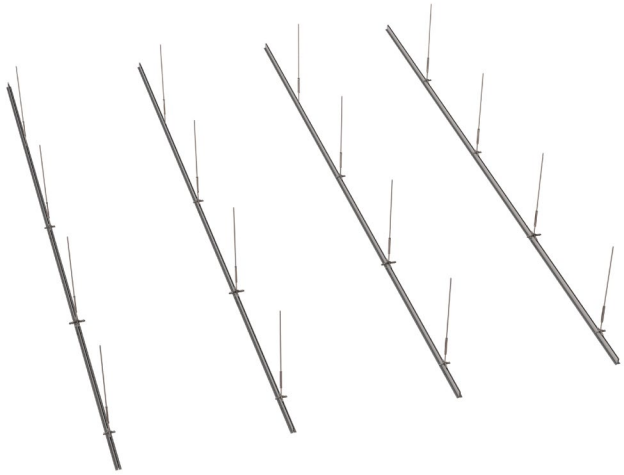
# Field Grid Assembly

While Tate Grid can be customized to meet the needs of your specific application, the following example is based on 2′ x 2′ grid spacing with turnbuckle connections on 4′ x 4′ centers.

## Step 1

### Install Main Runners

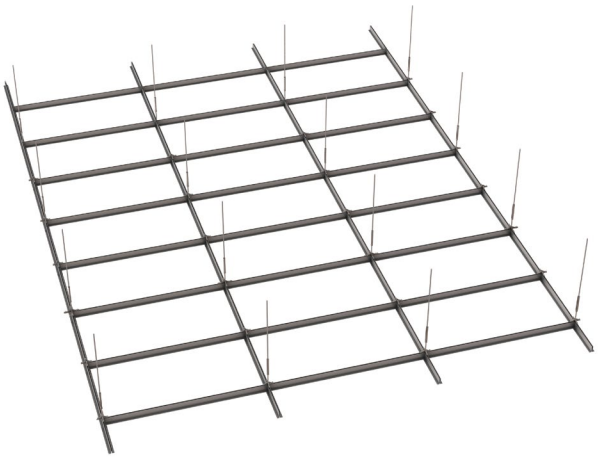
The Mains are equally spaced every 4′. All thread and turnbuckles are placed every 4′ along the mains to connect them to the building structure. Field Connectors are used along the Mains and the connection point between two adjoining Mains require XL Connectors.



## Step 2

### Install 4′ Structural Tees

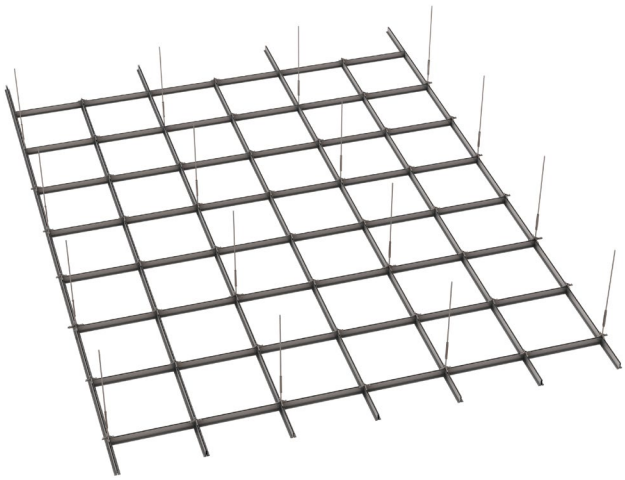
The Structural Tees are placed every 2′ along the Mains. The 4′ Tee's are factory coped on each end so that they rest on top of the Mains. All connections are aligned using factory cut notches every 2′ in the top edge of the Mains. The notches along the Mains provide proper location and alignment of the grid and speed up installation.



## Step 3

### Install 2′ Structural Tees

For ceilings planning to use a 2′ grid, additional 2′ Structural Tees can be installed between the 4′ Structural Tees. These 2′ Structural Tees connect to the 4′ Tees using Field Connectors. The connectors are aligned using factory cut notches in the top edge of the 4′ Structural Tee.



# 7. Service Conditions

## Connecting to the bottom slot of the Grid:

A standard 3/8"-16 threaded rod can be used to suspend services from the 3/8"-16 bottom slot of the Grid. Fixings to the bottom slot of the Grid must be at least 75% engaged, or to a depth of at least 5/8".

## Bottom Slot Torque:

**Between 20 in-lbs and 30 in-lb**, See Section 6 for details

## Hot Aisle Containment:

Hot Aisle Containment components supplied by Tate can easily be secured to the bottom slot of the Grid.

## Performance Criteria

The following load capacities must be strictly observed when installing services from the Tate Grid.

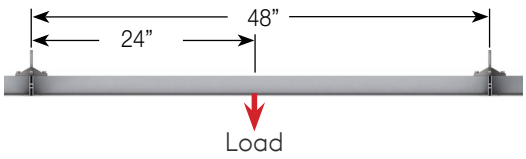
| On Center Hanger Spacing | Max. Uniform Load | Max. Safe Working Load (Point Load) | Midspan Deflection at Max. Safe Working Load | Safety Factor |
|---|---|---|---|---|
| 4' x 4' | 50 lbs/ft$^2$ | 380 lbs* | .53" | 2x |

**Max point load no less than 4' apart in any direction.*

## Field System Performance:

The Ultimate Load of the Tate Grid system is the point at which the system will fail - see stress graph below:

**Structural Tee Deflection**
*(Midspan Beam)*

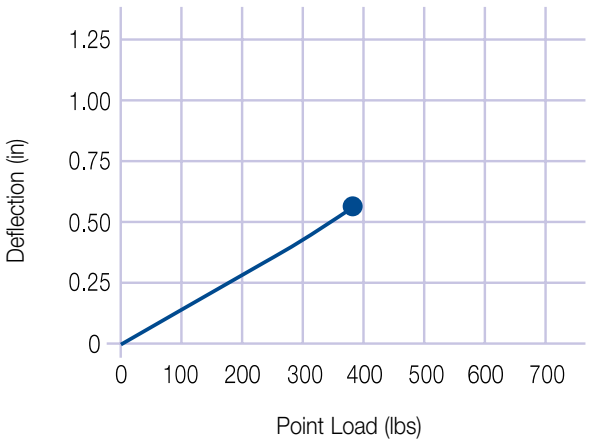



Calculate midspan beam deflection at any point below yield

$$S = \frac{WL^3}{48EI}$$

S = Deflection
W = load
L = 48in

E = 10x10$^6$ lbs/in$^2$
I = .153 in$^4$



### Cable Installation & Bracing Drops:

Dynamic loads applied to Tate Grid system shall not exceed 5% of the distance in inches between the bottom of the Tate Grid ceiling and the top level of the cable tray. Example: If the top level of cable tray is installed 5′ (60″) below the ceiling, the allowable lateral movement in line with the cable tray is 3″. Published load capacities of the grid shall not be exceeded at any time.

To distribute a load that would otherwise exceed the stated 380 lb point load, cable ladders can be employed to achieve up to 50 psf. The example to the right shows the recommended method to distribute load so as to ensure no single 3/8″ stud exceeds the 380 lb point load.

## 8. Maintenance

### Cleaning:

To clean Tate Grid components please use a common non-abrasive mild detergent containing less than 0.5% phosphate and water, applied using a sponge. The components should be dried using a soft towel. If solvents are required to remove materials not soluble in water such as petroleum products, the following solvents can be used: Isotropy alcohol, denatured alcohol, mineral spirits or methanol. Paint scratches can be touched up. Contact the factory for matching paint.

### Maintenance of above ceiling services:

The Tate Grid system should not be walked on under any circumstances. This may expose the system to excess dynamic loads and cause a failure.

Ceiling tiles may be removed to build a scaffold like structure that rises through the Grid and can allow walk-on access above the Grid without exposing the Grid system to extra loads.

# Appendix: Field Coping Guidelines

The aim of this document is to describe and present one method that can be used to cope the ends of the cross tees in the field (if necessary). Other methods that achieve the proper cope depth are also acceptable. Every 4 ft and 2 ft cross tee will be delivered from the factory with coped ends which aid in installation and add structural rigidity. However, around the perimeter where it is usually necessary to cut the tees to size to fit the exact space, the ends must be coped on-site or a Tate Grid Insert must be used at every perimeter tee to maintain the rated load capacity of the ceiling grid.

Figures 1 and 2 below show the difference between an extrusion with and without a coped end.

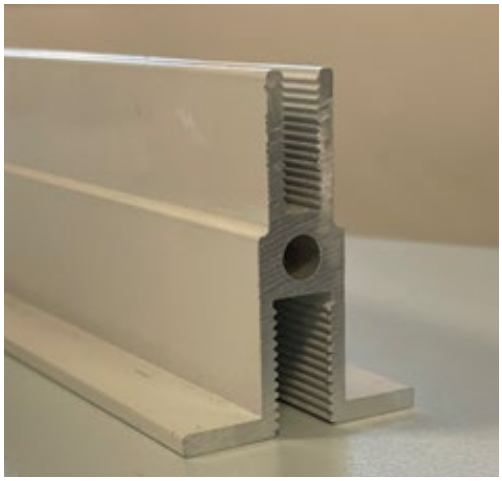


Figure 1. Tate Grid extrusion without coped end

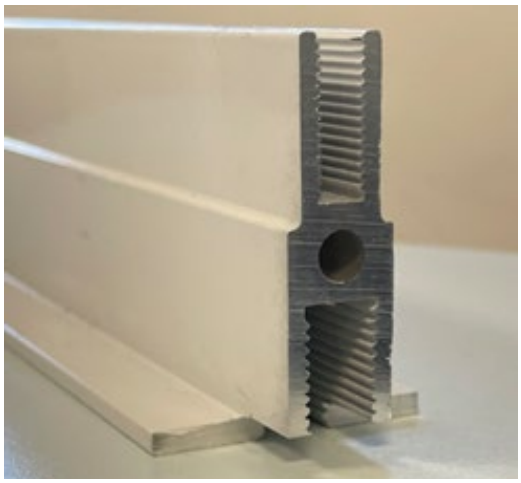


Figure 2. Tate Grid extrusion with coped end

The equipment/material required to cope the tees is presented below:

- Portable band saw. (Similar to the one shown below)
- Workshop table.
- Ruler.
- Marker.
- Any clamping method to fix the Tate Grid extrusion when coping it.

First step is to mark the cope distance. Measured from the end of the extrusion, The cope should have a width of just under 1/2". See below cope detail.

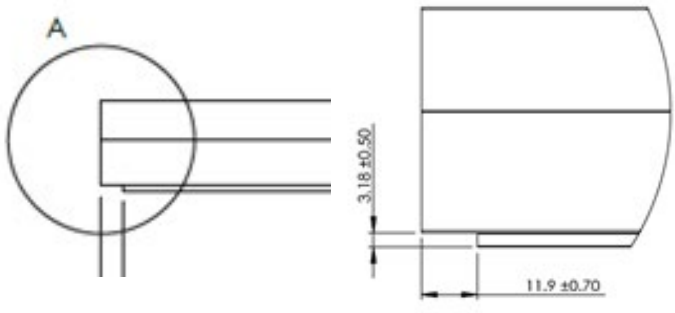


Figure 5. Measuring and marking the cope dimensions in a Tate Grid extrusion.

**After the cope width is marked on the extrusion, the extrusion should be positioned and clamped onto the workshop table so it is does not move when cut with the band saw.**

Figure 6. Positioning of the Tate Grid extrusion before coping it

Below pictures show an example of a band saw used on site to do the cope.

Figure 7. Example of Band saw. Front view

Figure 8. Example of Band saw. Back view

When the Band saw is properly positioned and clamped, Use the band saw to cut the flange perpendicular to the extrusion as shown in the image below. The flange thickness is approximately 1/8" and care should be taken to avoid cutting deeper than that.

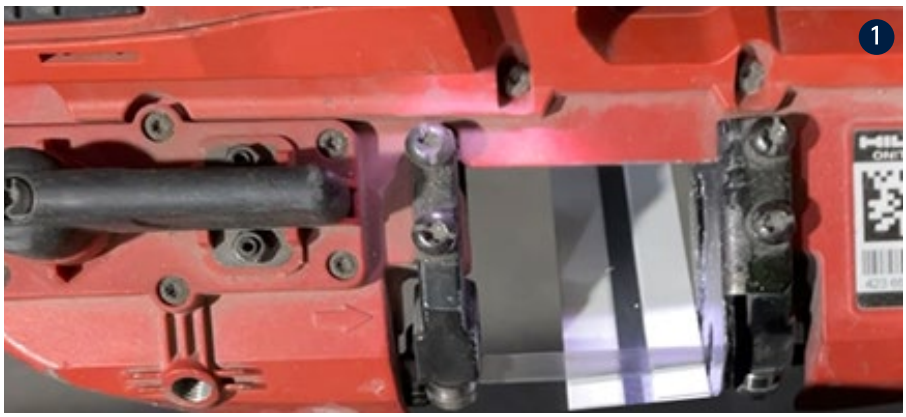



Figure 9. Field coping with a band saw. Image 1

Next, cut into the end of the extrusion to a ½" depth as shown in below pictures. The band saw should be positioned with a 90 degree angle as shown below.

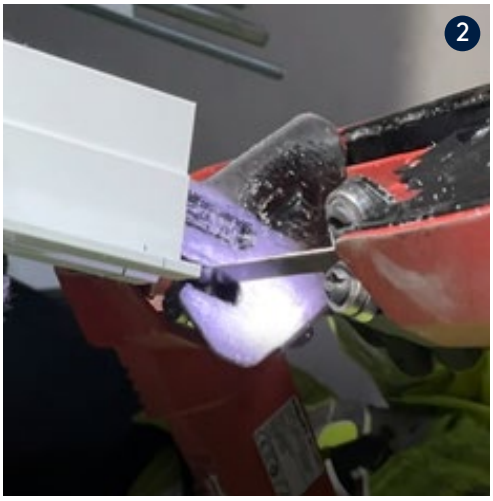




Figure 10.. Field coping with a band saw. Images 2 & 3

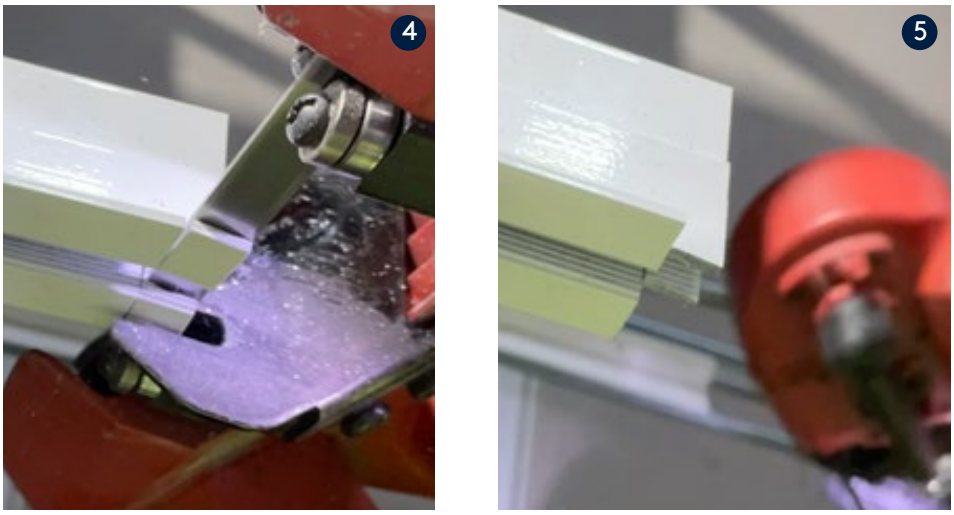



Figure 11. Field coping with a band saw. Images 4 & 5

**When the cut is finished, check that the cope is correct by placing the piece perpendicular to a main runner and ensuring that there are no gaps.**

Figure 12. Checking the accuracy of the Field cope

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