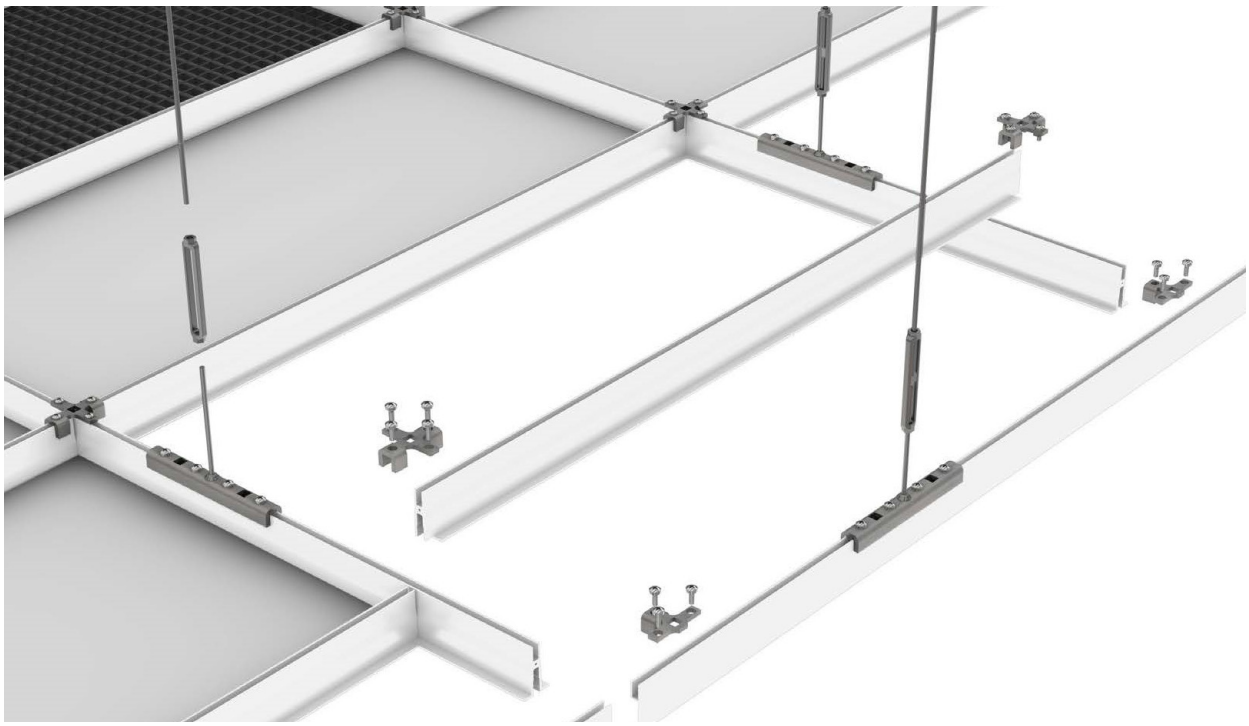
Installation Guide
Tate Duo



THE INFORMATION PROVIDED IN THIS DOCUMENT IS TO BE SHARED WITH ALL SERVICEPROVIDERS INTERACTING WITH THE TATE DUO CEILING

NOTE: MAX TORQUE OF 4NM FOR ALL CONNECTIONS TO THE GRID

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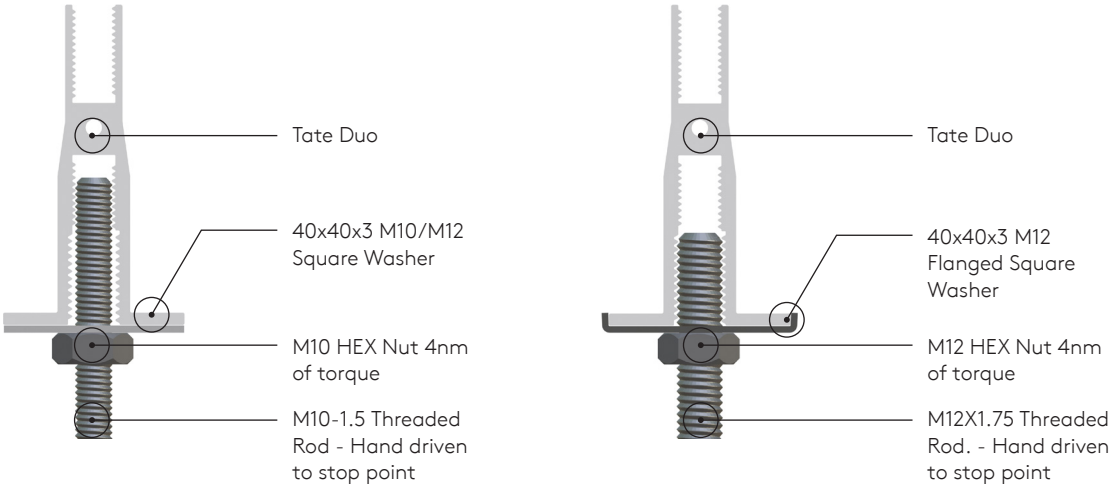
Safety Clause

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

Tate Duo is a structural ceiling system designed to support static vertical loads.

When installing services to the bottom M12 or M10 threaded channel, the following instructions must be adhered to:

1. Do not torque the threaded rod or bolts above 4Nm. Over torquing will damage the threads of the slot reducing the load capacity of the Tate Duo system.
2. For threaded rod connections, the rod should be fully engaged. For bolted connections bolts should be carefully selected to maximize thread engagement, but should not be oversized to avoid bottoming out. There must be at least 17 mm thread length into the M12 slot or 35mm thread length into the M10 slot as measured from the bottom to the flange.
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 Duo. During installation of supported services, bracing is required to prevent dynamic load on the Tate Duo ceiling.
5. All bottom thread fixings should be completed with a Square flanged washer for M12 rod and typical washer for M10 rod and tightened up to 4N-m. to prevent separation of the slot under load.
6. Do not put a load on the system until the installation is complete.
7. Tate Duo 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.

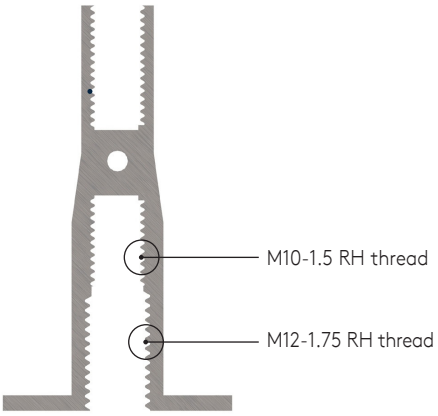


Suitable Connection Methodology

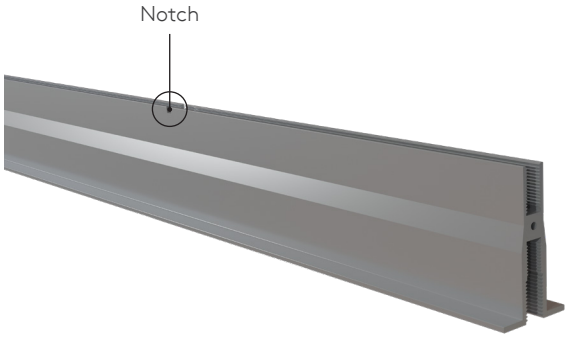
Component Overview
Extrusions

Main Runners

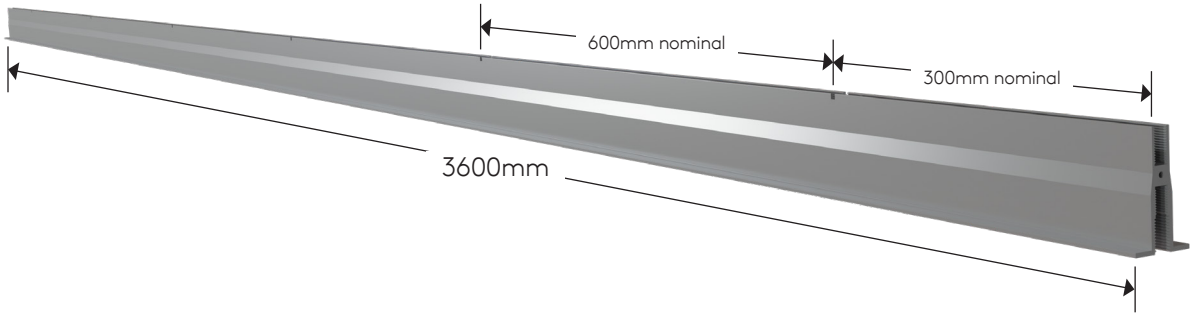
Main Runners are installed first and act as the main structure in the structural ceiling system. Main Runners come in 3600mm lengths and are notched every 600mm to align the Cross Tees. Every Main Runner is parallel to the next one, with a perpendicular distance of 1200mm.



Tate Duo Main Runner Section



Notched Tate Duo Main Runner

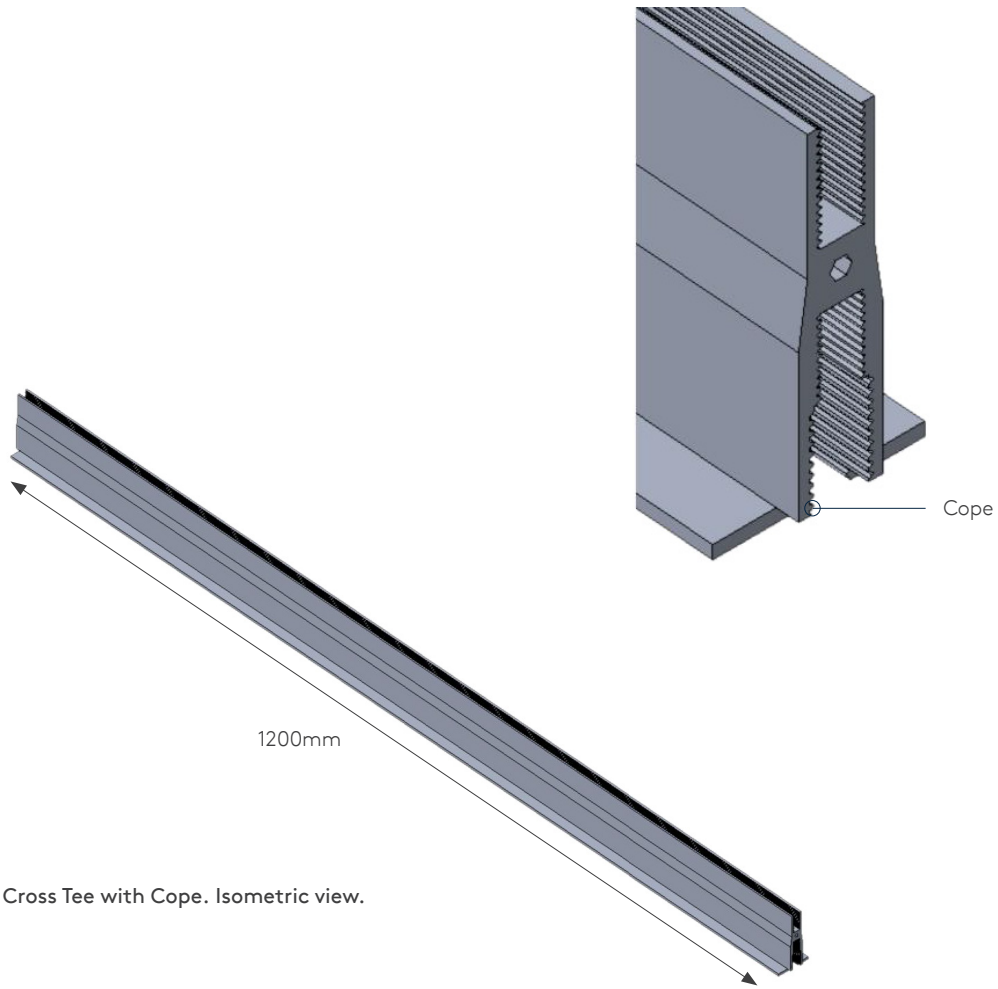


Notch layout in Tate Duo Main Runner

Component Overview
Extrusions

Cross Tees

Cross Tees have the exact same section as Main Runners. The only difference is the length which is 1200mm nominal. Cross Tees are coped at their edges to interface with Main Runners and create a 1200x1200mm grid.

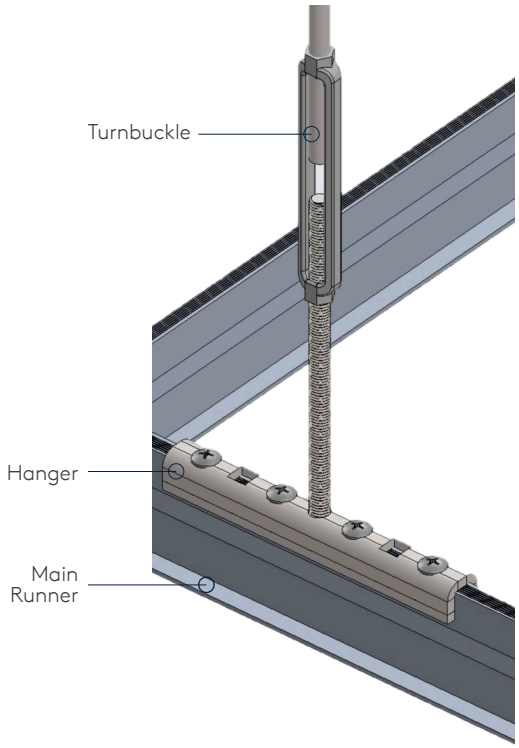


Cross Tee with Cope. Isometric view.

Component Overview
Connectors

Hanger w/M12 Starter Rod

Made from black painted steel, hangers support and connect the structural ceiling system to the building main structure. Depending on the project and grid configuration, they can have different layouts, i.e., 1200mm x 1200 mm, 1800mm x 1200mm, 2400mm x 1200 mm. They come with a welded M12 threaded rod that is connected to the turnbuckle.



Tate Duo Hanger + Turnbuckle

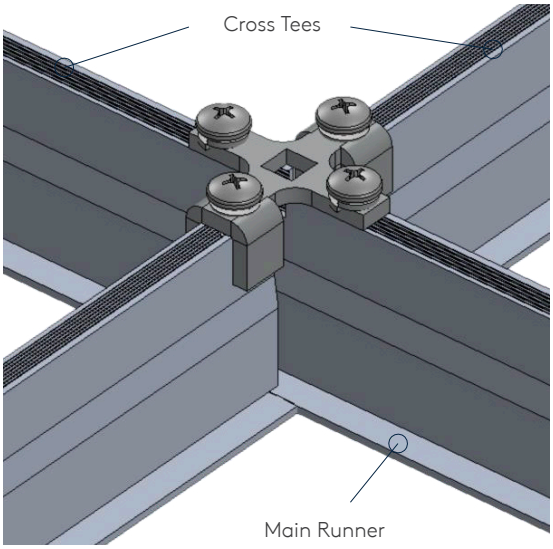
Turnbuckle

Made from black painted steel, turnbuckles allow the hangers to be properly set and aligned. Turnbuckles connect the hanger from Tate Duo with the Top threaded rods. Everything above the turnbuckle is outside of Tate scope. Refer to the illustration above.

Component Overview
Connectors

Cross Connector

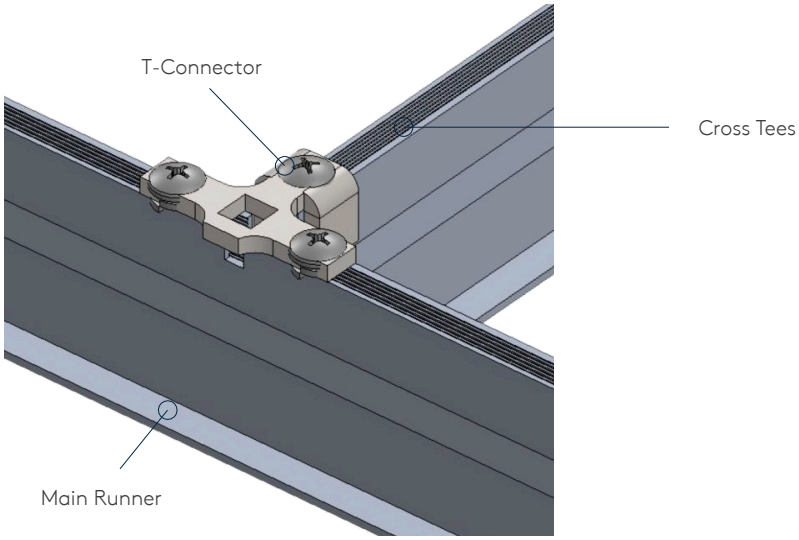
Cross connectors connect Main Runners with Cross Tees.



Tate Duo Cross Connector

T-Connector

Designed to connect both Main runners and Cross Tees at grid perimeters.

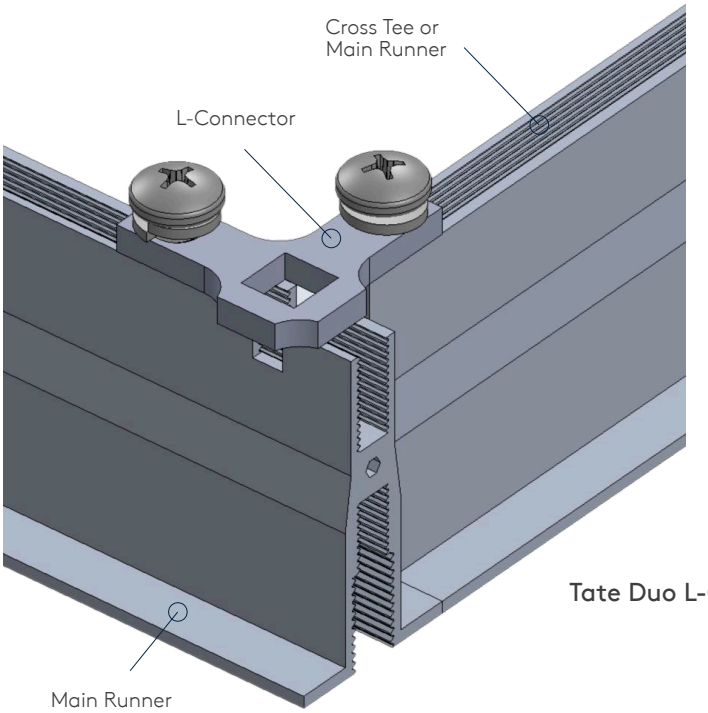


Tate Duo T-Connector

Component Overview
Connectors

L-Connector

Designed to connect Main Runners with Cross Tees or two perpendicular Main Runners at grid perimeters.



Tate Duo L-Connector

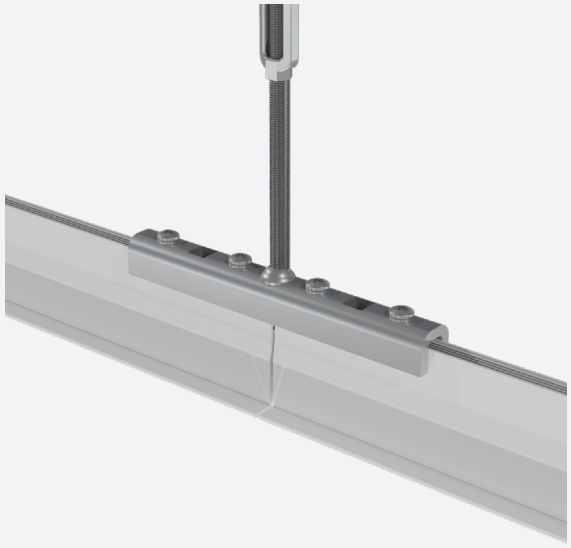
Component Overview
Connectors

Splice Connector (Only required in condition B)

The Splice Kit or Splice Connector is used to extend main runners. A Splice Connector may or may not be required, depending on the project ceiling layout. See below possible situations found on-site.

Condition A
Main Runners' extensions done with Hangers

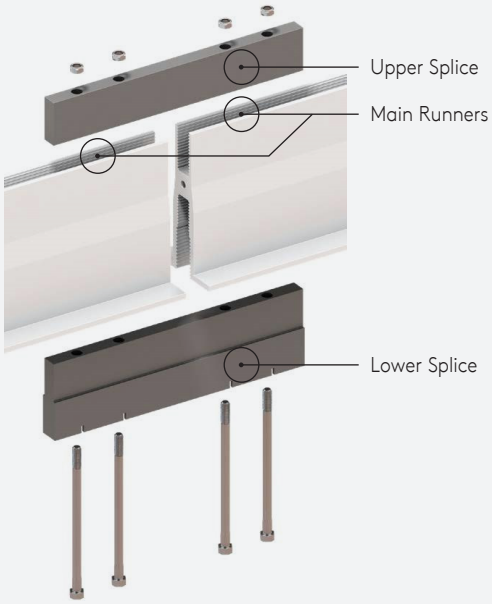
Condition A does not require Splice Kit because there is a hanger centered at Main runner extension. Refer to the below figure. Condition A can be achieved if all Top Drop Rods, which connect the Turnbuckle and Hanger, can be equally spaced 1.2m throughout the ceiling layout in the project.



Tate Duo Hanger used for Main Runners' extensions

Condition B
Main Runners' extensions done with Splice Connector.

When it is not possible to have the Hanger centered at all 3.6m Main Runner extensions, a Splice Connector is required. Refer to the below figure. In situations where a Splice Connector is required, Main Runners will come with two M5 holes at each end to allow the Splice Connector screws to pass through.



Tate Duo Splice connector used for Main Runners' extensions

Component Overview
Connectors

M12 Flanged Square Washer (Only required For M12 rods connections)

The M12 Flanged Square Washer should be utilised with all M12 rods connections to the Tate Duo structural ceiling. It strengthens the connection of any M12 rod to Tate Duo Ceiling and gives additional safety to the M12 connections to the system.

Flanged Square Washer for all M12 connections

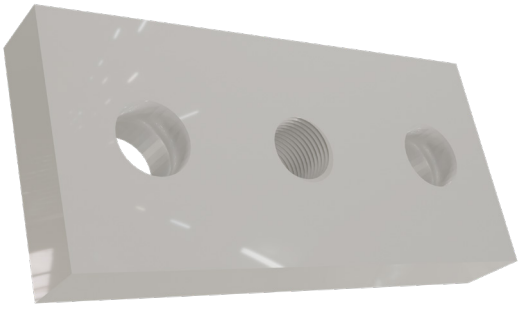
Load Adapter Plates for M10 and M12 connections (not always required)

In areas with very demanding loads, Tate recommends the use of Load Adapter Plates. Plates can come with either M10 or M12 to allow for the two types of connections to Tate Duo.

These plates are bolted with No.2 screws to the bottom thread of the Tate Duo system. They will spread the load and strength the system loading capabilities at this connection.

The requirement of load adapter plates in a project will depend on the project loading conditions and customer preferences.

In situations where load adapter plates are used for M12 rods connections. M12 flanged square washer is not required.



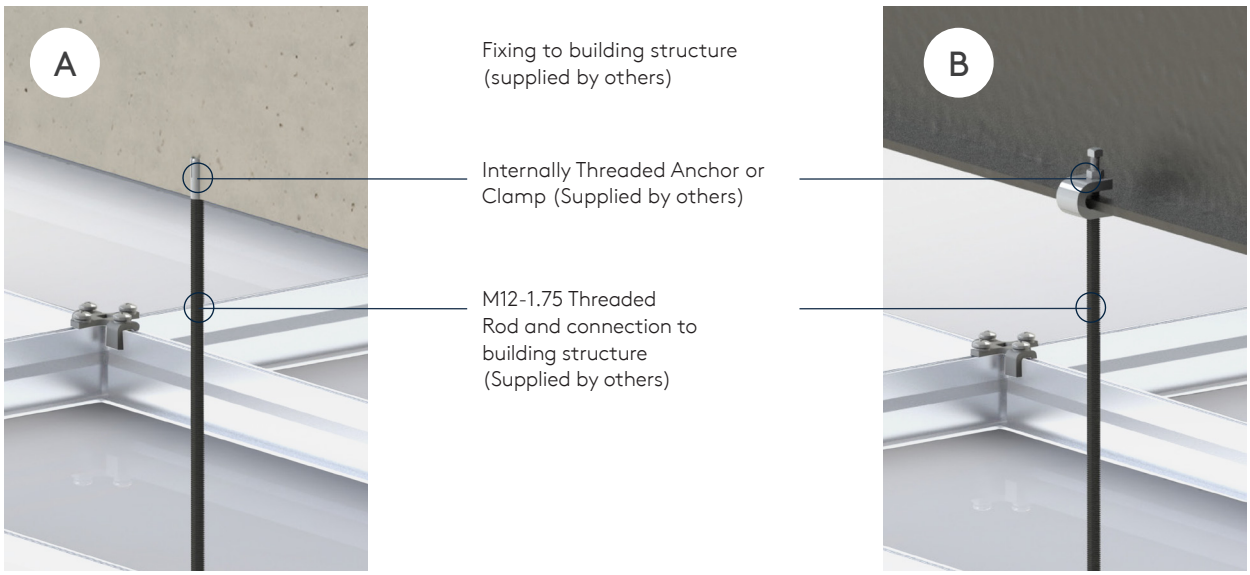
Component Overview

Top Threaded Rods (supplied by others)

M12-1.75 threaded rods, vertically installed between the turnbuckle and fixing to the building structure. These rods are supplied by others. Refer to the below figure. Hot Dip Galvanized steel version is the most commonly used.

Fixing to Building Structure (supplied by others)

Every component above the turnbuckle. i.e. Top Threaded Rods and Fixings is outside of Tate scope. Therefore, all connections to the main structure are designed by others. Fixings are required to connect the structural ceiling system to the top (ceiling) and to the sides (walls) of the building structure. The below image shows... different fixing solutions depending on the building structure.



Fixing to Building structure detail.
A) Connection to Concrete
B) Connection to Steel Beams

Installation Guide
Tools

Bolt Torque:

All bolt connections to the top slot of the grid should be tightened flush to a washer with a maximum torque value of 4Nm, using a torque limiting screw gun or ratchet similar to:

Torque Limiting Screw Gun

All bolt or nut connections to the bottom slot of the grid should be tightened flush to a washer or mounting bracket with a maximum torque value of 4Nm, using a torque limiting screw gun or wrench similar to:

Wrench

A torque adapter is another alternative tool to ensure the correct torque in all connections. It can be connected to any bit holder and act as a torque screwdriver. The below image shows a torque adapter for 4Nm. Standard torque value that can be easily outsourced.

4Nm Standard Torque Adapter

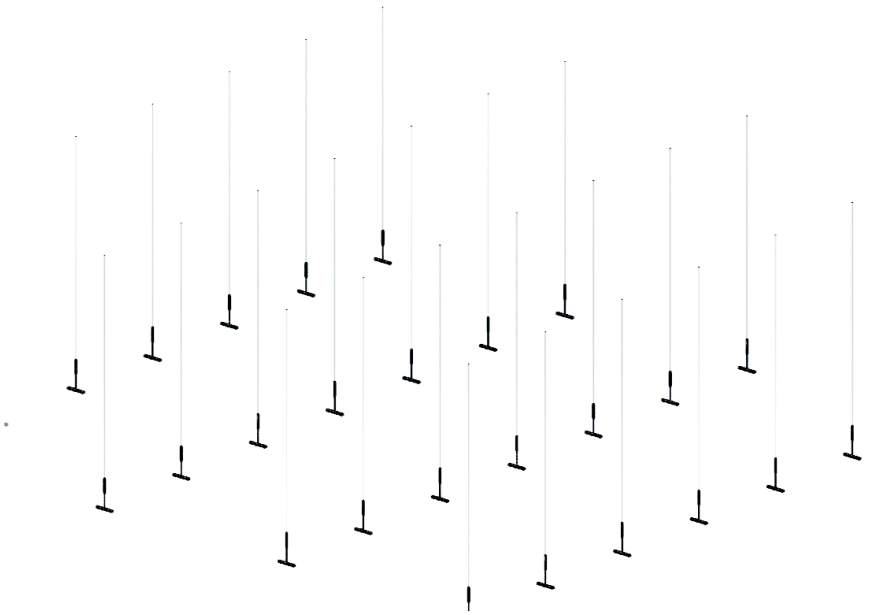
Thread Engagement:

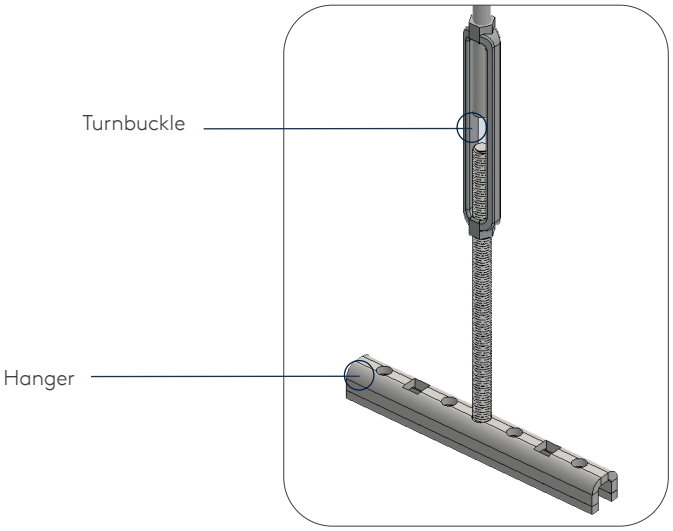
When threading bolts or threaded rod into bottom slot to hang equipment, ensure that the bolt or rod is long enough to fully engage the depth of the slot entirely or thread tear-out could occur.
Any less than17 mm thread length into the M12 slot or 35mm thread length into the M10 slot as measured from the bottom to the flange could cause thread tear-out at less than rated loads for the system.

Installation Guide
Typical Installation Step By Step

1. Fix Top Threaded Rods (supplied by others) to the Building Ceiling.

2. Hang Turnbuckle + Hanger at specified increments. Below image shows the connection of the Hangers to the already installed Threaded Rods





Hanger + Turnbuckle hanging from installed Threaded Rods

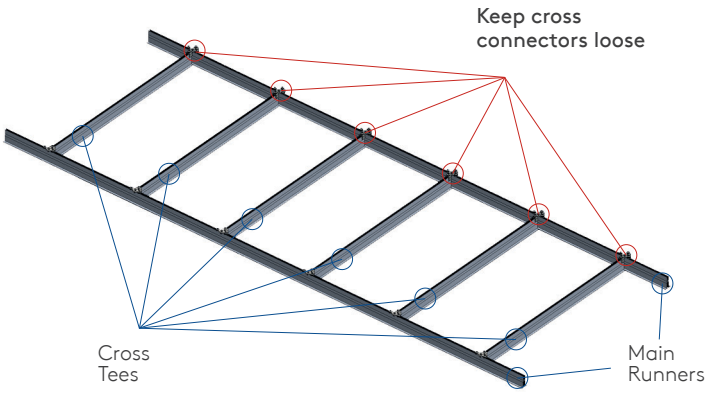
Installation Guide
Typical Installation Step By Step

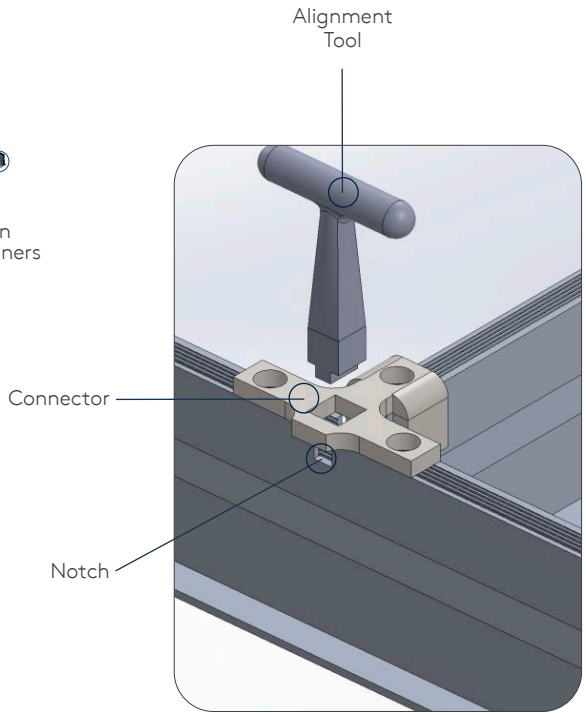
3. Assemble 2 Main Runners and 6 Cross Tees (Type 1 Cell*) on the ground. Refer to the illustration below.

4. Attach Cross Tee to Main Runner by inserting the Alignment Tool through the connector and into the notch. Connect members using 6 T- Connectors and 6 Cross connectors. Refer to the illustration below.

5. Use screws tightened at 4Nm in flush to lock washers to secure all connectors using a torque limiting screw gun.

6. Do not fully tighten cross connectors at interior single sided junctions (shown in red).

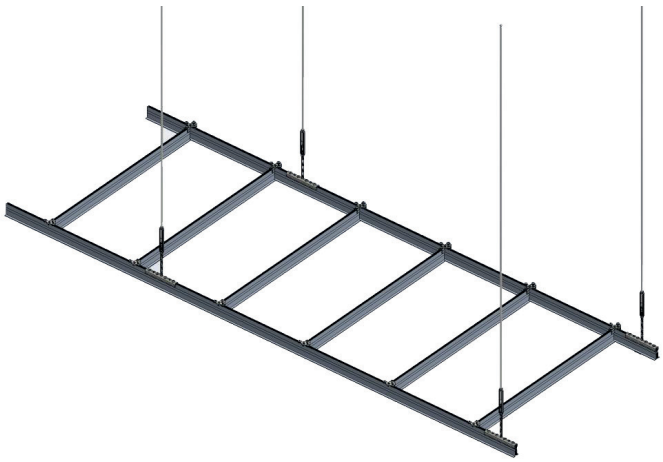


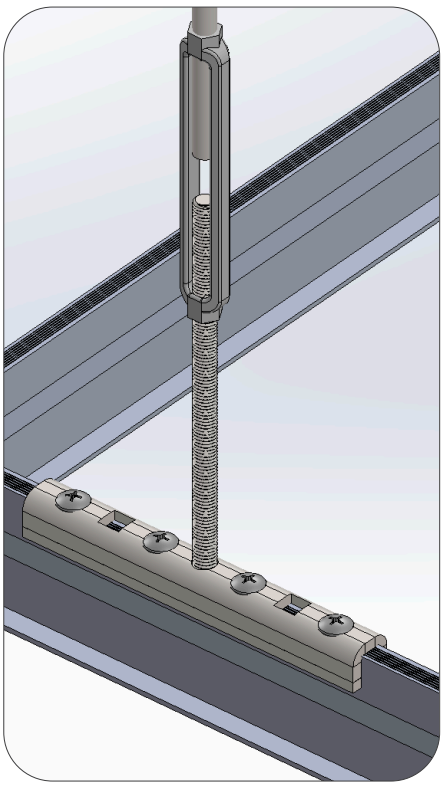


Type 1 Cell & Alignment Tool Detail.

Installation Guide
Typical Installation Step By Step

7. Lift and attach the Type 1 Cell assembly to Hangers using appropriate screws and washers.





Type 1 Cell assembly – Hanger's connection detail

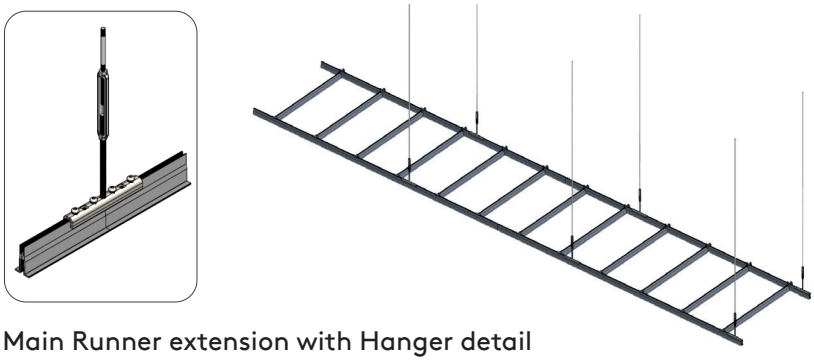
8. Assemble another Type 1 Cell on the ground.
9. Lift and attach to hangers on the ceiling.

Installation Guide
Typical Installation Step By Step

10. Attach to previous subassembly using one of below the two options:

a. Hangers. **(Condition A above)**

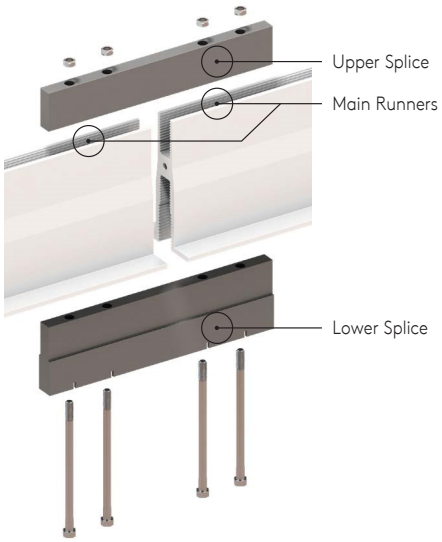
For situations where it is agreed that throughout the project, hangers will be used to extend 3.6m main runners. Hangers will be placed right at the junction between Main Runners and must have 2 bolts screwed at each Main Runner. See Below.



Main Runner extension with Hanger detail

b. Splice Kit. **(Condition B above)**

For situations where it is agreed that Splice Kits or Splice Connectors will be used to extend 3.6m main runners, Main Runners will come with two M5 holes at both ends to allow for the screws of the Splice Connector to pass through. See below image.

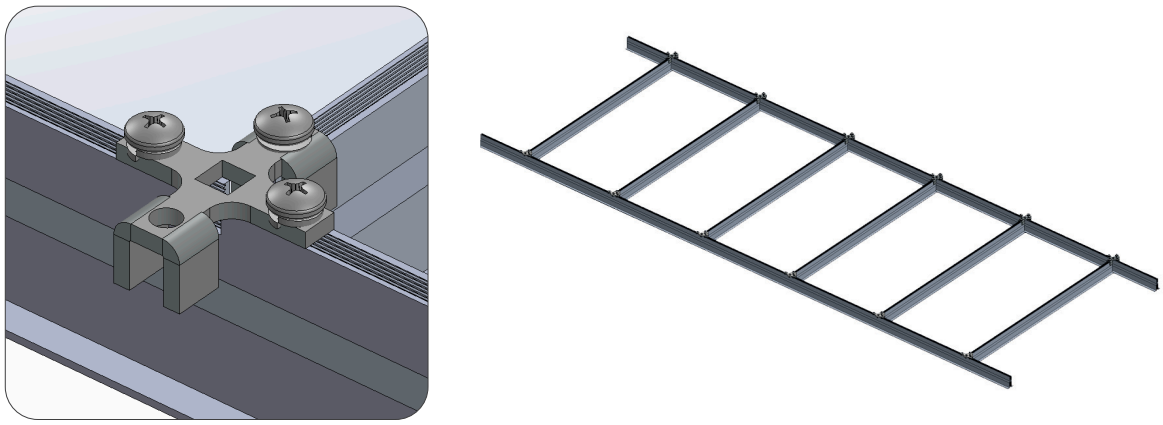


Cell assembly extension with Splice Connector detail

Installation Guide
Typical Installation Step By Step

11. Assemble 2 Main runners and 6 Cross Tees with Cross Connectors (Type 2 Cell*) on the ground using the alignment tool. Refer to top image.

12. Do not fully tighten cross connectors.

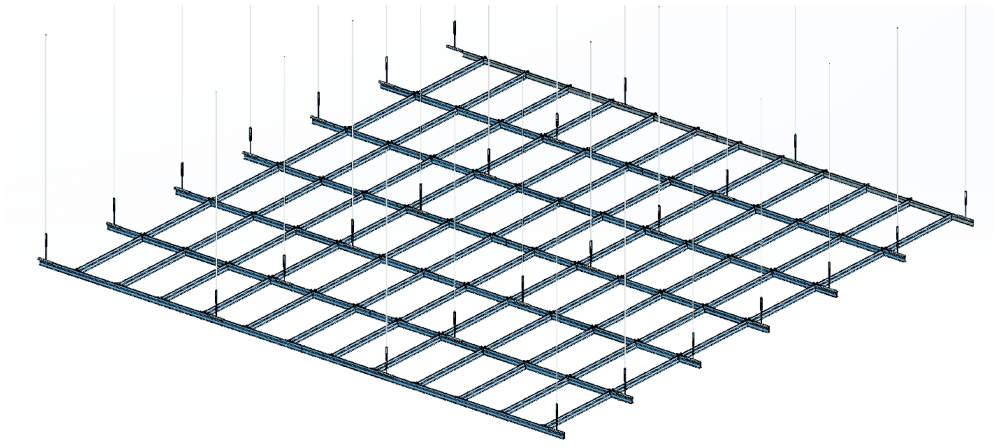


Type 2 Cell assembly with Cross Connector detail

**Type 2 Cell is built only with Cross connectors*

13. Lift and attach two Type 2 Cells to the Hangers using appropriate screws and washers.

14. Connect parallel Main Runners by attaching the Cross Tees and fully tightening the flush to the screws flush to lock washers at 4Nm using the Torque tool.



Fully installed Tate Duo (2400mm x 1200mm hanger configuration) Grid system.

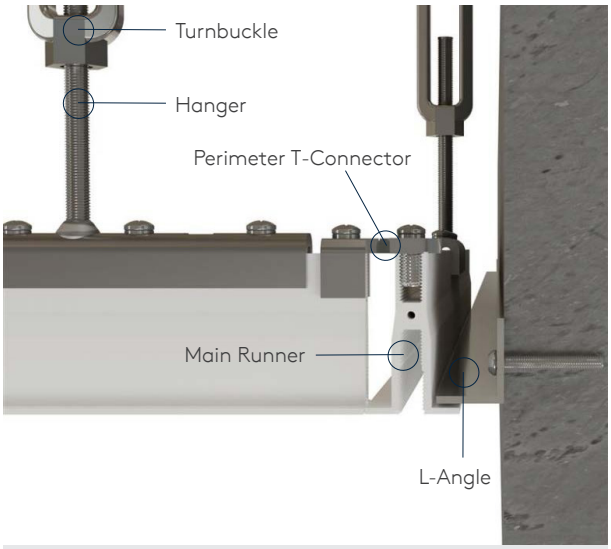
Installation Guide
Perimeter Installation Details

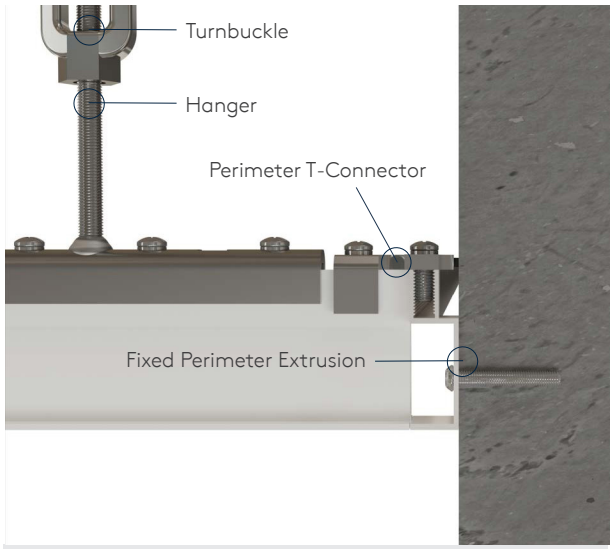
The Tate profile should run along all perimeters and should be anchored every 1200mm. This serves multiple purposes:

- An engineering purpose as it ensures no part of the system is cantilevered.
- An installation purpose as the notches every 600mm 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 the design is not followed, Tate Duo components terminating at the wall may not be structurally sound. It can lead to excessive deflections and potential failure.

There are two options when installing Tate Duo at the perimeter of a data hall: **Floating** and **Fixed**.
See the below illustrations.





Floating Installation Detail

Main Runners are used in the floating perimeter detail. When installing with a floating perimeter, a Perimeter Connector can be utilised.

To close the space between the wall and the Main Runner at the perimeter, it is recommended to use an L- Angle that can be fixed to the wall with appropriate fasteners for the wall type.

To ensure full load rating, a Hanger is required at the end of each extrusion that connects to the perimeter. Refer to the image above.

Fixed Installation Detail

Perimeter Extrusions are designed to create a clean corner joint assembly.

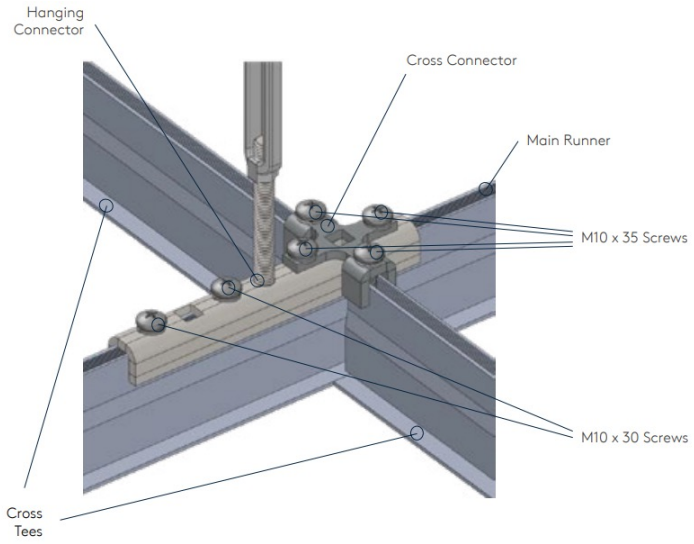
Perimeter Extrusions can be cut on site to the desired length when assembled along perimeter walls. Perimeter Extrusions can also be bolted directly to the wall with appropriate fasteners for the wall type.

To ensure full load rating, a Hanger is required at the end of each extrusion that connects to the perimeter. Refer to the image above.

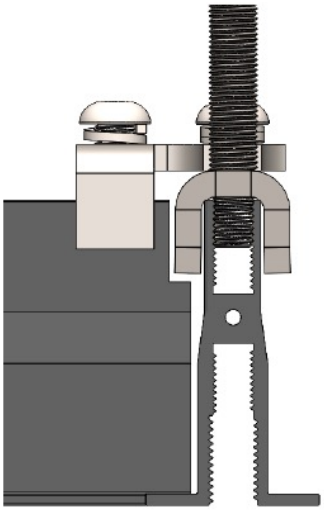
Installation Guide
Special Situations On-Site

Component Connectors Overlap

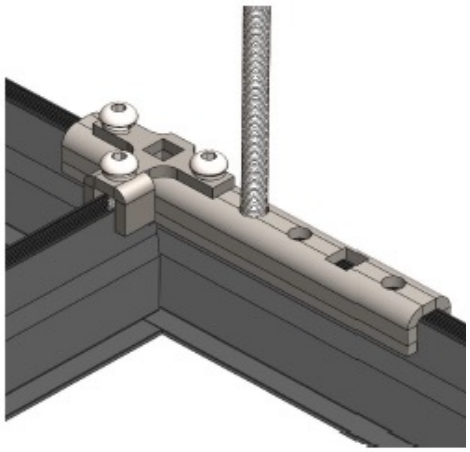
Depending on hanger spacing and ceiling tile size, overlap between Hangers and Cross or T-Connectors may occur. This is an acceptable configuration but requires longer screws + spacers to ensure full thread connection. Refer to Appendix A for additional information regarding connectors overlap situations.



Hanger - cross connector interface assembly detail



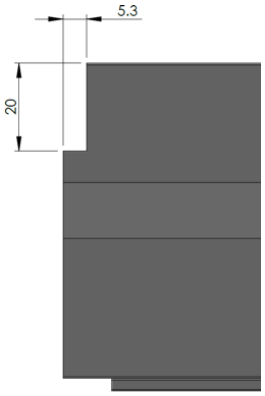
Connectors interface assembly.
Front View

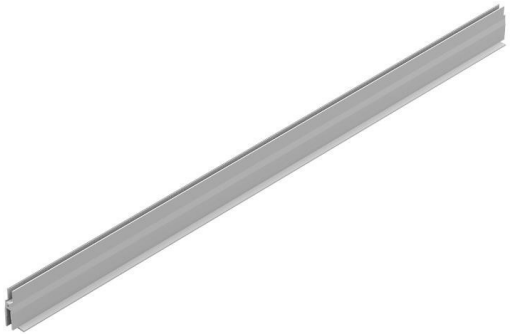


Connectors interface assembly.
Isometric View

Installation Guide
Special Situations On-Site

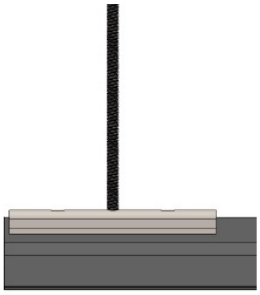
Tate Duo 1.2m Top Notching on Site Guide





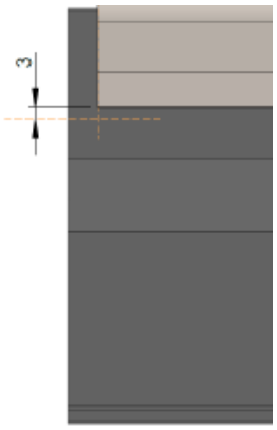
Typical Notch Detail

Hanger as fixture



Hanger placed 5.3 mm offset from Cross Tee tip.

1. Place Hanger on to top of the 1.2m Structural Tee 5.3mm from the end)
2. Then trace a mark 3mm offset from the bottom of the Hanger
3. Finally cut the notch using an aluminium cutting blade



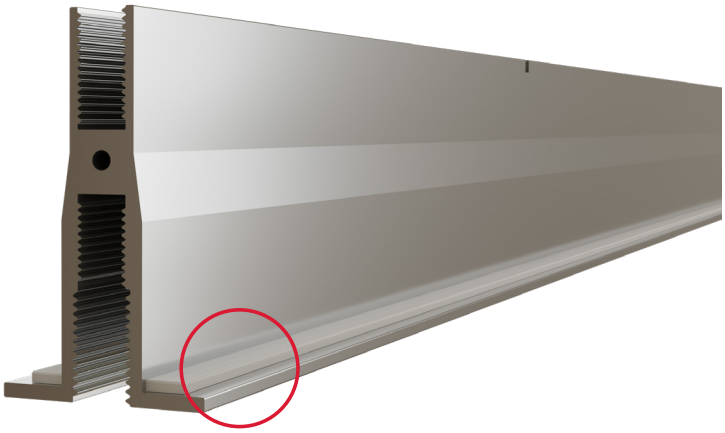
Installation Guide
Airflow Management

Apart from offering support for services, Tate Duo ceilings can also be used for airflow management within a data hall. A combination of ceiling tiles, gaskets and clips can be deployed to achieve an air plenum above the ceiling.

Step 1 - Choosing the ceiling tile
While Tate can supply ceiling tiles of various materials, any ceiling tile that fits the Grid configuration can be used.

Various materials can be used for the ceiling tile material, e.g., metal pan or mineral fiber. The effect of heat transfer from a metal pan tile is negligible when compared with an insulated tile. Refer to: "Analysis of the Effect of Various Ceiling Tiles and IT Deployment on Cold Aisle Temperature Rise: A Case Study" whitepaper by Tate. For further information, please contact TateEurope.engineering@kingspan.com

Step 2 - Applying the Gasket
In order to achieve an air seal, Gasket material can be supplied by Tate. Gaskets are placed onto the runners' flanges. See below image. Alternatively, gaskets can also be installed at the edges of the tiles.



Gaskets placed to achieve air seal between tiles and Tate Duo profiles

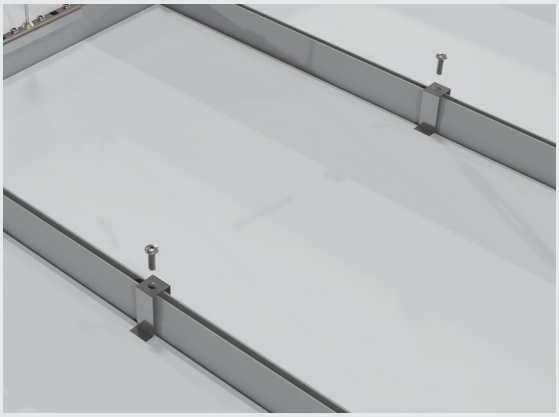
Step 3 - Install the ceiling tiles
Once the Grid has been assembled and the gasket has been applied, the ceiling tiles can then be installed.

Installation Guide
Airflow Management

Step 4 - Installing Ceiling clips

Ceiling clips are recommended in order to firmly secure the ceiling tile to the Tate ceiling. Tate offer double spring or security clips.

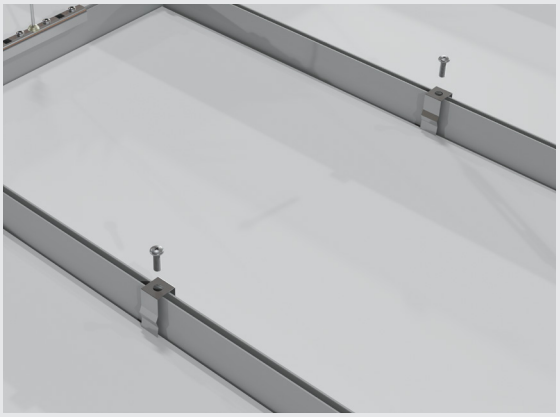
Please contact your local Tate representative to define the correct number of clips for each tile.



Security Clip Detail

Security Clip

- Secured to top channel by a M10 bolt
- Holds tile securely in place during normal operation of a data hall to prevent access to above ceiling plenum
- To remove a tile during standard operating conditions of the data hall, the bolt on the top of the clip needs to be un-screwed
- To remove a tile at the center of the data hall, the tiles must be removed sequentially from an access tile or from the hot aisle opening



Double Spring Clip Detail

Double Spring Clip

- Secured to top channel by a M10 bolt
- Allows access to above ceiling plenum
- Tiles can be removed and installed by hand during normal operation of the data hall
- By applying pressure from below, the ceiling tile can be pushed upward past the spring clip
- Once access to the ceiling plenum is no longer needed, the tile slots back over the spring clip, where it is held in place once more

Installation Guide
Service Conditions

Connecting to the bottom slot of the Duo:

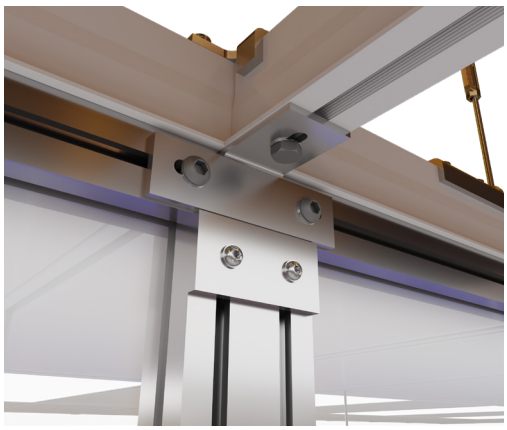
A standard 12mm or 10mm threaded bar can be used to suspend services from the M12 or M10 bottom slot of the Duo. Threaded rods connections must be fully engaged. Bolted connections to the bottom slot of the Duo must be at least 17mm thread length into the M12 slot or 35mm thread length into the M10 slot as measured from the bottom to the flange. M12 Flanged square washer should be used for the M12 slot.

Bottom Slot Torque:

Bottom slot torque should be the same torque as for Top Slot. 4Nm

Hot Aisle Containment:

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



Bottom Slot Detail at Corner

System Performance:

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

Hanger Configuration	Max. Safe Working Uniform Load (kN/m2)	Max allowable deflection (mm)	Max. Safe Working Point Load* (kN)	Ultimate Load (kN)
1200mm x 1200mm	5.0	10	3.56*	7.12
1800mm x 1200mm	3.6	10	1.65*	3.3
2400mm x 1200mm	2.4	10	0.67*	1.34

*Max safe working load no less than 1200mm in any direction

Installation Guide
Service Conditions

Cable Installation & Bracing Drops:

Do not pull cables or expose the Grid to any dynamic loading. Dynamic loads and dragging cables across the Grid may exceed the Ultimate Load of the grid.

To distribute a load that would otherwise exceed the max point loads stated in previous table. Cable ladders can be employed to limit the max loads, as shown previous table. This is the recommended method to distribute the load to ensure no single M10 or M12 stud exceeds the max point load allowed by the Tate Duo Ceiling Grid in a particular project.

See below example:

Please note: Bracing is required during cable pull. The installer should use a bracing method to hold the ladder racks in position so when cables are pulled during install the ladder does not swing back or forth. Bracing must be strictly adhered to in order to avoid exceeding the stated system load tolerances.

Tate recommends a maximum distance of 1.2m between M&E services supports.

Installation Guide
Maintenance

Cleaning:

To clean Tate Duo 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: Isopropyl 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 Duo system must 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 in order 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.

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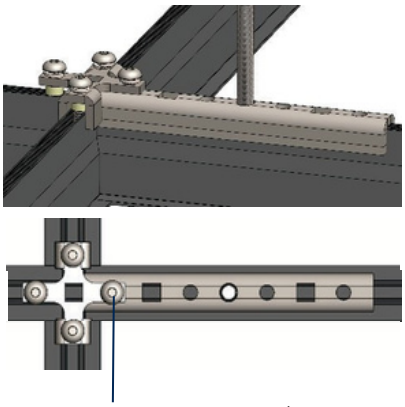
Installation Guide

Appendix: Tate Duo Hanger with Connector Interface Cases

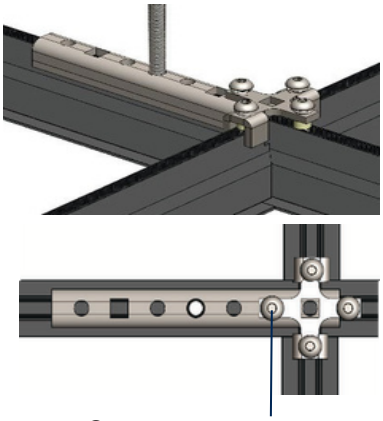
There are four cases as how to connect the Hangers with the Main Runner and the Structural Tees. This happens along one run that repeat itself across the whole ceiling. In all cases M10x35mm are required.

Case A



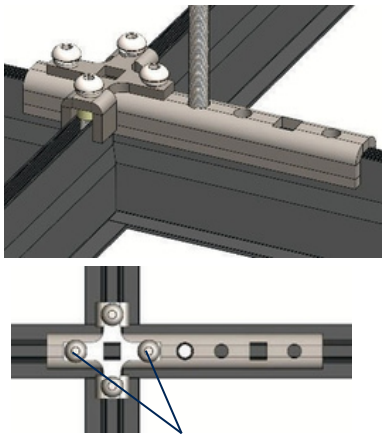
Connecting into 1st Hole in Hanger

Case B



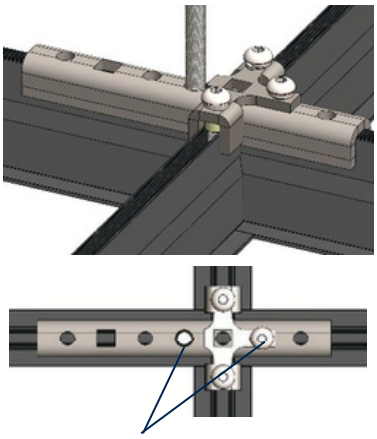
Connecting into Squared Hole in Hanger

CaseC



Connecting into 1st & 2nd Hole in Hanger

CaseD

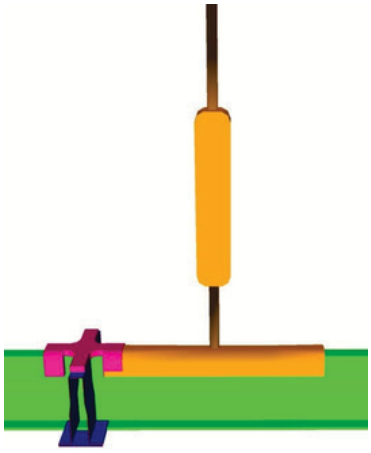


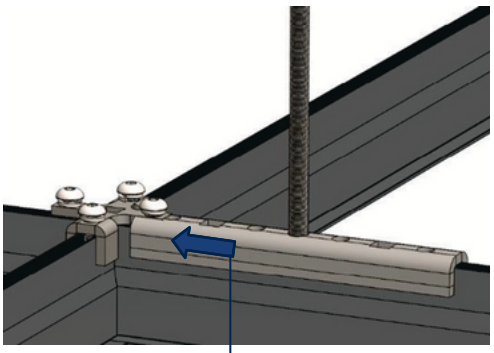
Connecting into 2nd & cut cross connector flange

Installation Guide

Appendix: Tate Duo Hanger with Connector Interface Cases

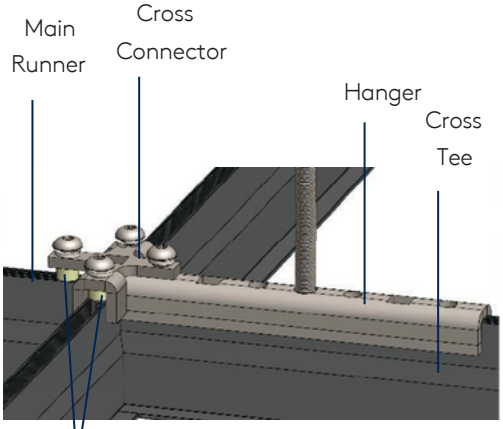
Case A

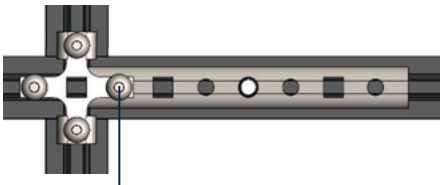




Slide Hanger towards connector until the M10 bolt can pass through both Hanger and Main runner

Make use of Spacer to tight Cross Connector to the Structural Tee



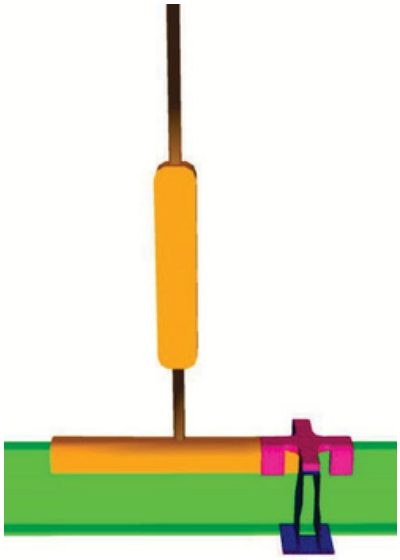


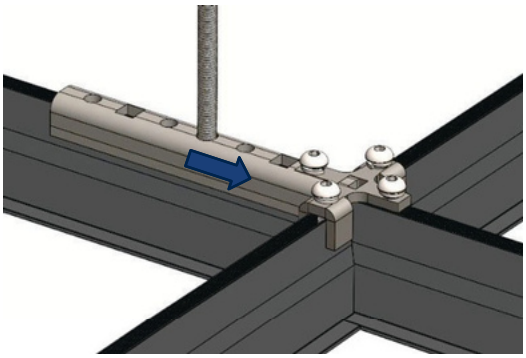
Connecting into 1st hole in Hanger

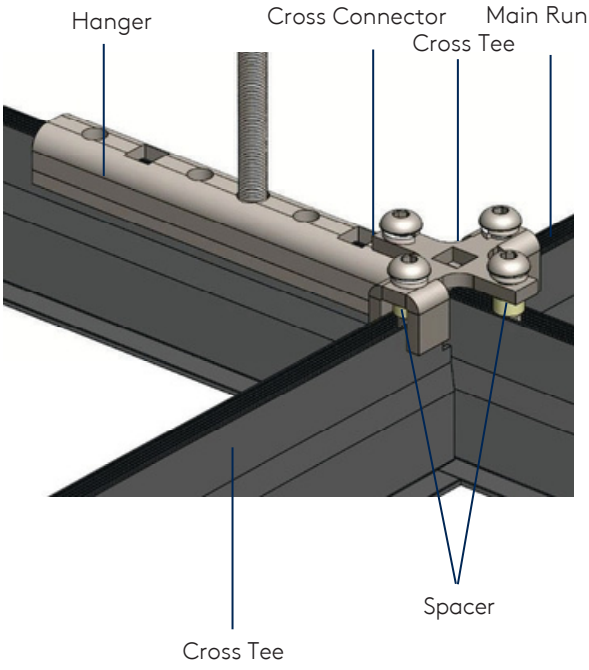
Installation Guide

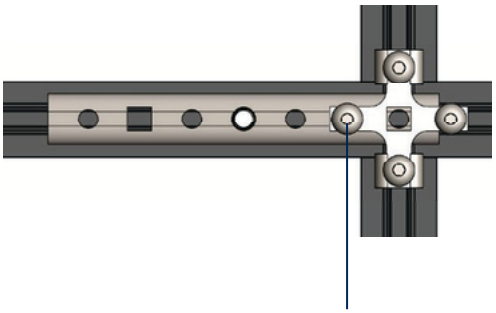
Appendix: Tate Duo Hanger with Connector Interface Cases

Case B







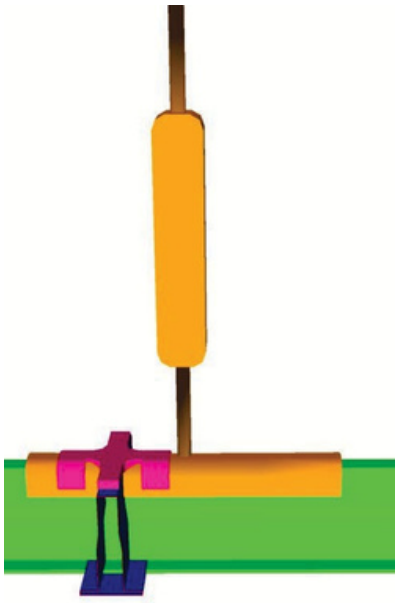


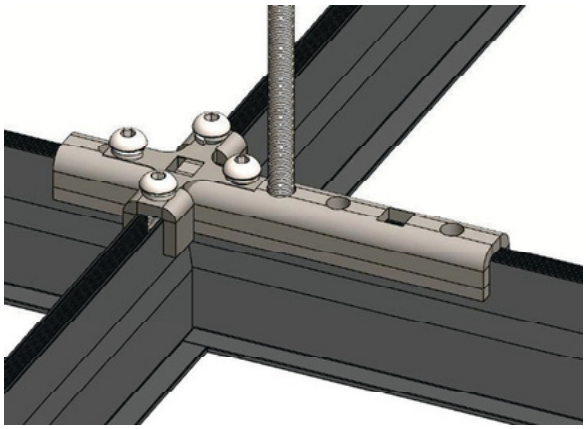
Connecting into squared hole in Hanger

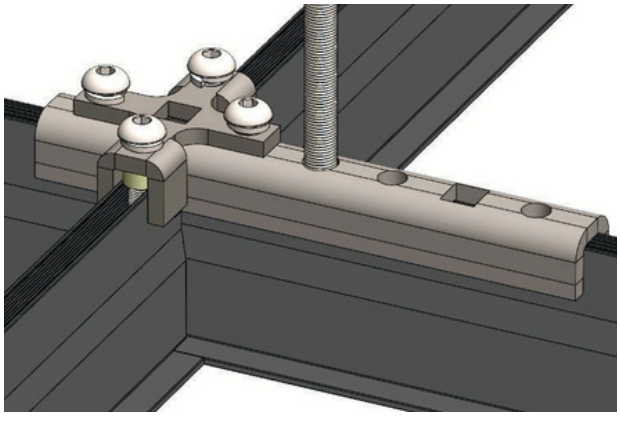
Installation Guide

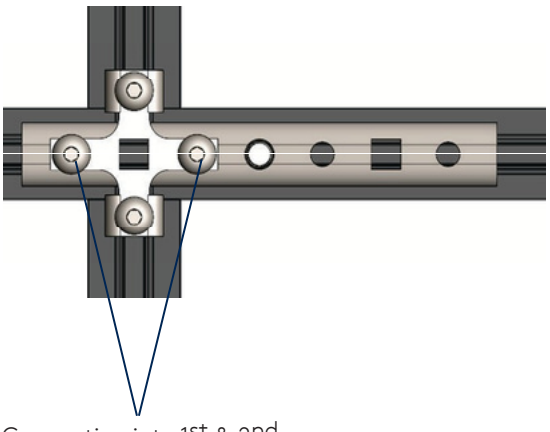
Appendix: Tate Duo Hanger with Connector Interface Cases

Case C







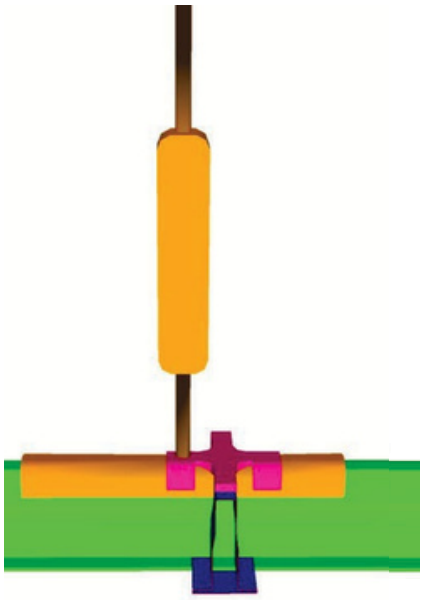


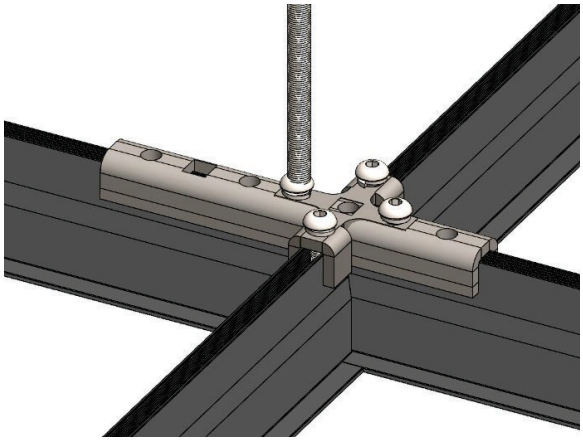
Connecting into 1st & 2nd hole in Hanger

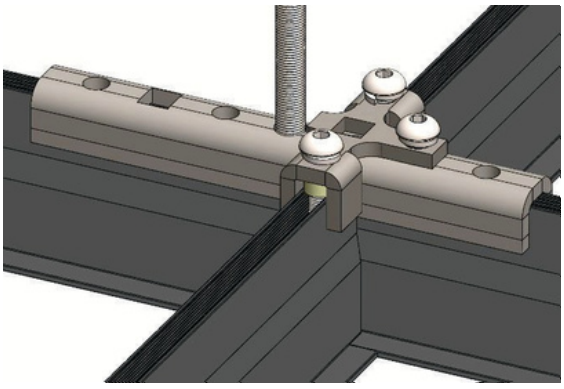
Installation Guide

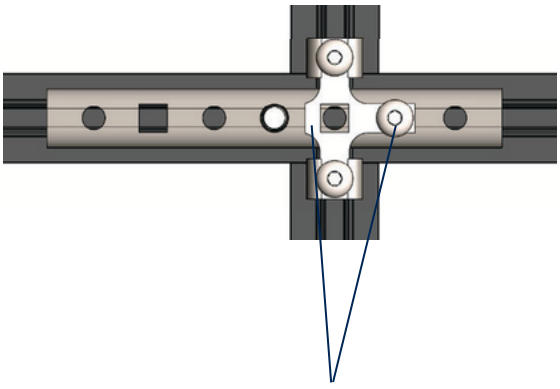
Appendix: Tate Duo Hanger with Connector Interface Cases

Case D









Connecting into 2nd & cut cross connector flange