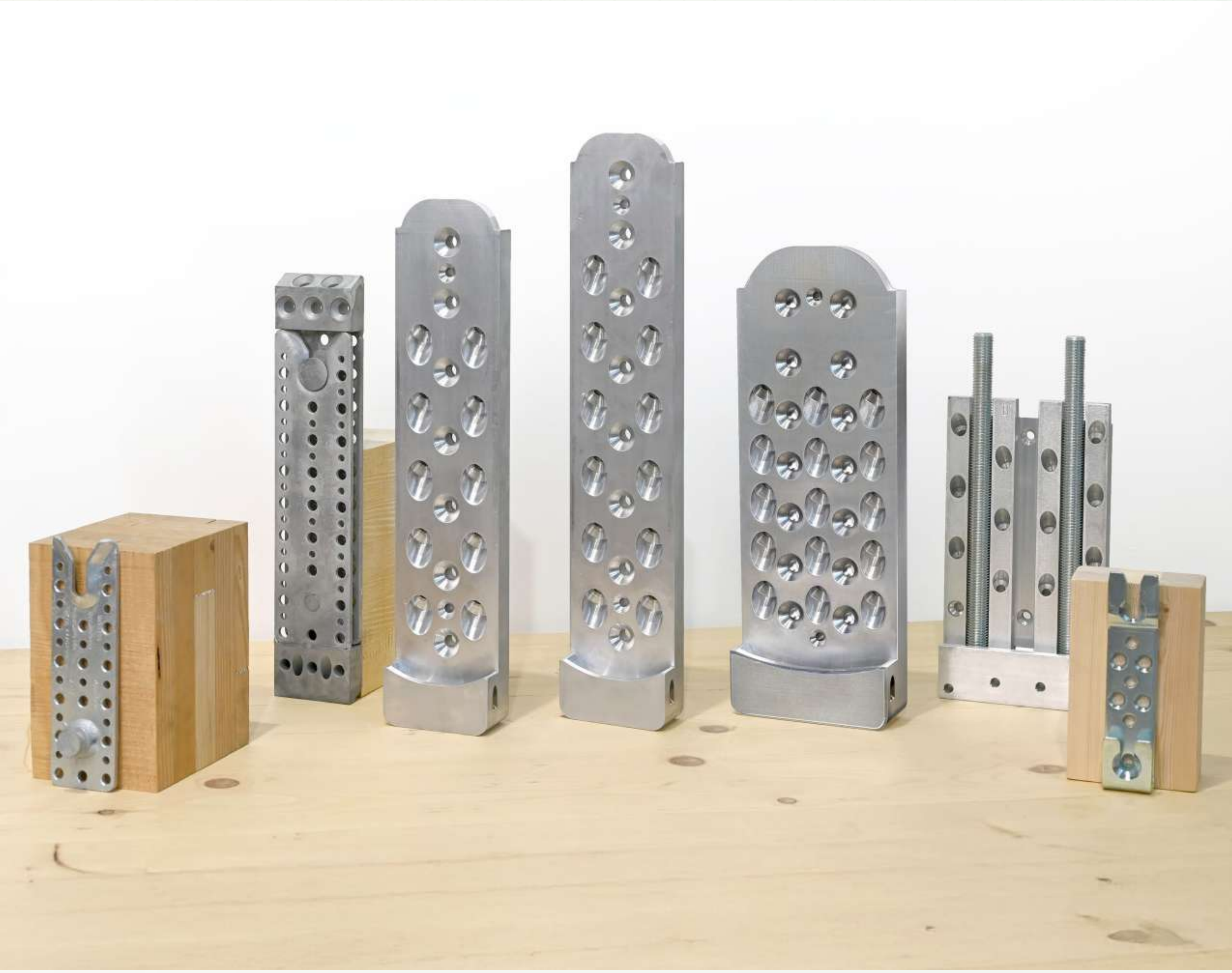
MTC SOLUTIONS



Version CAN 3.0

Beam Hanger Design Guide

LSD for Canada

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MTC SOLUTIONS

Beam Hanger Design Guide

Limit States Design for Canada

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Mass Timber Hardware Specialists

At MTC Solutions, our core focus is to supply structural hardware for modern mass timber applications in commercial, industrial, and residential projects. Our pride lies in collaborating with leading industry experts to offer design solutions and tools for code-compliant, sustainable buildings, continuously pushing the boundaries of the North American construction industry.

Our in-house team of mass timber specialists support professionals in designing customized connections that cater to the specific requirements of each project, resulting in truly innovative and cost-efficient solutions. With industry-recognized expertise and tested & proven solutions, we stand at the forefront of the industry, driving progress and innovation in mass timber construction.

Expertise

We provide our customers with the knowledge and tools necessary to construct cutting-edge, code-compliant mass timber projects while pushing the boundaries of the North American construction industry.

Commitment

We are dedicated to making your project a success, offering support from design and installation assistance to fast and precise delivery of high-quality products.

Products Tailored for North America

We partner with leading research facilities across North America to ensure that our products are tested and customized to meet the unique needs of the market, including seismic considerations and solutions for large post-and-beam structures in various climates.

Find Your Connection Solution

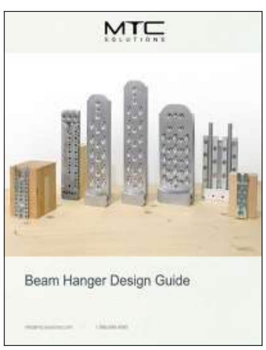
MTC Solutions provides the right tools to design code-compliant buildings, educating the mass timber industry on connection solutions.

Structural Screw Catalog

Structural Screw Connection Design Guide

Structural Fasteners

Accessories



Beam Hanger Design Guide

Beam Hangers

Connector Design Guide

Connectors

Rigging Design Guide

Rigging Devices

Fall Arrest Anchor Design Guide

Fall Arrest

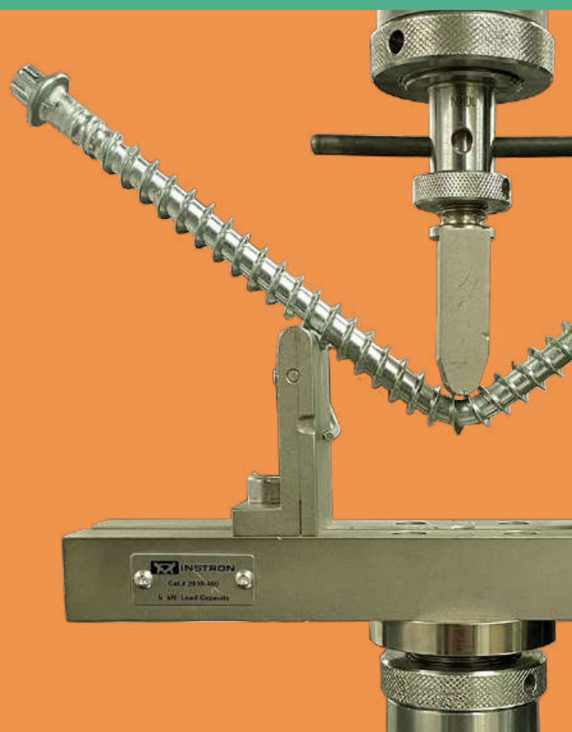
WHO ARE WE?

YOUR MASS TIMBER HARDWARE SUPPLIER

Rely on our distribution team to deliver your North American projects with speed and accuracy.

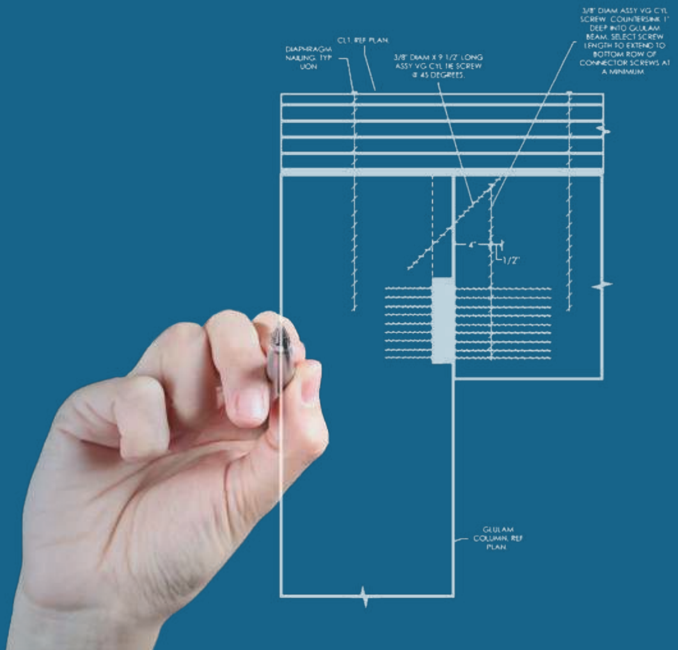
LEADING WITH INNOVATION & RESEARCH

We are leading the mass timber industry with cutting-edge connection solutions and through partnerships with renowned research facilities.



WE MAKE YOU THE EXPERT

Learn about the right solutions for your projects and mass timber connections with our technical resources & support team!



CONNECTION DESIGN SUPPORT

Reach out to our technical team for design support, from early design stages to ongoing iterative changes. We help you find the most efficient connection solutions.

MANUFACTURERS' HELP DESK

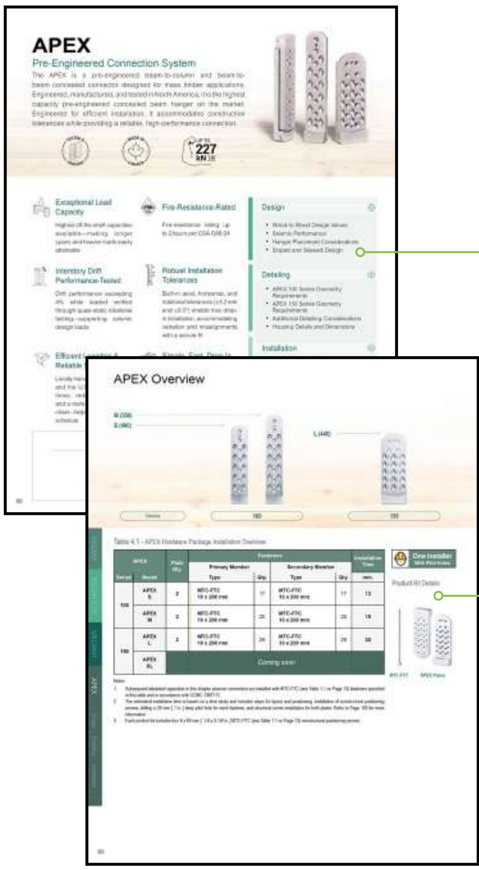
Use our comprehensive & practical resources to find the most cost-effective solutions for your structural elements.

TESTED & PROVEN SOLUTIONS

Count on MTC Solutions' 10+ years of expertise, providing tested & proven, ICC-approved solutions, support, and resources.

How to Use This Guide

Each connection chapter in this guide is structured into four sections—Overview, Design, Detailing, and Installation—to provide a clear and consistent pathway from concept to execution. The Overview introduces the connection, its intended use, and key considerations that inform design decisions. The Design section outlines the engineering principles and calculation methods used to determine capacities, following the CSA O86:24 framework and connector-specific assumptions. The Detailing section then translates these principles into practical layout guidance, including spacing, edge distances, routing information, and other requirements needed for safe and code-compliant configurations. Finally, the Installation section summarizes the field tool requirements, installation steps, and best practices to ensure reliable performance. Together, these elements offer a complete and intuitive structure that supports designers, specifiers, and installers at every stage of the connection design process.


APEX

Pre-Engineered Connection System

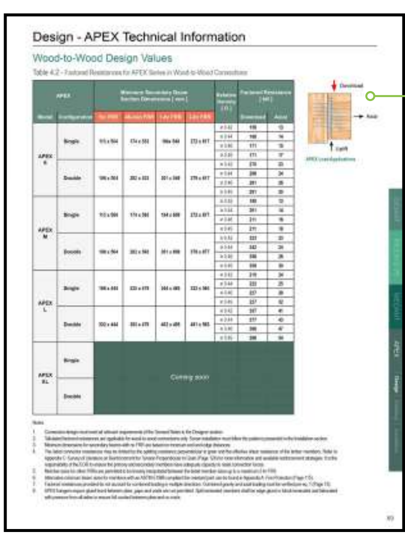
APEX Overview

Overview

This section provides the key highlights for each product, including product description, key design features, and product certifications.

This sidebar outlines the design values, detailing information, and installation guidelines included in each product subsection.

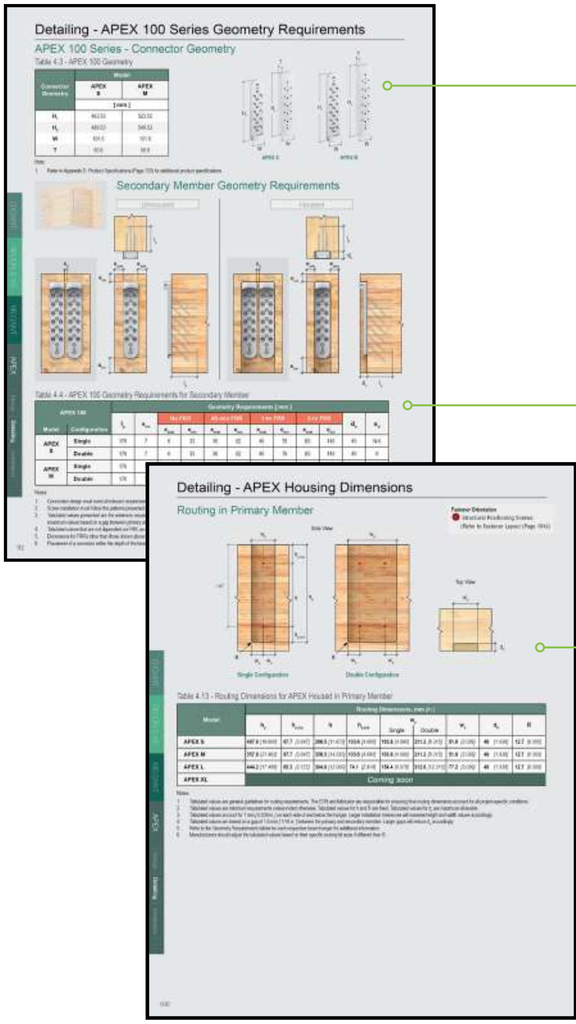
This table provides an overview of the hardware package required for a beam hanger connection, including the number of plates, fasteners for both primary and secondary members, and installation times.


Design - APEX Technical Information

Wood-to-Wood Design Values

Design Section

This table provides the factored resistances for connectors based on connection configurations and specific gravities. It also provides minimum secondary beam sizes for various fire-resistance ratings (FRR).



Detailing - APEX 100 Series Geometry Requirements

APEX 100 Series - Connector Geometry

Secondary Member Geometry Requirements

Detailing - APEX Housing Dimensions

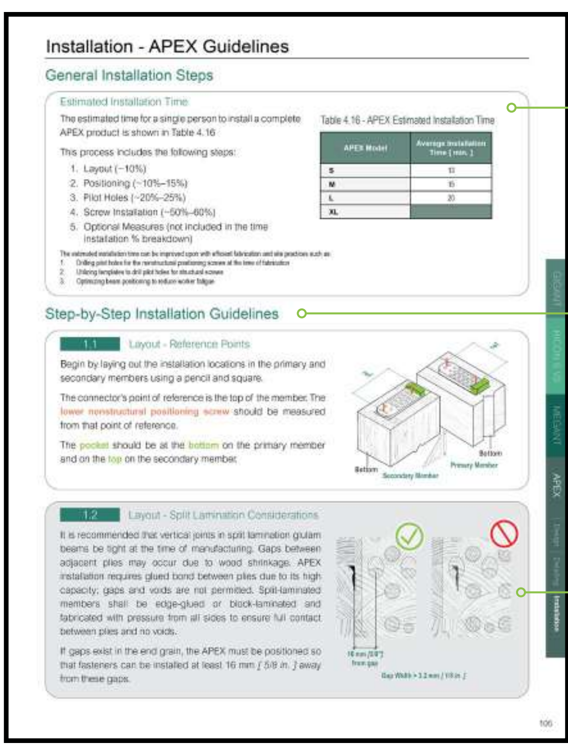
Routing in Primary Member

Detailing Section

These renderings define key dimensions for each series of connectors in the product family.

These tables provide minimum dimensions for secondary beams, primary beams, or primary columns incorporating minimum fastener geometry and Fire Resistance Rating (FRR).

This section provides detailed guidelines for preparing wood members to ensure proper alignment, load transfer, and connector performance. Detailed routing dimensions, including minimum tolerances, are provided to ensure proper installation and meet fire protection requirements.



Installation - APEX Guidelines

General Installation Steps

Estimated Installation Time

The estimated time for a single person to install a complete APEX product is shown in Table 4.16

This process includes the following steps:

1. Layout (~10%)
2. Positioning (~10%–15%)
3. Pilot Holes (~20%–25%)
4. Screw Installation (~50%–60%)
5. Optional Measures (not included in the time installation % breakdown)

Table 4.16 - APEX Estimated Installation Time

APEX Model	Average Installation Time [min.]
S	10
M	15
L	20
XL	

Step-by-Step Installation Guidelines

1.1 Layout - Reference Points

Begin by laying out the installation locations in the primary and secondary members using a pencil and square.

The connector's point of reference is the top of the member. The lower nonstructural positioning screw should be measured from that point of reference.

The pocket should be at the bottom on the primary member and on the top on the secondary member.

1.2 Layout - Split Lamination Considerations

It is recommended that vertical joints in split lamination glulam beams be tight at the time of manufacturing. Gaps between adjacent plies may occur due to wood shrinkage. APEX installation requires glued bond between plies due to its high capacity; gaps and voids are not permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.

If gaps exist in the end grain, the APEX must be positioned so that fasteners can be installed at least 16 mm [5/8 in.] away from these gaps.

Installation Section

General Installation Information: Includes average installation time for each connector and outlines the tools required for installation.

Step-by-Step Guidance: Provides a detailed breakdown of the installation process, including connector layout, placement of positioning screws, pilot hole recommendations, and the sequence for installing structural screws. Detailed tips to ensure precise screw installation are also included.

Special-Case Instructions: The gray boxes highlight procedures or requirements that apply only to specific scenarios, such as unique structural needs, uplift considerations, or sealing for fire protection.

General Notes to the Designer

1. Factored resistances are derived in accordance with CSA O86:24.
2. Unless noted otherwise, factored resistances provided assume normal load duration, dry service conditions, and untreated wood members (K_D = 1.0, K_{SF} = 1.0, and K_T = 1.0). Connections with conditions that vary from this must be multiplied by all applicable modification factors per CSA O86:24.
3. Connectors in combination with carbon steel fasteners are to be used only in dry service conditions (K_{SF} = 1.0). During construction, mass timber elements may experience temporary surface wetting, potentially causing the timber surface moisture content (MC) to exceed 19%. In such cases, connectors with carbon steel fasteners can be used, provided:
   - The surface wetting shall not exceed the moisture limits defined for dry service conditions for more than a few weeks.
   - The annual average MC during construction shall remain within the range of 10–16%.
4. Tabulated specified resistances apply to connections exposed to sustained temperatures below 50°C, except for occasional exposures up to 65°C.
5. Factored resistances provided are valid only when using the listed GIGANT SK screws with GIGANT connectors and the listed MTC-FTC / MTC-PTC screws with RICON S VS, MEGANT, and APEX connectors.
6. Connectors are to be centered with the resultant vertical force, with the plates installed symmetrically about the vertical axis. Horizontal eccentricities need to be specified and the resulting rotational forces accounted for.
7. Appropriate lateral support should be provided for lateral stability against rotation. If subjected to rotational forces, connectors must be designed accordingly, with the Engineer of Record (EOR) specifying any necessary additional measures.
8. A pilot hole is a short, starter hole intended to reduce installation torque and wandering of the screw. Pilot holes may be used to facilitate fastener installation with greater precision. Pilot hole diameters shall not exceed the minor diameter, D_m, of the fastener.
9. A hole is considered predrilled if its length matches the entire embedment of the fastener. Predrilling is required when installing connectors into Parallel Strand Lumber (PSL) and the edge of laminated veneer products to reduce the risk of splitting.
10. Installation must respect all minimum beam size requirements, including fastener geometry requirements and fire-resistance rating (FRR) requirements.
11. Within this guide, the term "primary member" refers to the supporting member (beam or column), and the term "secondary beam" refers to the supported beam, typically with the connector installed into the end grain.
12. Minimum beam sizes presented are based on geometry and FRR requirements. Factored resistances of the connector may exceed the capacity of the wood member. The EOR must ensure that all possible stress limits for the wood members, such as the shear capacity, flexural capacity, deflection limits, and other material properties, are not exceeded while maintaining a continuous load path. See Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124) for more information on brittle failure mode resistance and reinforcement.

13. Minimum dimensions for members with an FRR are based on minimum wood cover requirements specified in CSA O86:24 Annex B.4. Member sizes satisfying an FRR assume a maximum 3.2 mm *[1/8 in.]* gap and that any void below the connector in the routing has been sealed with a wood plug.
14. Tabulated beam depths are for reference purposes only. Note that tolerances for finished glulam dimensions provided in the CSA-O122 manufacturing standard may not ensure the adequate squareness and depth required for seamless field installation. An undersize up to 6 mm in depth and 2 mm in width may be required. Verify all finished glulam dimensions with the timber provider.
15. When side grain or beam-end conditions cause the splitting resistance of the wood perpendicular to grain to be exceeded, reinforcement must be added to ensure the connection's structural integrity. The EOR is responsible for the design of any required reinforcing screws.
16. For relative densities, G, assigned to different timber species, refer to CSA O86:24 Table A.12.
17. In order to avoid excessive gaps in beam-end conditions, members manufactured with split laminations should have the vertical joints of all laminations in contact at the time of fabrication.
18. Factored resistances provided do not account for combined loading in multiple directions. Combined shear (download or uplift) and axial loading must be verified using the following interaction equation:

$$\left(\frac{V_f}{V_r}\right)^2 + \left(\frac{T_f}{T_r}\right)^2 \leq 1.0 \qquad \textbf{(eq. 1)}$$

Where V_f and T_f are factored loads (shear and axial/withdrawal), and V_r and T_r are the corresponding factored resistances.

Fastener Designation Update

To reflect improvements in our quality-control program, some screw designations used in this guide have been updated. While the fasteners themselves remain unchanged, MTC Solutions now applies an enhanced quality-verification process—specifically additional screening related to hydrogen-embrittlement resistance. The updated naming convention identifies fasteners that have undergone this added level of verification, ensuring clarity and consistency across all MTC technical documents.

All factored resistances remain valid for both the legacy and the current designations.

Table 1.1 - Fastener Designation Updates

Legacy Designation	Current Designation	Description
ASSY VG CSK	**MTC-FTC**	**Fully Threaded (FT), Countersunk (C) head**
ASSY VG CYL	**MTC-FTCY**	**Fully Threaded (FT), Cylinder (CY) head**
ASSY ECOFAST	**MTC-PTC**	**Partially Threaded (PT), Countersunk (C) head**

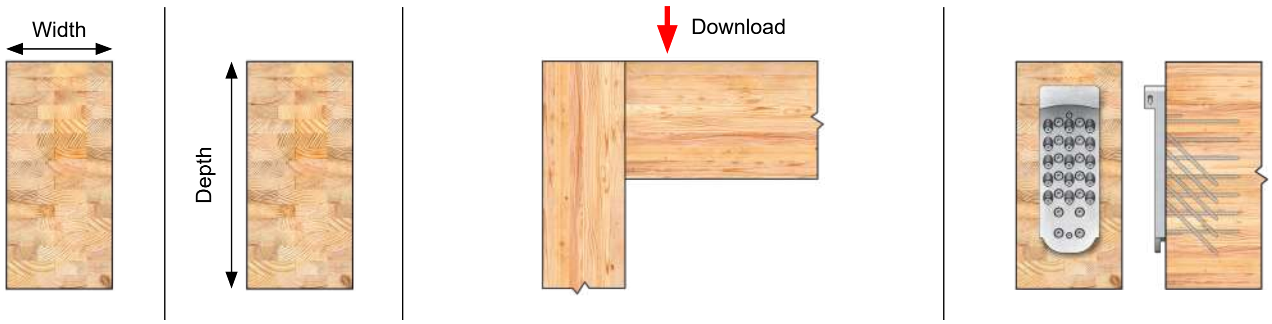
Example: MTC-FTC-10x200 (metric) or MTC-FTC-3/8x7-7/8" (imperial)

General Notes to the Installer

1. Refer to detailing installation guidelines within each product chapter for additional information.
2. Carbon steel fasteners shall only be used in dry service conditions, as exposure to wet service conditions may lead to premature failure. Connections designed for dry service conditions should be protected from wetting and excessive moisture during construction.
3. Connectors in combination with carbon steel fasteners are to be used only in dry service conditions (K_{SF} = 1.0). During construction, mass timber elements may experience temporary surface wetting, potentially causing the timber surface moisture content (MC) to exceed 19%. In such cases, connectors with carbon steel fasteners can be used, provided:
   - The surface wetting shall not exceed the moisture limits defined for dry service conditions for more than a few weeks per year.
   - The annual average MC during construction shall remain within the range of 10–16%.
   - The design must incorporate appropriate detailing to accommodate dimensional changes in the wood due to wetting and/or drying
4. Use a drill equipped with a feather (variable-speed) trigger to ensure proper torque management and mitigate the risk of overtorquing. Although impact guns are not expressly prohibited, their use is discouraged due to increased risk of overtorquing. If an impact gun is utilized, limit its use to short screws and maintain a continuous drive without pausing. For more information on drill selection, refer to the Installation Guidelines within each product section.
5. GIGANT connectors must be installed with the listed GIGANT SK screws. RICON S VS, MEGANT, and APEX connectors must be installed with the listed MTC-FTC / MTC-PTC screws. Substitution of fasteners is not permitted.
6. If splitting of a wood member or fastener damage is observed prior to or during installation of the fasteners, the installation process must be stopped, and the Engineer of Record (EOR) must be contacted immediately to provide appropriate site instructions to rectify the issue.
7. A pilot hole is a short, starter hole intended to reduce installation torque and wandering of the screw. Pilot holes may be used to facilitate fastener installation with greater precision. Pilot holes shall be 25 mm deep and their diameters shall not exceed the minor diameter, D_m, of the fastener.
8. For fasteners installed in a countersunk hole, a pilot hole using the Predrilling Jig is recommended to ensure proper installation of the fasteners.
9. A hole is considered predrilled if its length matches the entire embedment of the fastener. Predrilling is required when installing connectors into Parallel Strand Lumber (PSL) and the edge of laminated veneer products to reduce the risk of splitting.
10. Screws should be fully driven in an uninterrupted process, from tip insertion to head seating. If necessary, a torque wrench may be used to complete installation immediately after initial insertion of the screw.

Beam Hanger Selection Tool

The following pre-selection table helps the designer choose the correct beam hanger system. It lists the factored resistances for each system as well as the minimum beam width and depth. More details on a specific beam hanger system can be found on the pages referenced in the table. Additional requirements, such as those relating to geometry and special connections, must also be taken into consideration where applicable.



Minimum Beam Width		Minimum Beam Depth		Factored Resistance	Connector	
mm	*[in.]*	mm	*[in.]*	kN	Model	Page
100	*[3-15/16]*	**160**	*[6-5/16]*	8	GIGANT 120 x 40	20
		180	*[7-3/32]*	11	GIGANT 150 x 40	20
		220	*[8-21/32]*	16	GIGANT 180 x 40	20
92	*[3-5/8]*	**186**	*[7-5/16]*	24	RICON S VS 140 x 60	40
		246	*[9-11/16]*	38	RICON S VS 200 x 60	40
120	*[4-23/32]*	**260**	*[10-1/4]*	59	RICON S VS 200 x 80	43
		320	*[12-19/32]*	67	RICON S VS 290 x 80	43
		430	*[16-15/16]*	129	RICON S VS XL 390 x 80	46
89	*[3-1/2]*	**530**	*[20-7/8]*	83	MEGANT 430 x 60	66
128	*[5-1/32]*	**376**	*[14-13/16]*	73	MEGANT 310 x 100	69
		496	*[19-17/32]*	115	MEGANT 430 x 100	69
178	*[7]*	**376**	*[14-13/16]*	94	MEGANT 310 x 150	72
		496	*[19-17/32]*	147	MEGANT 430 x 150	72
113	*[4-7/16]*	**504**	*[19-27/32]*	171	APEX S	92
		564	*[22-7/32]*	211	APEX M	92
166	*[6-17/32]*	**444**	*[17 15/32]*	227	APEX L	95

Notes:

1. Tabulated factored resistances are only valid for Limit States Design in Canada. This table is a pre-selection tool. Refer to each respective connector section and CSA O86:24 for design guidelines.
2. Tabulated factored resistances are only valid for use in G ≥ 0.49 in standard-term loading (K_D = 1.0). Refer to each respective connector section for additional values.
3. Tabulated factored resistances are for a single connector. Refer to the RICON S VS, MEGANT, and APEX product chapters for double connector configuration capacities.
4. Tabulated minimum beam sizes are based on geometry requirements for the connector and fasteners and do not account for the fire-resistance rating (FRR) or capacity of the wood members. The EOR is responsible for verifying stress limits for the wood members. See product chapters for minimum beam size requirements for various FRR.

GIGANT

Pre-Engineered Connection System

The GIGANT is a pre-engineered system for beam-to-column and beam-to-beam connections. Manufactured from mild steel, it consists of two identical parts and is suitable for use in timber framing, log home building, and mass and heavy timber construction. Easy to install with structural screws perpendicular to its plates, the GIGANT can be fully concealed or visible.

Pre-Installable

Pre-installable in a controlled shop environment for a faster on-site installation

Drop-in Installation

A fast, streamlined & repeatable installation process that significantly enhances efficiency

Timber Frame

Best used in timber framing & log home building

Fully Concealable

Easy to conceal connections, enhancing architectural wood features

Design

- Wood-to-Wood Design Values
- Hanger Placement Considerations

Detailing

- GIGANT Geometry Requirements
- Additional Detailing Considerations
- Housing Details and Dimensions

Installation

- Installation Configurations
- Tool Requirements
- Fastener Layout
- Step-by-Step Guidelines

STANDARDS AND CERTIFICATIONS

CSA O86:24

ETA-10/0189 2019

GIGANT Overview

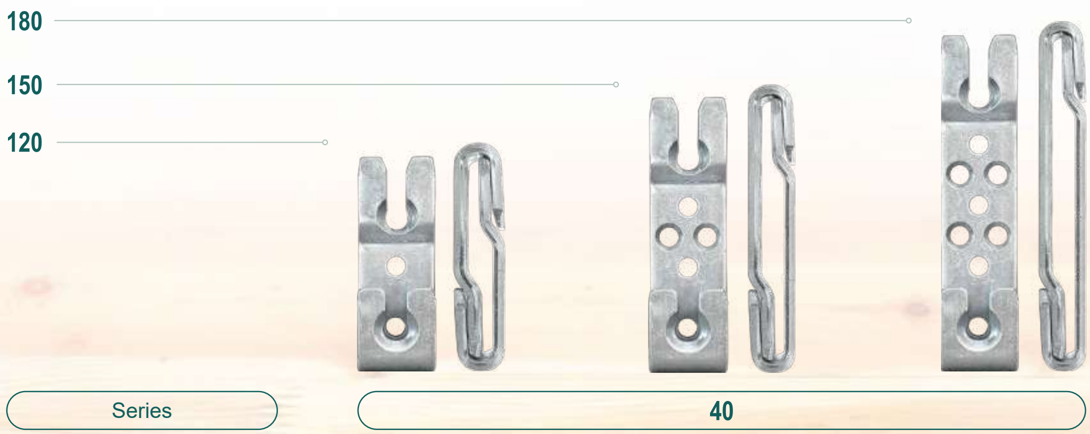


Table 1.1 - GIGANT Hardware Package Installation Overview

GIGANT		Plate Qty.	Fasteners				Installation Time
			Primary Member		Secondary Member		
Series	Model		Type	Qty.	Type	Qty.	min.
40	GIGANT 120 x 40	2	GIGANT SK 10 x 80 mm	3	GIGANT SK 10 x 120 mm	3	4
	GIGANT 150 x 40	2	GIGANT SK 10 x 80 mm	4	GIGANT SK 10 x 120 mm	4	5
	GIGANT 180 x 40	2	GIGANT SK 10 x 80 mm	6	GIGANT SK 10 x 120 mm	6	5

Notes:

1. Subsequent tabulated capacities in this chapter assume connectors are installed with fasteners specified in this table.
2. The estimated installation time is based on a time study and includes steps for layout and positioning and structural screw installation for both plates. Refer to the General Installation Steps (Page 28) for more information.

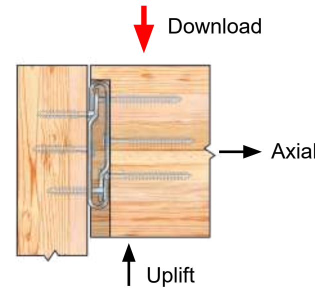
One Installer
With Pilot Holes

Product Kit Details

Wood-to-Wood Design Values

Table 1.2 - Factored Resistances for GIGANT in Wood-to-Wood Connections

Model	Minimum Secondary Beam Section Dimensions [mm]				Relative Density [G]	Factored Download Resistance [kN]
	No FRR	45-min FRR	1-hr FRR	2-hr FRR		
GIGANT 120 x 40	100 x 160	113 x 183	132 x 200	210 x 268	≥ 0.42	8
					≥ 0.44	8
					≥ 0.46	8
					≥ 0.49	8
GIGANT 150 x 40	100 x 180	113 x 209	132 x 226	210 x 294	≥ 0.42	11
					≥ 0.44	11
					≥ 0.46	11
					≥ 0.49	11
GIGANT 180 x 40	100 x 220	113 x 245	132 x 262	210 x 330	≥ 0.42	16
					≥ 0.44	16
					≥ 0.46	16
					≥ 0.49	16



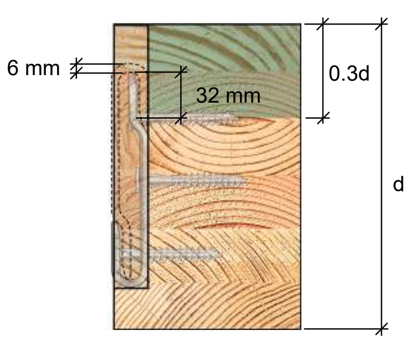
GIGANT Load Applications

Notes:

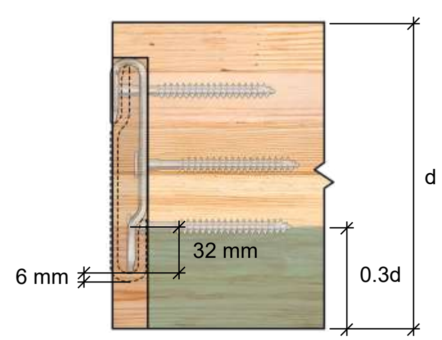
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Tabulated factored resistances are applicable for wood-to-wood connections only. Screw installation must follow the patterns presented in the Installation section.
3. Minimum dimensions for secondary beams with no FRR are based on testing.
4. The listed connector resistances may be limited by the splitting resistance perpendicular to grain and the effective shear resistance of the timber members. Refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124) for more information and available reinforcement strategies. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
5. Member sizes for other FRRs are permitted to be interpolated between the listed member sizes up to a maximum 2-hr FRR.
6. Alternative minimum beam sizes for members with an ASTM E1966 compliant fire-resistant joint can be found in Appendix A: Fire Protection (Page 115).
7. Highlighted factored resistances indicate values that have decreased by more than 5% from the previous design guide due to the updated requirements of CSA O86:24. No change to product geometry or materials.

Positioning Considerations for Reinforcement

The hanger placement relative to the height of the beam can impact the need for reinforcement. Connectors in the primary beam should have the uppermost fastener in the top 30% of the member depth (0.3d), as shown in the bottom left figure. Connectors in the secondary beam should have the lowermost fastener in the bottom 30%, as shown in the bottom right figure. Outside of these zones, the primary and secondary beams should be checked for splitting to determine if reinforcement is required. Note that these requirements do not apply to columns. For further information, refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124)



Primary Beam



Secondary Beam

First Tech Federal Credit Union

Hillsboro, Oregon

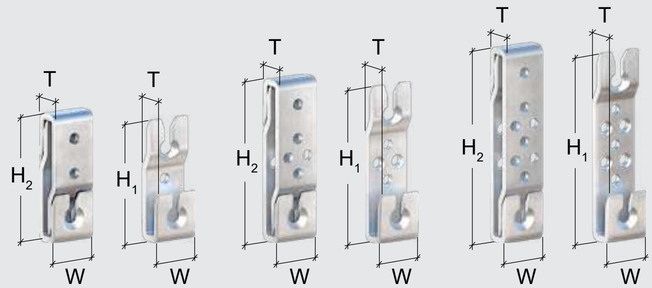
Courtesy of Swinerton

Detailing - GIGANT Geometry Requirements

GIGANT Series - Connector Geometry

Table 1.3 - GIGANT Geometry

Connector Geometry	Model		
	GIGANT 120 x 40	**GIGANT 150 x 40**	**GIGANT 180 x 40**
	[mm]		
H_1	112	144	176
H_2	118	150	182
W	40	40	40
T	26	26	26

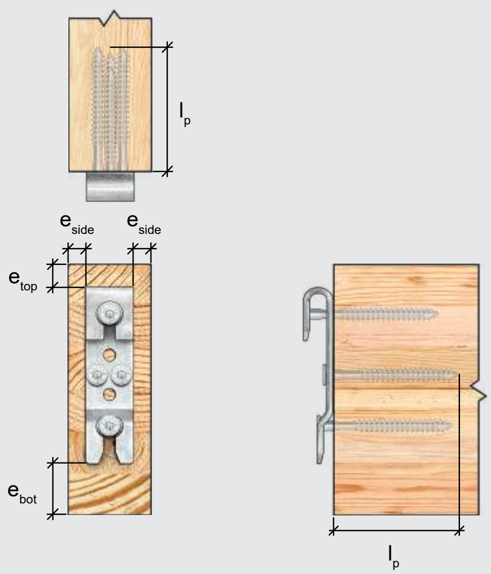


GIGANT 120 x 40 GIGANT 150 x 40 GIGANT 180 x 40

Note: Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.

Secondary Member Geometry Requirements

Unhoused



Housed

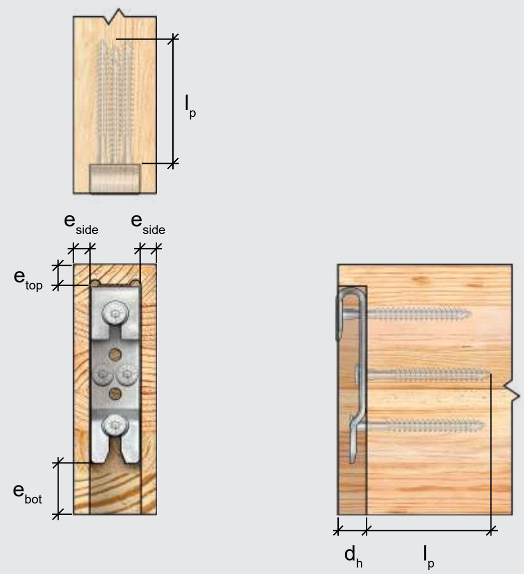


Table 1.4 - GIGANT Geometry Requirements for Secondary Member

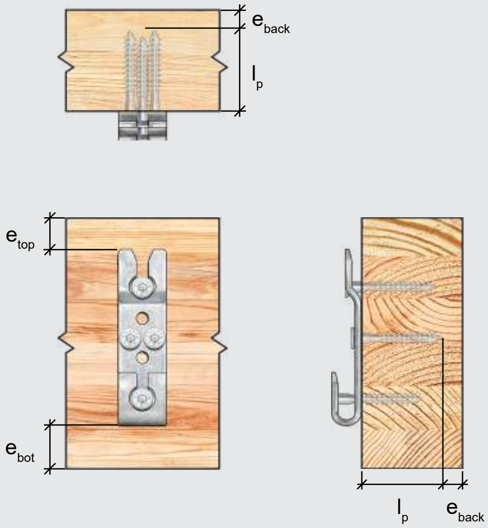
Model	Geometry Requirements [mm]										
	l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h
			e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	
GIGANT 120 x 40	110	21	30	27	36	50	46	67	85	135	25
GIGANT 150 x 40	110	15	30	21	36	50	46	67	85	135	25
GIGANT 180 x 40	110	19	30	25	36	50	46	67	85	135	25

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on testing.
5. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the member.

Primary Member Geometry Requirements - Beam/Girder

Unhoused



Housed

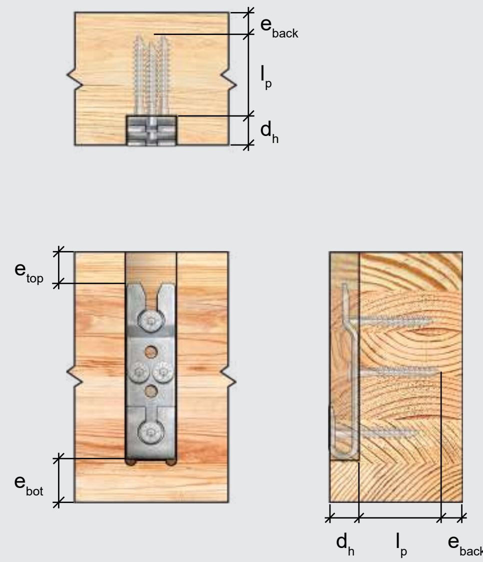


Table 1.5 - GIGANT Geometry Requirements for Primary Member (Beam/Girder)

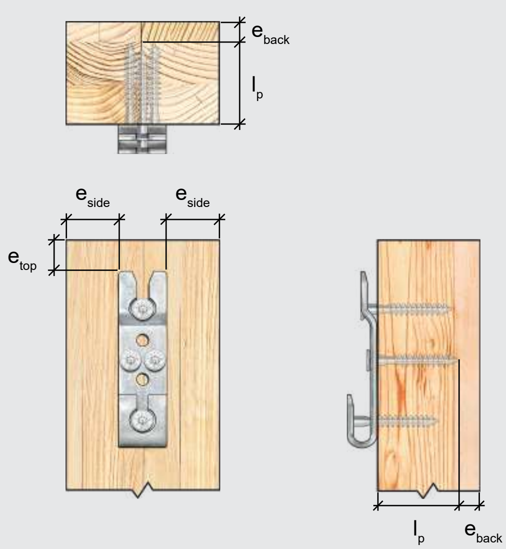
Model	Geometry Requirements [mm]										
	l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h
			e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	
GIGANT 120 x 40	70	27	21	10	44	36	61	46	129	85	25
GIGANT 150 x 40	70	21	15	10	44	36	61	46	129	85	25
GIGANT 180 x 40	70	25	19	10	44	36	61	46	129	85	25

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on testing.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Primary Member Geometry Requirements - Column

Unhoused



Housed

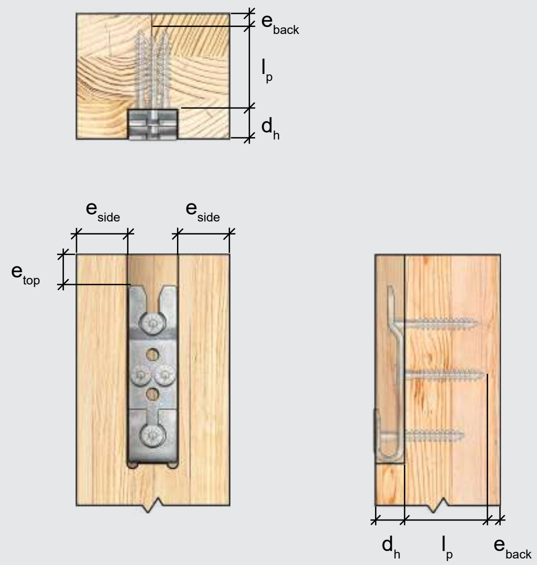


Table 1.6 - GIGANT Geometry Requirements for Primary Member (Column)

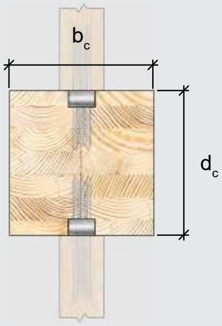
Model	Geometry Requirements [mm]										
	l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h
			e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	
GIGANT 120 x 40	70	27	30	10	36	36	46	46	85	85	25
GIGANT 150 x 40	70	21	30	10	36	36	46	46	85	85	25
GIGANT 180 x 40	70	25	30	10	36	36	46	46	85	85	25

Notes:

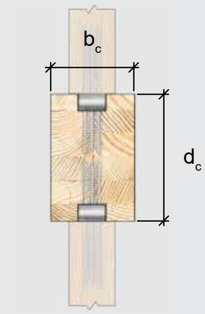
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum fastener end distances, a minimum depth to prevent the screw tip from penetrating through the column, and testing.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Detailing - GIGANT Additional Considerations

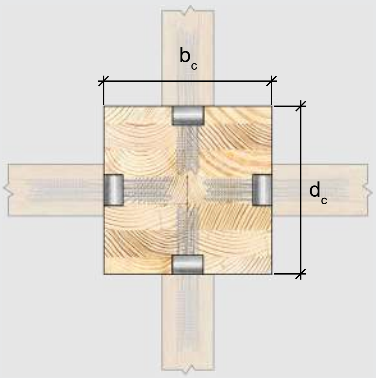
Geometry Requirements for Columns with Multiple Beam Hangers



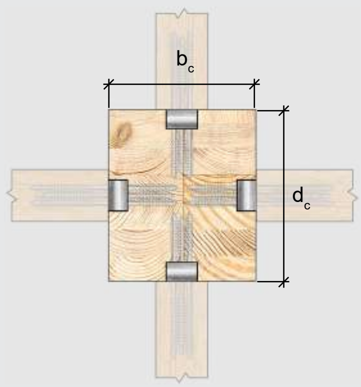
A
Hangers on Opposing Faces of a Square Column



B
Hangers on Opposing Faces of a Rectangular Column



C
Hanger on Each Face of a Square Column



D
Hanger on Each Face of a Rectangular Column

Table 1.7 - Minimum Column Sizes for Multiple GIGANT Connectors

Model	Minimum Column Section Dimensions, b_c x d_c [mm x mm]							
	A Hangers on Opposing Faces of a Square Column				B Hangers on Opposing Faces of a Rectangular Column			
	No FRR	45-min FRR	1-hr FRR	2-hr FRR	No FRR	45-min FRR	1-hr FRR	2-hr FRR
GIGANT 120 x 40	203 x 203	203 x 203	203 x 203	210 x 210	100 x 203	113 x 203	132 x 203	210 x 203
GIGANT 150 x 40	203 x 203	203 x 203	203 x 203	210 x 210	100 x 203	113 x 203	132 x 203	210 x 203
GIGANT 180 x 40	203 x 203	203 x 203	203 x 203	210 x 210	100 x 203	113 x 203	132 x 203	210 x 203

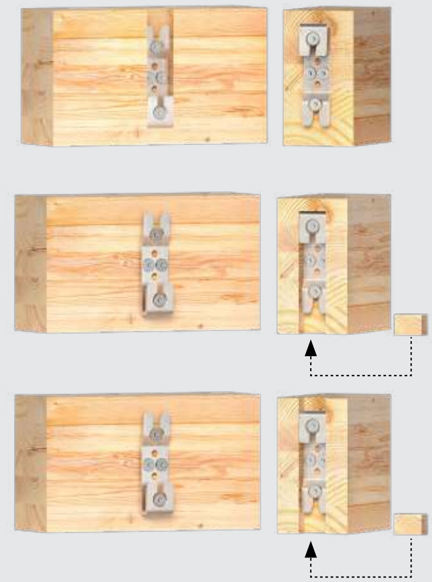
Model	Minimum Column Section Dimensions, b_c x d_c [mm x mm]							
	C Hanger on Each Face of a Square Column				D Hangers on Each Face of a Rectangular Column			
	No FRR	45-min FRR	1-hr FRR	2-hr FRR	No FRR	45-min FRR	1-hr FRR	2-hr FRR
GIGANT 120 x 40	215 x 215	215 x 215	215 x 215	215 x 215	203 x 215	203 x 215	203 x 215	203 x 215
GIGANT 150 x 40	235 x 235	235 x 235	235 x 235	235 x 235	203 x 235	203 x 235	203 x 235	203 x 235
GIGANT 180 x 40	235 x 235	235 x 235	235 x 235	235 x 235	203 x 235	203 x 235	203 x 235	203 x 235

Notes:

1. Tabulated column section dimensions are minimum values based on a 12.7 mm *[1/2 in.]* clearance between screw tips, minimum edge and end distances, and minimum wood cover requirements for FRR. Refer to Geometry Requirements for further details.
2. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
3. Tabulated column section dimensions assume hangers are centered within each column face and are housed in the column as shown.
4. Member sizes for other FRRs are permitted to be interpolated between the listed member sizes up to a maximum 2-hr FRR.

Detailing - GIGANT Housing Details

Housing Possibilities



Primary Beam Housing

- Most common housing for concealed installation
- Concealed from below

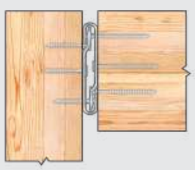
Secondary Beam Housing

- Joist housing from bottom up
- Concealed from below with a wood plug

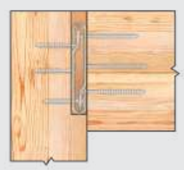
Secondary Beam Through Housing

- Full-depth housing in joist
- Concealed from below with a wood plug
- May simplify fabrication

Housing and Surface Detailing

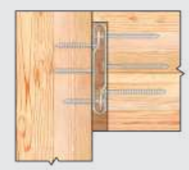


Surface-Mounted



Housed in Primary Member (Column)

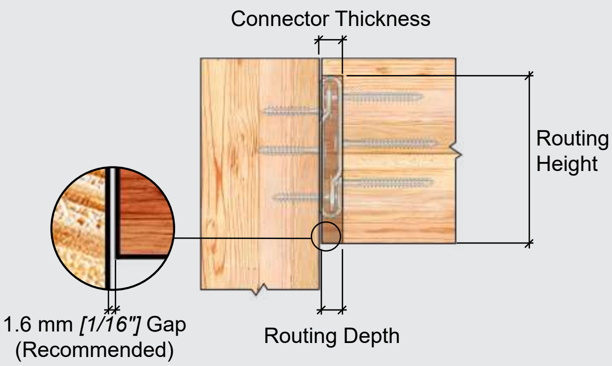
Housed in Primary Member (Girder)

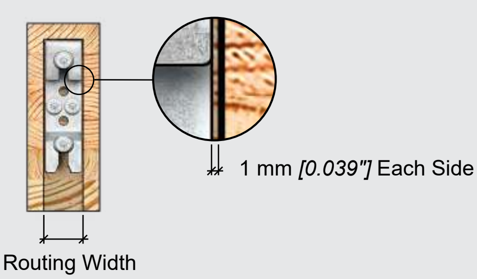


Housed in Secondary Member (Joist or Purlin)

Parallel Surface: The members must be parallel at the location of the connection to ensure proper hanger alignment and load transfer.

Gap Size: The gap size between wood members balances installation ease and fire performance, with larger gaps simplifying installation but reducing fire protection. A gap of 1.6 mm *[1/16 in.]* is recommended for proper installation to allow the secondary member to slide into place. The gap should be no more than 3.2 mm *[1/8 in.]* to address fire protection considerations. For more information, refer to Appendix A: Fire Protection (Page 115).





Routing Depth: The routing depth is the depth of the housing, d_h, noted in the Geometry Requirements and Routing Details sections. This depth takes into account the thickness of the connector and the gap between members (recommended 1.6 mm *[1/16 in.]* herein—larger gaps will reduce d_h accordingly).

Routing Width: It is recommended to allow a clearance of 1 mm *[0.039 in.]* on each side of the connector, resulting in a routing width of 42 mm *[1.654 in.]* for the GIGANT connector.

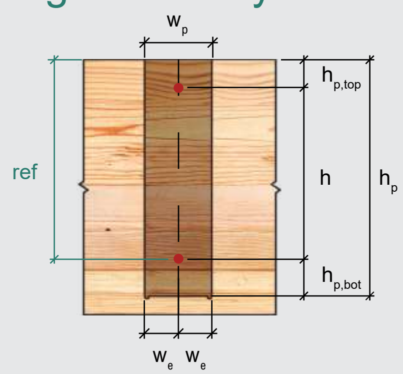
Routing Height: The routing height must be coordinated with the EOR. The height of the connector in the beam section has an impact on connector performance. Refer to Positioning Considerations for Reinforcement (Page 18) for further information.

Detailing - GIGANT Housing Dimensions

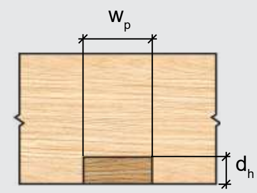
Routing in Primary Member

Fastener Orientation

- Structural Positioning Screws (Refer to Fastener Layout on Page 27)



Side View



Top View

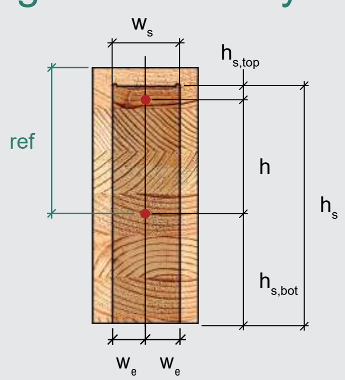
Table 1.8 - Routing Dimensions for GIGANT Housed in Primary Member

Model	Routing Dimensions, mm *[in.]*						
	h_p	$h_{p,top}$	h	$h_{p,bot}$	w_p	w_e	d_h
GIGANT 120 x 40	**140** *[5.512]*	**59** *[2.323]*	**57** *[2.244]*	**24** *[0.945]*	**42** *[1.654]*	**21** *[0.827]*	**25** *[0.981]*
GIGANT 150 x 40	**166** *[6.535]*	**53** *[2.087]*	**89** *[3.504]*	**24** *[0.945]*	**42** *[1.654]*	**21** *[0.827]*	**25** *[0.981]*
GIGANT 180 x 40	**202** *[7.953]*	**57** *[2.244]*	**121** *[4.764]*	**24** *[0.945]*	**42** *[1.654]*	**21** *[0.827]*	**25** *[0.981]*

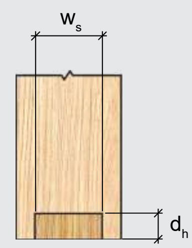
Notes:

1. Tabulated values are general guidelines for routing requirements. The EOR and fabricator are responsible for ensuring final routing dimensions account for all project-specific conditions.
2. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for h are fixed. Tabulated values for d_h are maximum allowable.
3. Tabulated values account for 1 mm *[0.039 in.]* on each side of and below the hanger. Larger installation tolerances will increase height and width values accordingly.
4. Tabulated values are based on a gap of 1.6 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
5. Refer to the Geometry Requirements tables for each respective beam hanger for additional information.
6. Tabulated values assume square corners. Manufacturers should adjust these values based on their specific routing bit sizes. In order to account for the round corner created by routing tools, 6 mm *[1/4 in.]* overrun is permitted at the inside corners as indicated on the image above.

Routing in Secondary Member



Side View



Top View

Table 1.9 - Routing Dimensions for GIGANT Housed in Secondary Member (Beam-End)

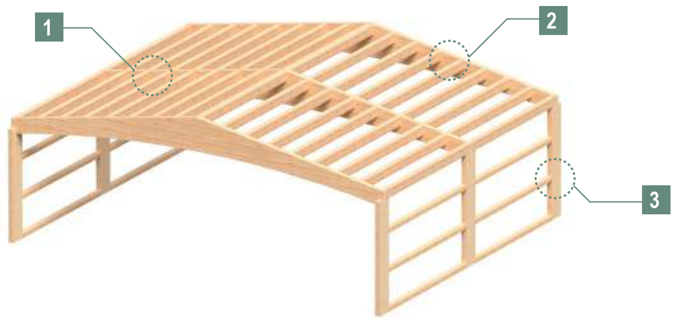
Model	Routing Dimensions, mm *[in.]*						
	h_s	$h_{s,top}$	h	$h_{s,bot}$	w_s	w_e	d_h
GIGANT 120 x 40	**140** *[5.512]*	**24** *[0.945]*	**57** *[2.244]*	**59** *[2.323]*	**42** *[1.654]*	**21** *[0.827]*	**25** *[0.981]*
GIGANT 150 x 40	**166** *[6.535]*	**24** *[0.945]*	**89** *[3.504]*	**53** *[2.087]*	**42** *[1.654]*	**21** *[0.827]*	**25** *[0.981]*
GIGANT 180 x 40	**202** *[7.953]*	**24** *[0.945]*	**121** *[4.764]*	**57** *[2.244]*	**42** *[1.654]*	**21** *[0.827]*	**25** *[0.981]*

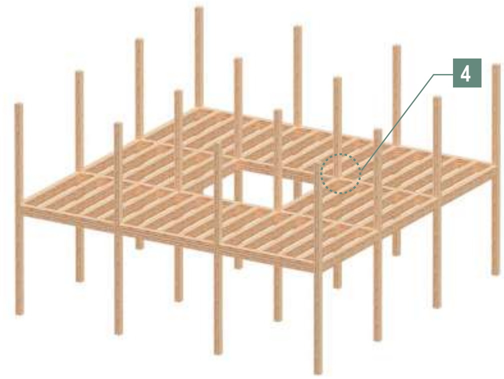
Notes:

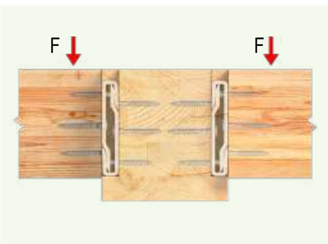
1. Tabulated values are general guidelines for routing requirements. The EOR and fabricator are responsible for ensuring final routing dimensions account for all project-specific conditions.
2. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for h are fixed. Tabulated values for d_h are maximum allowable.
3. Tabulated values account for 1 mm *[0.039 in.]* on each side of and above the hanger. Larger installation tolerances will increase height and width values accordingly.
4. Tabulated values are based on a gap of 1.6 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
5. Refer to the Geometry Requirements tables for each respective beam hanger for additional information.
6. Tabulated values assume square corners. Manufacturers should adjust these values based on their specific routing bit sizes. In order to account for the round corner created by routing tools, 6 mm *[1/4 in.]* overrun is permitted at the inside corners as indicated on the image above.

Installation - GIGANT Configurations

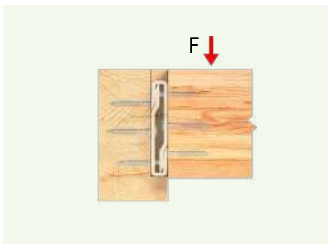
Possible Installation Configurations for GIGANT





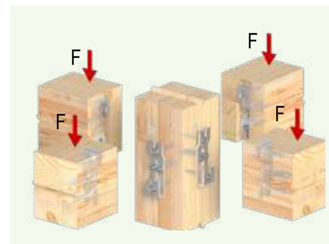


1 Multiple Beams-to-Girder



2 Beam-to-Girder

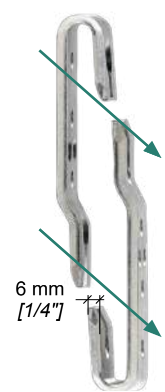
3 Beam-to-Column



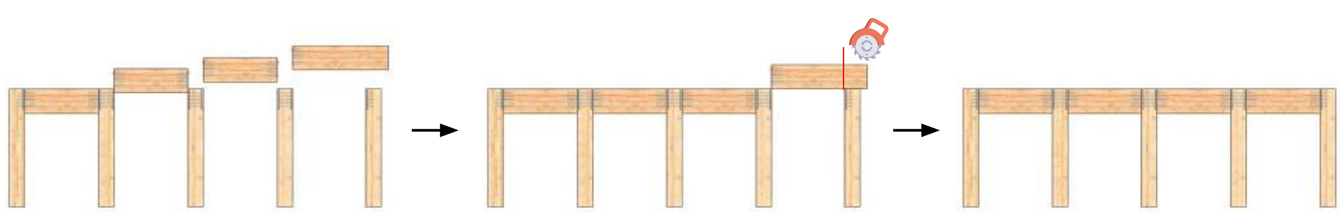
4 Multiple Beams-to-Column

Beam Length Tolerances and Sequencing

Installation sequencing is important, especially for buildings with multiple bays of post-and-beam framing. It is recommended to install the beams starting from one end of the building and progress along the column line. The last beam can be produced slightly over length and cut to size on-site to help address any dimensional tolerance challenges. The GIGANT features tapered openings that facilitate installation by guiding the secondary beam into place. Beams positioned up to 6 mm *[1/4 in.]* to either side or slightly out from the primary member will self-center as they slide down.



GIGANT Installation Tolerance



GIGANT | Design | Detailing | **Installation** | RICON S VS | MEGANT | APEX

Installation - GIGANT General Requirements

Tool Requirements

Tools - Use the Correct Bit

Fasteners should only be driven using appropriately sized star bits. This ensures good centering and positioning with optimal torque transmission.

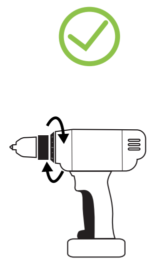

Star Bit

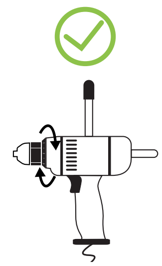
Tools - Use the Correct Drill

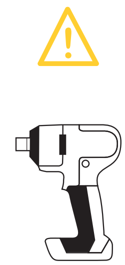
Use low-RPM, high-torque drills equipped with a feather (variable speed) trigger to install fasteners. Avoid excessive acceleration and deceleration during the drive-in process. Do not overtorque fasteners. Although impact guns are not expressly prohibited, their use is discouraged - particularly for beam hanger systems - due to an increased risk of overtorquing. Use the appropriate drill chuck size according to the fastener.

Table 1.10 - Recommended Torque, Drill Bits, and Power Drill

Nominal Fastener Diameter [D]		HSS Drill Bit Size		Power Drill Voltage	Allowable Insertion Torque	
mm	[in.]	mm	[in.]	V	N · m	[lb. ft.]
10	*[3/8]*	6	*[1/4]*	60	30.0	*[22.13]*


Cordless Clutched Drill

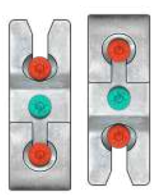

Double Handle Drill

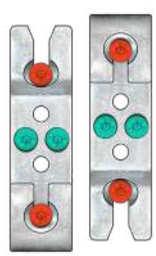

Impact Drill

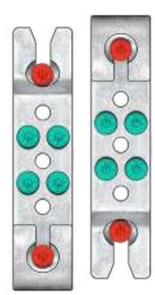
Fastener Layout

Fastener Orientation

- Structural Positioning Screws
- Horizontal Screws


GIGANT 120 x 40


GIGANT 150 x 40


GIGANT 180 x 40

Installation - GIGANT Guidelines

General Installation Steps

Estimated Installation Time

The estimated time for a single person to install a complete GIGANT product is shown in Table 1.11. The process includes the following steps:

1. Layout (~25%–30%)
2. Positioning (~40%– 50%)
3. Screw Installation (~20%– 30%)
4. Optional Measures (not included in the time installation % breakdown)

Table 1.11 - GIGANT Estimated Installation Times

Model	Average Installation Time [min.]
GIGANT 120 x 40	4
GIGANT 150 x 40	5
GIGANT 180 x 40	5

The estimated installation time can be improved upon with efficient fabrication and site practices such as:

1. Drilling pilot holes for the structural positioning screws at the time of fabrication
2. Utilizing templates to drill pilot holes for structural screws
3. Optimizing beam positioning to reduce worker fatigue

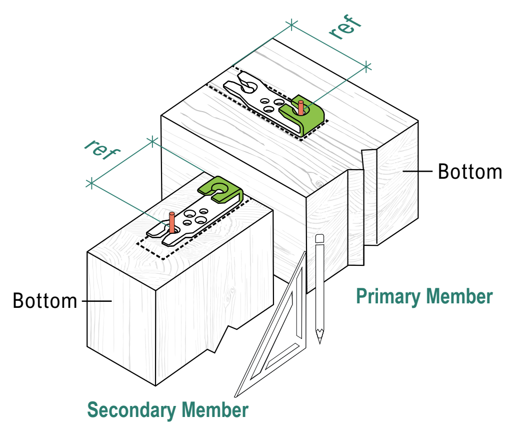
Step-by-Step Installation Guidelines

1.1 Layout - Reference Points

Begin by laying out the installation locations in the primary and secondary members using a pencil and square.

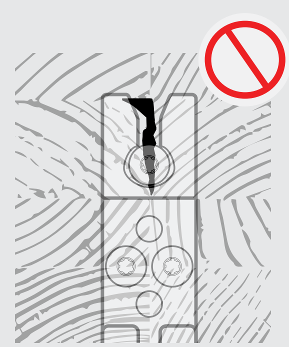
The connector's point of reference is the top of the member. The **lower structural positioning screw** should be measured from that point of reference.

The **hook** should be at the **bottom** on the primary member and on the **top** on the secondary member. The structural fasteners will act as collar bolts when installed.



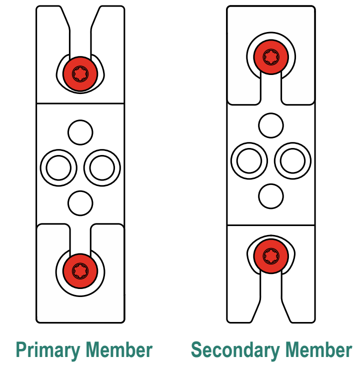
1.2 Layout - Split Lamination Considerations

It is recommended that gaps in split lamination glulam beams be tight at the time of manufacturing. Gaps between adjacent plies may occur due to wood shrinkage. Such gaps are not compatible with GIGANT installation.



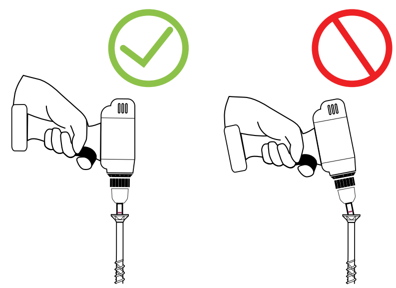
2.1 Positioning - Structural Positioning Screw Installation

Structural positioning screws ensure accurate placement of the GIGANT connector. Install one structural positioning screw into the center hole at the top of the plate for the primary member and into the bottom of the plate for the secondary member. Check to ensure alignment is maintained, and then install another structural positioning screw into the center hole at the opposite end of the plate. Ensure the screw is not overdriven so the connector does not bend.



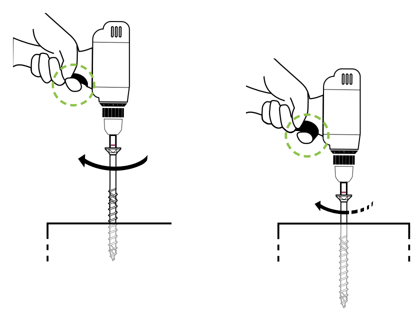
3.1 Screw Installation - Align Drill Bit Axis

Align the drive bit axis parallel to the fastener axis during installation to allow proper torque transmission and to avoid stripping.



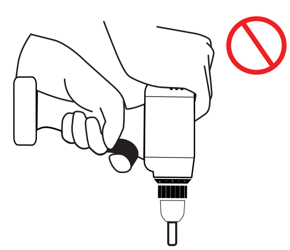
3.2 Screw Installation - Decrease RPM

To avoid overtorquing the screw, decrease the rotation speed about 12.7 mm *[1/2. in.]* away from the final installed position. This is crucial to prevent wood crushing due to overtorquing, which can impact beam hanger tolerances, potentially impeding overall connection assembly. This is especially important when using an impact drill.



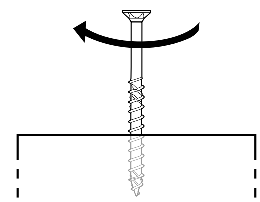
3.3 Screw Installation - Drill Pressure

Do not apply excessive pressure on the drill while driving the fastener to prevent fastener buckling or deviation during installation. Only apply the required force or use the recommended holder case to eliminate cam-out effects.



3.4 Screw Installation - One-Step Process

To avoid increased torque peaks caused by stopping and restarting the drive-in process, install the screw in one run until the head is lightly seated against the side member.

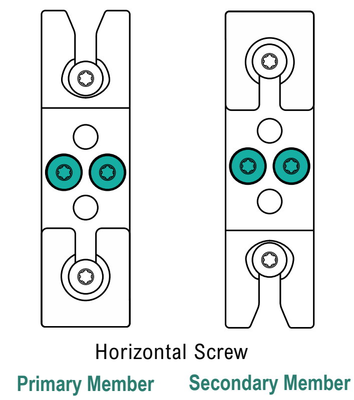


3.5 Screw Installation - Structural Screws

Install properly sized GIGANT screws in all holes.

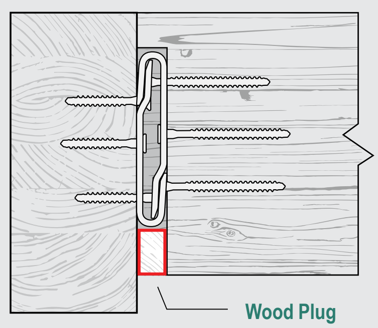
For the primary member, use 10 x 80 mm *[3/8 x 3-1/8 in.]* GIGANT SK screws.

For the secondary member (in end-grain), use 10 x 120 mm *[3/8 x 4-3/4 in.]* GIGANT SK screws.



4.1 Optional Measures - Wood Plug

Where connectors are housed in the secondary beam, it is recommended to seal the void in the routing below the connector for aesthetics and fire protection. A wood plug may be used, and installation instructions shall be provided by the EOR.



Chemeketa Agricultural Complex

Salem, Oregon

Courtesy of Timberlab

RICON S VS

Pre-Engineered Connection System

The RICON S VS connector is an ICC-certified, pre-engineered, beam-to-column and beam-to-beam connector manufactured from mild steel with a welded collar bolt. It consists of two identical parts and is suitable for use in all timber and hybrid-timber construction applications. The RICON S VS has been extensively tested for the North American market.

AVAILABLE IN MULTIPLE SIZES

TESTED IN NORTH AMERICA

UP TO 129 kN LSD

Pre-Installable

Pre-installable in a controlled shop environment for a faster on-site installation

Fire-Resistance-Rated

Fire-resistance rating up to 2 hours per CSA O86:24

Interstory Drift Performance-Tested

Drift ratio exceeding 4% in quasi-static rotational testing under full LSD loading

Hybrid Construction Compatible

Can be installed in wood-to-wood or wood-to-steel beam or embed plate

Fully Concealable

Easy to conceal connections, enhancing architectural wood features

Drop-in Installation

A fast, streamlined & repeatable installation process that significantly enhances efficiency

Design

- Wood-to-Wood Design Values
- Wood-to-Steel Design Values
- Seismic Performance
- Hanger Placement Considerations
- Clip Lock System
- Sloped and Skewed Design

Detailing

- RICON S VS 60 Series Geometry Requirements
- RICON S VS 80 Series Geometry Requirements
- RICON S VS XL Series Geometry Requirements
- Additional Detailing Considerations
- Housing Detailing and Dimensions

Installation

- Installation Configurations
- Tool Requirements
- Fastener Layout
- Step-by-Step Guidelines

STANDARD AND CERTIFICATIONS

CSA O86:24

ASTM D7147

ES ICC EVALUATION SERVICE®

ICC-ESR-4300

ISO 50001 Energy Management System

ETA

ETA-10/0189 2019

RICON S VS Overview

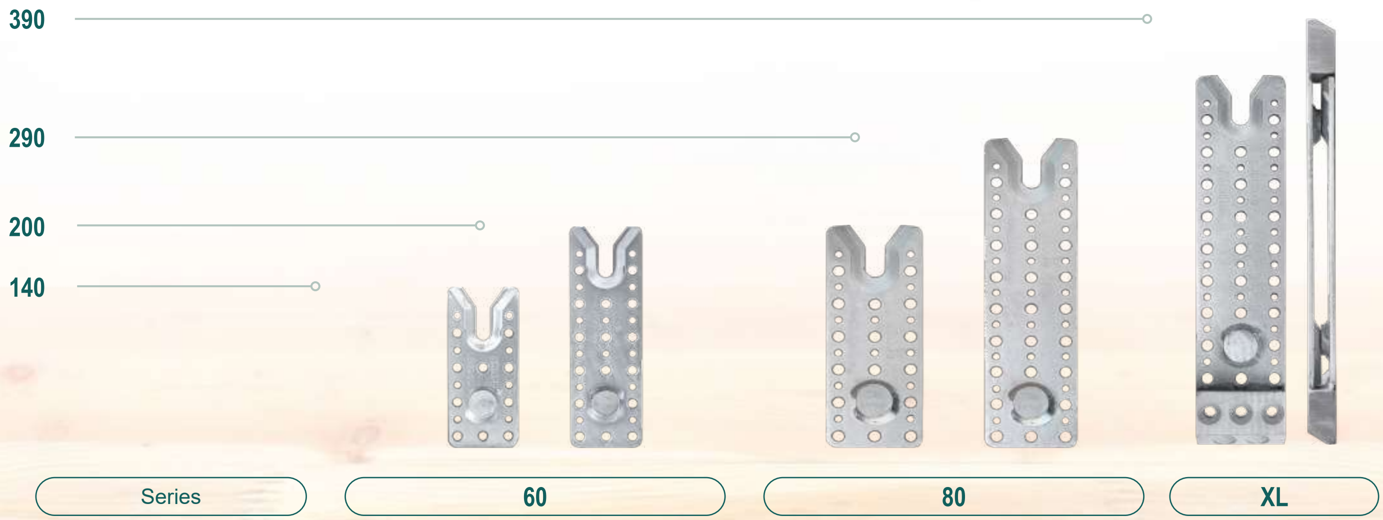


Table 2.1 - RICON S VS Hardware Package Installation Overview

RICON S VS Series	RICON S VS Model	Plate Qty.	Fasteners: Primary Member Type	Fasteners: Primary Member Qty.	Fasteners: Secondary Member Type	Fasteners: Secondary Member Qty.	Installation Time min.
60	RICON S VS 140 x 60	2	MTC-FTC 8 x 80 mm	10	MTC-FTC 8 x 160 mm	10	**9**
	RICON S VS 200 x 60	2	MTC-FTC 8 x 80 mm	16	MTC-FTC 8 x 160 mm	16	**13**
80	RICON S VS 200 x 80	2	MTC-FTC 10 x 100 mm	16	MTC-FTC 10 x 200 mm	16	**13**
	RICON S VS 290 x 80	2	MTC-FTC 10 x 100 mm	20	MTC-FTC 10 x 200 mm	20	**14**
XL	RICON S VS XL 390 x 80	2	MTC-FTC 10 x 100 mm	28	MTC-FTC 10 x 200 mm	30	**20**
			MTC-FTC 10 x 200 mm	2			

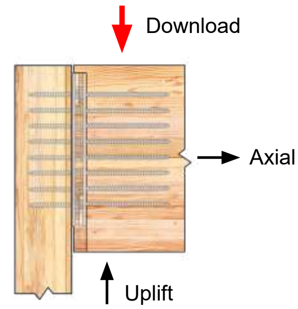
One Installer
With Pilot Holes

Product Kit Details

Notes:

1. Subsequent tabulated capacities in this chapter assume connectors are installed with MTC-FTC (see Table 1.1 on Page 13) fasteners specified in this table and in accordance with CCMC 13677-R.
2. The estimated installation time is based on a time study and includes steps for layout and positioning, drilling a 25 mm *[1 in.]* deep pilot hole for each fastener, and structural screw installation for both plates. Refer to the General Installation Steps (Page 56) for more information.

Design - RICON S VS Technical Information



RICON S VS Load Applications

Wood-to-Wood Design Values

Table 2.2 - Factored Resistances for RICON S VS 60 Series in Wood-to-Wood Connections

RICON S VS		Minimum Secondary Beam Section Dimensions [mm]				Relative Density [G]	Factored Resistance [kN]			
Model	Configuration	No FRR	45-min FRR	1-hr FRR	2-hr FRR		Download	Axial	Download w/ Clip Lock	Uplift w/ Clip Lock
RICON S VS 140 x 60	Single	92 x 186	133 x 226	152 x 242	230 x 310	≥ 0.42	22	14	16	7
						≥ 0.44	23	15	16	
						≥ 0.46	23	16	16	
						≥ 0.49	24	19	17	
	Double	160 x 186	201 x 226	220 x 242	298 x 310	≥ 0.42	38	24	26	7
						≥ 0.44	39	25	27	
						≥ 0.46	40	28	28	
						≥ 0.49	41	32	29	
RICON S VS 200 x 60	Single	92 x 246	133 x 286	152 x 302	230 x 370	≥ 0.42	36	14	29	7
						≥ 0.44	36	15	30	
						≥ 0.46	37	16	30	
						≥ 0.49	38	19	31	
	Double	160 x 246	201 x 286	220 x 302	298 x 370	≥ 0.42	60	24	49	7
						≥ 0.44	62	25	50	
						≥ 0.46	63	28	51	
						≥ 0.49	65	32	53	

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Tabulated factored resistances are applicable for wood-to-wood connections only. Screw installation must follow the patterns presented in the Installation section.
3. Highlighted factored resistances indicate values that have decreased by more than 5% from the previous design guide due to the updated requirements of CSA O86:24. No change to product geometry or materials.
4. Minimum dimensions for secondary beams with no FRR are based on minimum end and edge distances.
5. The listed connector resistances may be limited by the splitting resistance perpendicular to grain and the effective shear resistance of the timber members. Refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124) for more information and available reinforcement strategies. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
6. The Clip Lock system requires the removal of structural fasteners for proper installation. Therefore, the reduced download values shown must be used in conjunction with the Clip Lock system. For more information on the Clip Lock system, refer to Page 38.
7. Uplift values contain all applicable adjustment factors for load duration and shall not be increased for short term loads such as wind or seismic.
8. Member sizes for other FRRs are permitted to be interpolated between the listed member sizes up to a maximum 2-hr FRR.
9. Alternative minimum beam sizes for members with an ASTM E1966 compliant fire-resistant joint can be found in Appendix A: Fire Protection (Page 115).
10. Factored resistances provided do not account for combined loading in multiple directions. Combined shear and axial loading must be verified per eq. 1 (Page 13).
11. Double-configuration installations require glued bond between plies; gaps and voids are not permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.

Table 2.3 - Factored Resistances for RICON S VS 80 Series in Wood-to-Wood Connections

RICON S VS		Minimum Secondary Beam Section Dimensions [mm]				Relative Density [G]	Factored Resistance [kN]			
Model	Configuration	No FRR	45-min FRR	1-hr FRR	2-hr FRR		Download	Axial	Download w/ Clip Lock	Uplift w/ Clip Lock
RICON S VS 200 x 80	Single	120 x 260	153 x 300	172 x 316	250 x 384	≥ 0.42	55	22	44	13
						≥ 0.44	56	23	45	
						≥ 0.46	57	25	46	
						≥ 0.49	59	29	48	
	Double	210 x 260	243 x 300	262 x 316	340 x 384	≥ 0.42	93	37	75	13
						≥ 0.44	95	39	77	
						≥ 0.46	97	43	79	
						≥ 0.49	100	49	81	
RICON S VS 290 x 80	Single	120 x 320	153 x 360	172 x 376	250 x 444	≥ 0.42	67	22	58	13
						≥ 0.44	67	23	59	
						≥ 0.46	67	25	61	
						≥ 0.49	67	29	63	
	Double	210 x 320	243 x 360	262 x 376	340 x 444	≥ 0.42	114	37	99	13
						≥ 0.44	114	39	101	
						≥ 0.46	114	43	103	
						≥ 0.49	114	49	107	
RICON S VS XL 390 x 80	Single	120 x 430	153 x 474	172 x 491	250 x 559	≥ 0.42	115	22	105	13
						≥ 0.44	118	23	108	
						≥ 0.46	122	25	112	
						≥ 0.49	129	29	118	
	Double	210 x 430	243 x 474	262 x 491	340 x 559	≥ 0.42	195	37	178	13
						≥ 0.44	201	39	183	
						≥ 0.46	208	43	190	
						≥ 0.49	219	49	200	

Notes:

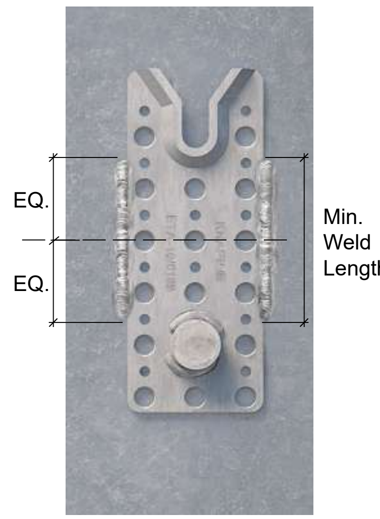
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Tabulated factored resistances are applicable for wood-to-wood connections only. Screw installation must follow the patterns presented in the Installation section.
3. Highlighted factored resistances indicate values that have decreased by more than 5% from the previous design guide due to the updated requirements of CSA O86:24. No change to product geometry or materials.
4. Minimum dimensions for secondary beams with no FRR are based on minimum end and edge distances.
5. The listed connector resistances may be limited by the splitting resistance perpendicular to grain and the effective shear resistance of the timber members. Refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124) for more information and available reinforcement strategies. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
6. The Clip Lock system requires the removal of structural fasteners for proper installation. Therefore, the reduced download values shown must be used in conjunction with the Clip Lock system. For more information on the Clip Lock system, refer to Page 38.
7. Uplift values contain all applicable adjustment factors for load duration and shall not be increased for short term loads such as wind or seismic.
8. Member sizes for other FRRs are permitted to be interpolated between the listed member sizes up to a maximum 2-hr FRR.
9. Alternative minimum beam sizes for members with an ASTM E1966 compliant fire-resistant joint can be found in Appendix A: Fire Protection (Page 115).
10. Factored resistances provided do not account for combined loading in multiple directions. Combined shear and axial loading must be verified per eq. 1 (Page 13).
11. Double-configuration installations require glued bond between plies; gaps and voids are not permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.

Wood-to-Steel Design Values

Table 2.4 - Factored Resistances for RICON S VS in Wood-to-Steel Connections

RICON S VS		Primary Member – Weld Requirements		Secondary Member	
Model	**Configuration**	**Min. Weld Size [mm]**	**Min. Weld Length [mm] e/s**	**Relative Density [G]**	**Factored Resistance [kN]**
RICON S VS 140 x 60	**Single**	5	70	≥ 0.42	**22**
				≥ 0.44	**23**
				≥ 0.46	**23**
				≥ 0.49	**24**
RICON S VS 200 x 60	**Single**		100	≥ 0.42	**36**
				≥ 0.44	**36**
				≥ 0.46	**37**
				≥ 0.49	**38**
RICON S VS 200 x 80	**Single**		100	≥ 0.42	**55**
				≥ 0.44	**56**
				≥ 0.46	**57**
				≥ 0.49	**59**
RICON S VS 290 x 80	**Single**		140	≥ 0.42	**67**
				≥ 0.44	**67**
				≥ 0.46	**67**
				≥ 0.49	**67**
RICON S VS XL 390 x 80	**Single**		190	≥ 0.42	**115**
				≥ 0.44	**118**
				≥ 0.46	**122**
				≥ 0.49	**129**

Steel-to-Wood Connection



Welded RICON S VS Connection

Notes:

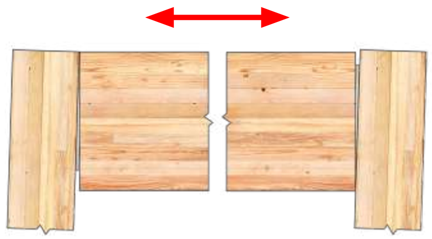
1. Tabulated weld values are minimum requirements based on X_u = 430 MPa.The minimum weld length shown is the minimum required on each side of the hanger. Additional weld size or length may be required dependent on loading conditions. Welded connections must be designed by a licensed professional engineer.
2. Primary member steel must have a thickness of at least 6 mm *[1/4 in.]*.
3. Structural steel and weld design and detailing shall be in accordance with CSA S16. The fabricator must be certified to a minimum of Division 2 of CSA W47.1.
4. Welds must be symmetrical on each side of the hanger and be centered within the height of the hanger.
5. Welded connections are not compatible with the Clip Lock system and are therefore not recommended for uplift conditions.
6. The RICON S VS can be welded directly to structural steel elements such as steel columns and steel embed plates in concrete walls.
7. The galvanized coating must be ground off the areas to be welded.
9. Refer to Tables 2.2 and 2.3 for minimum secondary beam requirements.

RICON S VS Seismic Performance

MTC has conducted extensive quasi-static, interstory, and component testing on the RICON S VS connector. The results have demonstrated its robust performance under drift and axial demands.

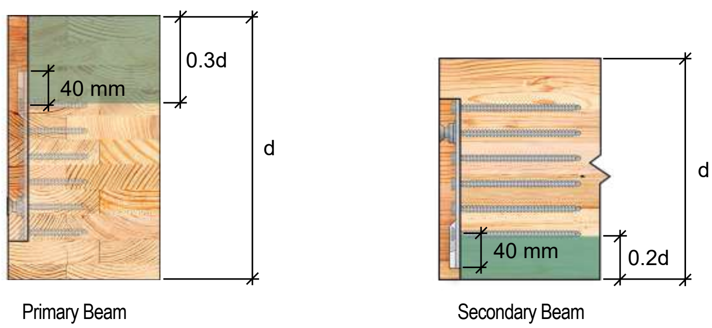
- The RICON S VS can accommodate drifts of over 4% while loaded, which satisfies the drift limits specified in NBCC 2024 Clause 4.1.8.13.
- The RICON S VS connector has significant axial capacity while fully loaded to ensure the structural integrity of the connection is maintained during a wind or seismic event.

Contact MTC Technical Support for additional details for accommodating seismic loads in your design.

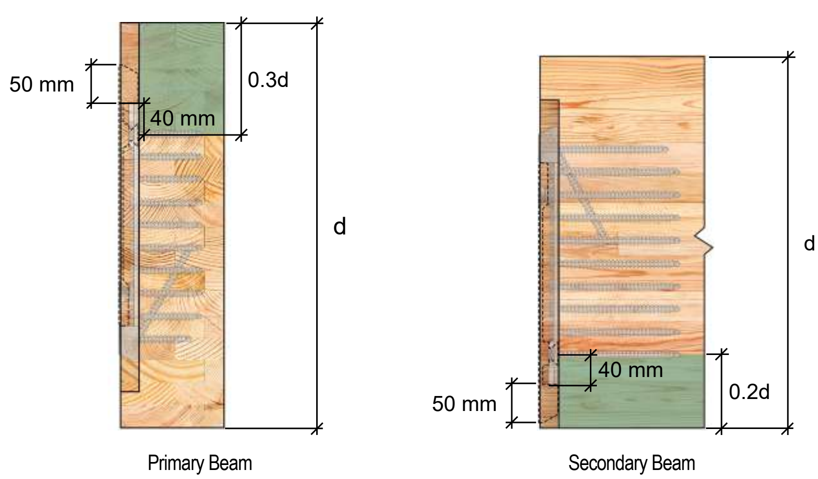


Positioning Considerations for Reinforcement

The hanger placement relative to the height of the beam can impact the need for reinforcement. Connectors in the primary beam should have the tip of the uppermost fastener in the top 30% of the member depth (0.3d), as shown in the bottom left figure. Connectors in the secondary beam should have the tip of the lowermost fastener in the bottom 20% (0.2d), as shown in the bottom right figure. Outside of these zones, the primary and secondary beams should be checked for splitting to determine if reinforcement is required. Note that these requirements do not apply to columns. For further information, refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124).



RICON S VS 60 & 80 Series

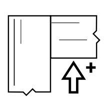


RICON S VS XL

Design - RICON S VS Clip Lock System

Clip Lock Brace System for Uplift

Clip Lock brace systems are additional components available for the RICON S VS beam hanger system. The Clip Lock is a special thin steel plate designed to fit into and lock the RICON S VS beam hanger plates together, providing a resistance to uplift forces. The Clip Lock is installed with the hanger on the primary beam or column, and as the secondary beam is lowered into place, the Clip Lock will automatically engage the screw heads on the opposite plate, providing resistance to uplift loads. These components are installed using the same screws used to fasten the beam hanger plates into the wood member. A new screw pattern applies to the primary member to allow the Clip Lock to be installed properly, which results in a reduced download capacity. Screws cannot be installed at the prohibited screw locations as they will deform the Clip Lock and prevent it from working properly.


Uplift Force Resistance

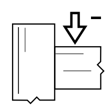

Reduced Downward Force

Table 2.5 - Screw Patterns with Clip Lock Brace System (in Primary Member)

Clip Lock Mounting Screw Locations

Prohibited Screw Locations

	RICON S VS 140 x 60	RICON S VS 200 x 60	RICON S VS 200 x 80	RICON S VS 290 x 80	RICON S VS XL 390 x 80
MTC-FTC Screw Qty.	7	13	13	17	27

Note:

1. Secondary member is assumed to have fasteners installed as noted in Table 2.1.

Design - RICON S VS Sloped and Skewed Configurations

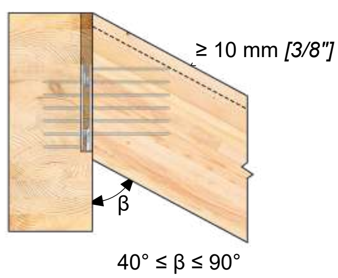
RICON S VS connectors can be installed in sloped or skewed configurations. These configurations may require different fastener lengths for the connector plate installed into the secondary member to prevent the fasteners from protruding. The connector plate installed into the primary member (e.g., girder beam or a column) has fasteners driven in the side grain. Because this fiber orientation promotes higher withdrawal capacity, the fasteners may be shorter and still sustain the same load. In a typical installation configuration, the connector plate installed into the secondary member has fasteners driven into the end grain. Longer fully threaded screws are used in the secondary member in order to compensate for the reduced resistance that is characteristic of this orientation of the wood fiber.

Sloped Configuration: Rafter-to-Ridge Beam Connection

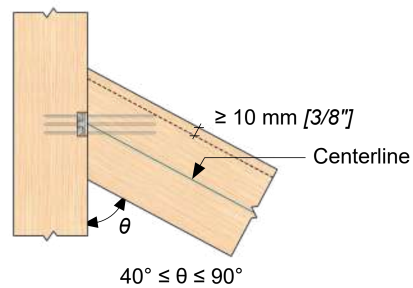
Skewed Configuration: Joist-to-Beam Connection

In sloped and skewed connections, the connector plate installed into the secondary member has fasteners driven into the grain at an angle relative to the connection angle. The factored resistance of the connection increases due to the improved angle-to-grain relationship, and thus respective design values may be achieved with shorter screw lengths in the secondary member.

Sloped and Skewed Connection Requirements



Sloped Configuration: Rafter-to-Ridge Beam Connection (Side View)



Skewed Configuration: Joist-to-Beam or Column Connection (Top View)

In sloped and skewed connections, the connector placement must adhere to the connection geometry requirements in order to avoid reinforcement. Where connection geometry imposes restrictions, fastener length may be reduced, and factored resistances shall be adjusted with the appropriate reduction factor, R_s. For skewed connections (40° ≤ θ ≤ 90°), the connector must be aligned with the centerline of the joist; otherwise, eccentricities and resulting moments must be accounted for by the Engineer of Record.

Table 2.19 - Reduction Factor, R_s, for RICON S VS 60 Series

Fastener Length [mm]	β or θ = 90°	β or θ = 80°	β or θ = 70°	β or θ = 60°	β or θ = 50°	β or θ = 40°
160	1.0	1.0	1.0	1.0	1.0	1.0
140	0.9	1.0	1.0	1.0	1.0	1.0
120	0.8	0.9	0.9	1.0	1.0	1.0

Note: Refer to the notes below Table 2.20.

Table 2.20 - Reduction Factor, R_s, for RICON S VS 80 Series and RICON S VS XL

Fastener Length [mm]	β or θ = 90°	β or θ = 80°	β or θ = 70°	β or θ = 60°	β or θ = 50°	β or θ = 40°
200	1.0	1.0	1.0	1.0	1.0	1.0
180	0.9	1.0	1.0	1.0	1.0	1.0
160	0.8	0.9	0.9	1.0	1.0	1.0
140	0.7	0.8	0.8	0.9	0.9	1.0

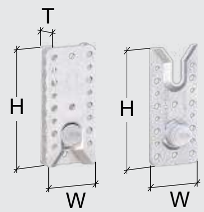
1. Reduced fastener lengths only apply for installation in the secondary member.
2. Factored resistance of the connector must be adjusted with the reduction factor provided in the table.
3. Reduction factor values are derived from ETA-10/0189.

Detailing - RICON S VS 60 Series Geometry Requirements

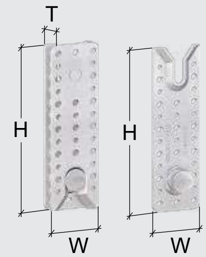
RICON S VS 60 Series - Connector Geometry

Table 2.6 - RICON S VS 60 Geometry

Connector Geometry	Model	
	RICON S VS 140 x 60	RICON S VS 200 x 60
	[mm]	
H	140	200
W	60	60
T	25	25



RICON S VS
140 x 60



RICON S VS
200 x 60

Note:

1. Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.

Secondary Member Geometry Requirements

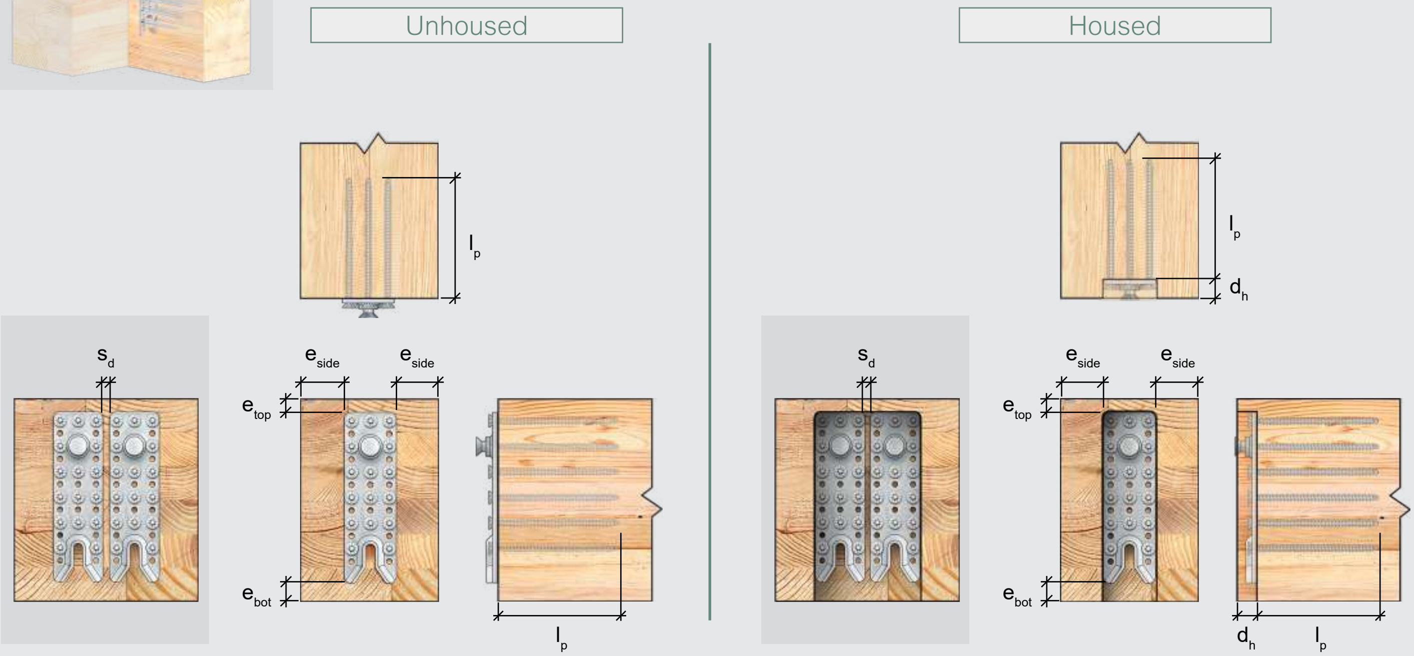


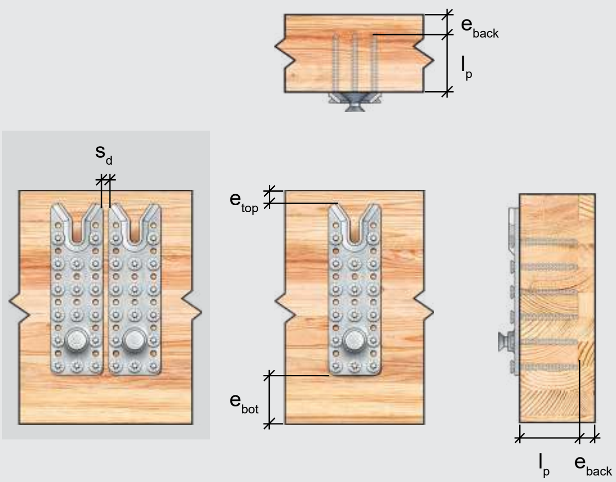
Table 2.7 - RICON S VS 60 Geometry Requirements for Secondary Member

RICON S VS 60		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}		
RICON S VS 140 x 60	Single	152	46	16	0	36	40	46	56	85	124	23	N/A
	Double	152	46	16	0	36	40	46	56	85	124	23	8
RICON S VS 200 x 60	Single	152	46	16	0	36	40	46	56	85	124	23	N/A
	Double	152	46	16	0	36	40	46	56	85	124	23	8

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the member.

Primary Member Geometry Requirements - Beam/Girder



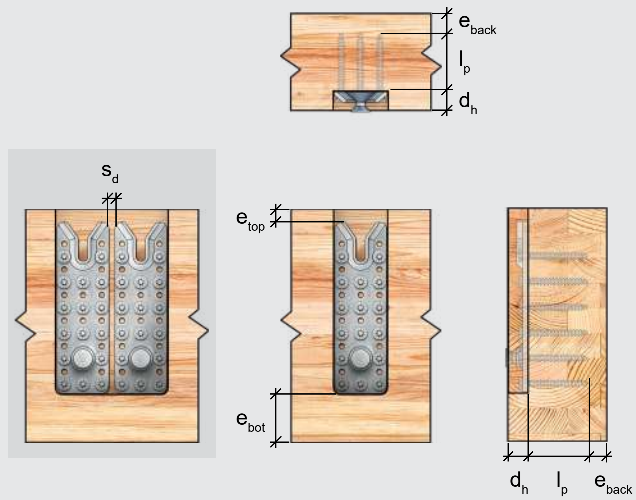


Table 2.8 - RICON S VS 60 Geometry Requirements for Primary Member (Beam/Girder)

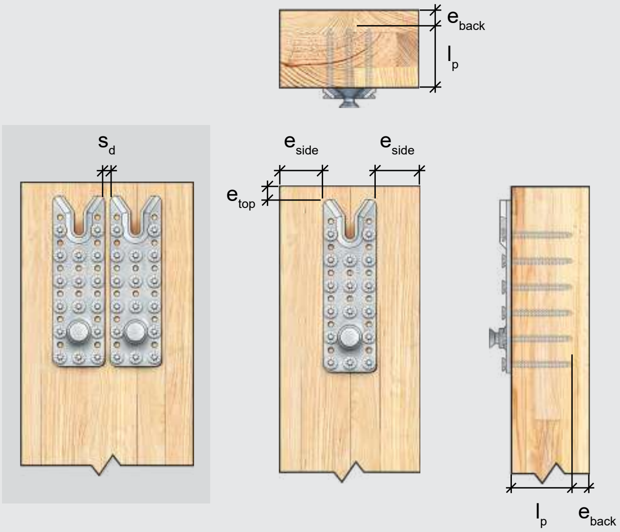
RICON S VS 60		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}		
RICON S VS 140 x 60	**Single**	72	46	46	10	46	36	56	46	124	85	23	N/A
	Double	72	46	46	10	46	36	56	46	124	85	23	8
RICON S VS 200 x 60	**Single**	72	46	46	10	46	36	56	46	124	85	23	N/A
	Double	72	46	46	10	46	36	56	46	124	85	23	8

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Primary Member Geometry Requirements - Column

Unhoused



Housed

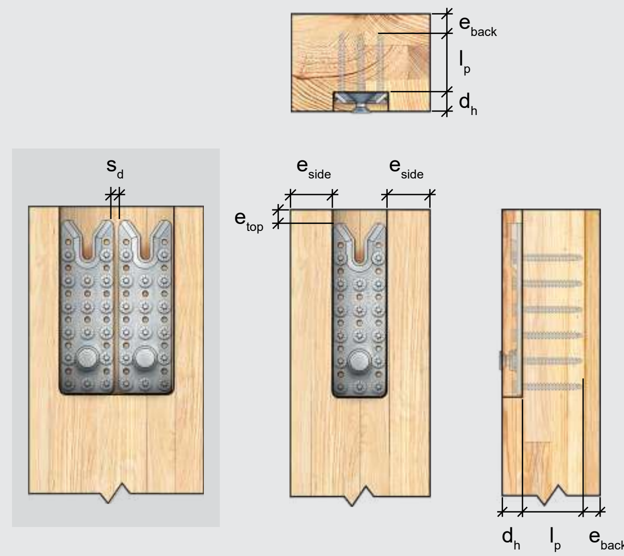


Table 2.9 - RICON S VS 60 Geometry Requirements for Primary Member (Column)

RICON S VS 60		Geometry Requirements [in.]											
				No FRR		45-min FRR		1-hr FRR		2-hr FRR			
Model	Configuration	l_p	e_{top}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	d_h	s_d
RICON S VS 140 x 60	Single	72	46	16	10	36	36	46	46	85	85	23	N/A
	Double	72	46	16	10	36	36	46	46	85	85	23	8
RICON S VS 200 x 60	Single	72	46	16	10	36	36	46	46	85	85	23	N/A
	Double	72	46	16	10	36	36	46	46	85	85	23	8

Notes:

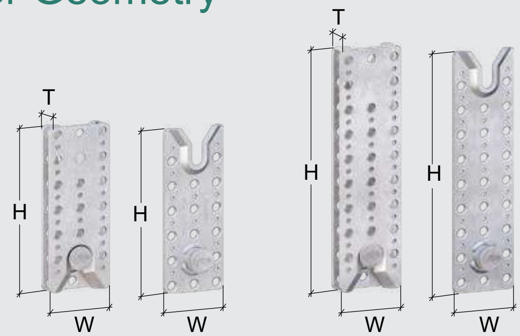
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for columns with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Detailing - RICON S VS 80 Series Geometry Requirements

RICON S VS 80 Series - Connector Geometry

Table 2.10 - RICON S VS 80 Geometry

Connector Geometry	Model	
	RICON S VS 200 x 80	**RICON S VS 290 x 80**
	[mm]	
H	200	290
W	80	80
T	25	25



RICON S VS 200 x 80

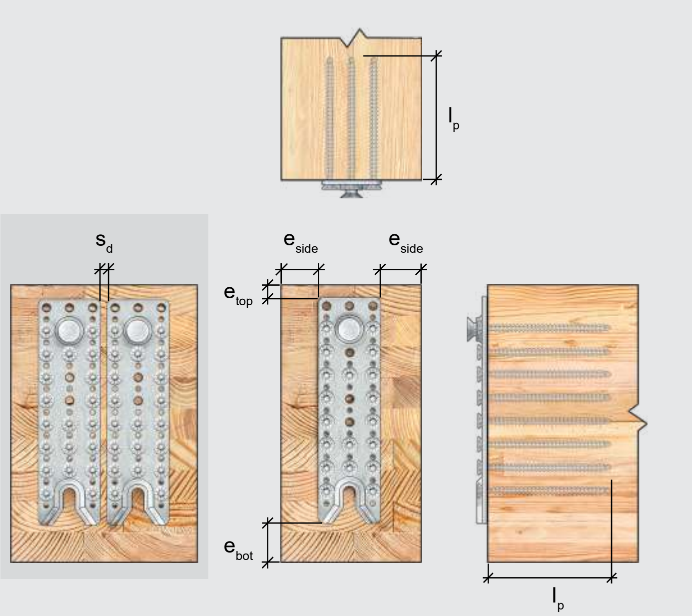
RICON S VS 290 x 80

Note:

1. Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.

Secondary Member Geometry Requirements

Unhoused



Housed

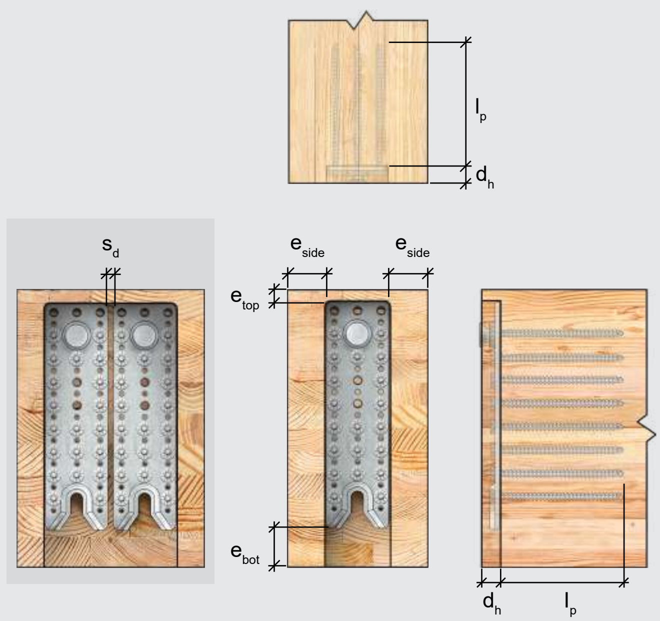


Table 2.11 - RICON S VS 80 Geometry Requirements for Secondary Member

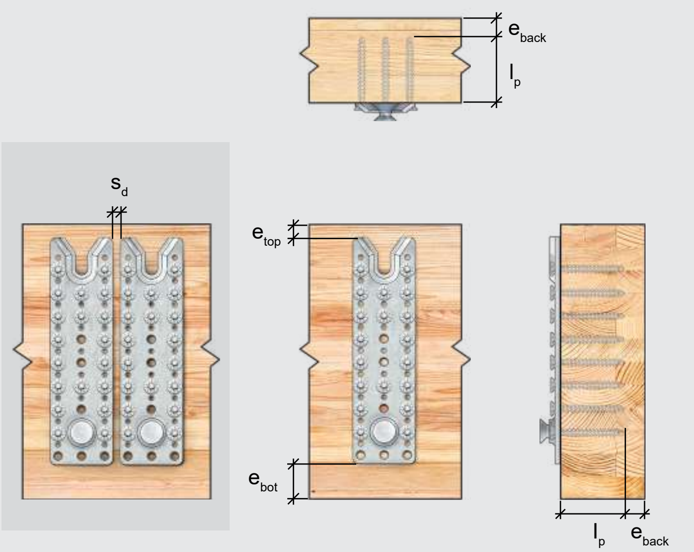
RICON S VS 80		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	**Configuration**			e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}		
RICON S VS 200 x 80	**Single**	192	60	20	0	36	40	46	56	85	124	23	N/A
	Double	192	60	20	0	36	40	46	56	85	124	23	10
RICON S VS 290 x 80	**Single**	192	30	20	0	36	40	46	56	85	124	23	N/A
	Double	192	30	20	0	36	40	46	56	85	124	23	10

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the member.

Primary Member Geometry Requirements - Beam/Girder

Unhoused



Housed

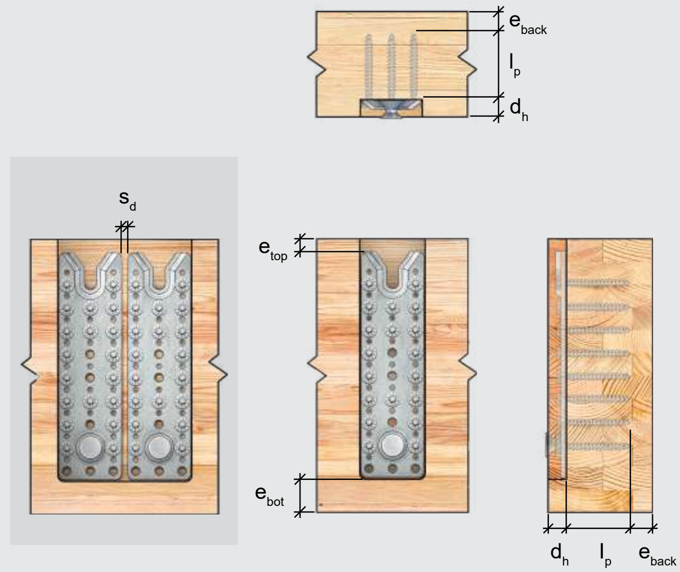


Table 2.12 - RICON S VS 80 Geometry Requirements for Primary Member (Beam/Girder)

RICON S VS 80		Geometry Requirements [mm]											
				No FRR		45-min FRR		1-hr FRR		2-hr FRR			
Model	Configuration	l_p	e_{top}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	d_h	s_d
RICON S VS 200 x 80	Single	92	60	60	10	60	36	60	46	124	85	23	N/A
	Double	92	60	60	10	60	36	60	46	124	85	23	10
RICON S VS 290 x 80	Single	92	30	30	10	40	36	56	46	124	85	23	N/A
	Double	92	30	30	10	40	36	56	46	124	85	23	10

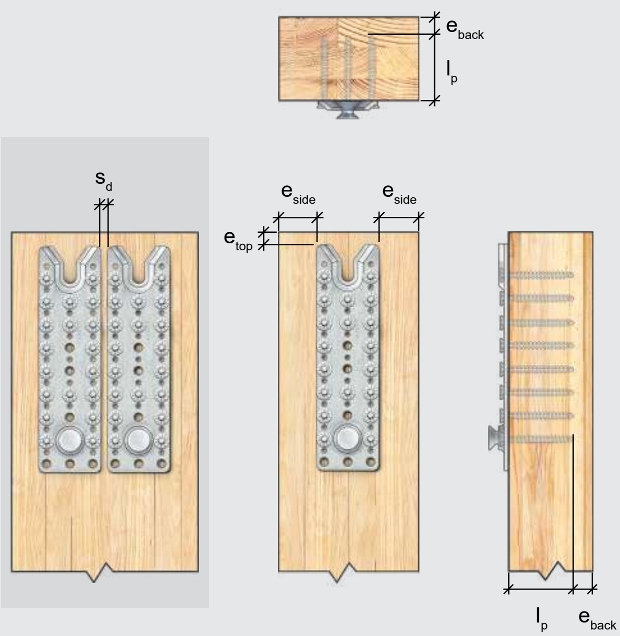
Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Primary Member Geometry Requirements - Column

Unhoused

Housed



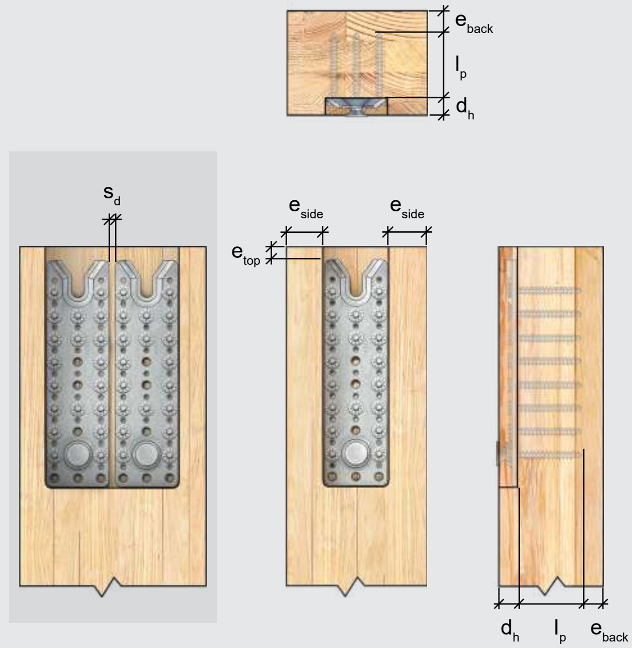


Table 2.13 - RICON S VS 80 Geometry Requirements for Primary Member (Column)

RICON S VS 80		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}		
RICON S VS 200 x 80	Single	92	60	20	10	36	36	46	46	85	85	23	N/A
	Double	92	60	20	10	36	36	46	46	85	85	23	10
RICON S VS 290 x 80	Single	92	30	20	10	36	36	46	46	85	85	23	N/A
	Double	92	30	20	10	36	36	46	46	85	85	23	10

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for columns with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

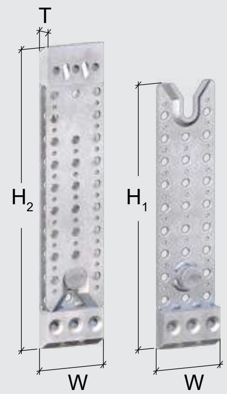
Detailing - RICON S VS XL Geometry Requirements

RICON S VS XL - Connector Geometry

Table 2.14 - RICON S VS XL Geometry

Connector Geometry	Model
	RICON S VS XL 390 x 80
	[mm]
H_1	340
H_2	390
T	25
W	80

Note:
1. Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.



RICON S VS XL
390 x 80

Secondary Member Geometry Requirements

Unhoused

Housed

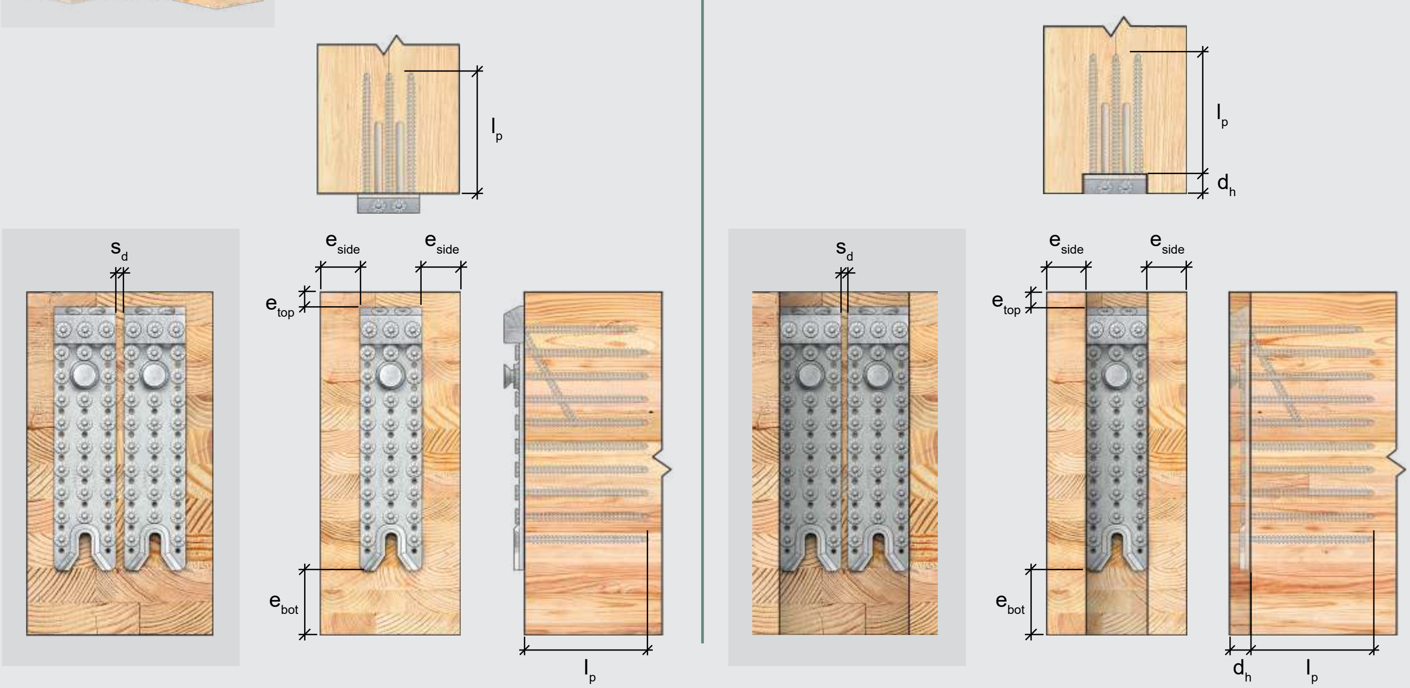


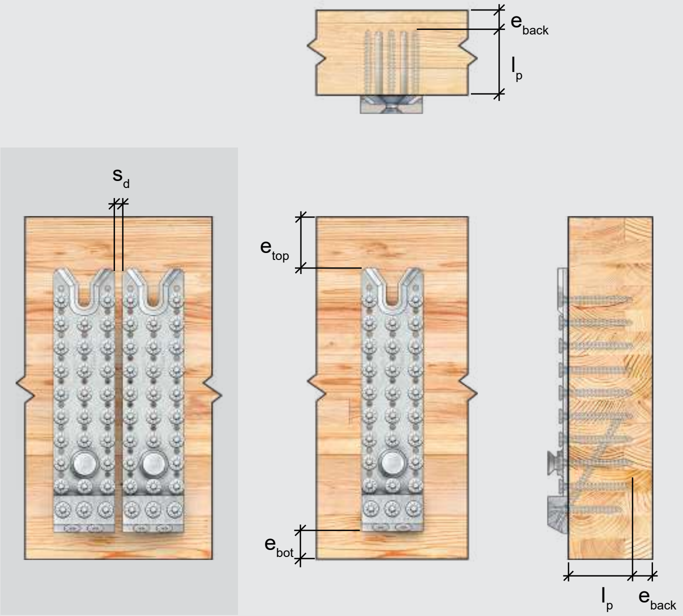
Table 2.15 - RICON S VS XL 390 x 80 Geometry Requirements for Secondary Member

RICON S VS XL		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	**Configuration**			e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}		
RICON S VS XL 390 x 80	**Single**	192	40	20	50	36	94	46	111	85	179	23	N/A
	Double	192	40	20	50	36	94	46	111	85	179	23	10

Notes:
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the member.

Primary Member Geometry Requirements - Beam/Girder

Unhoused



Housed

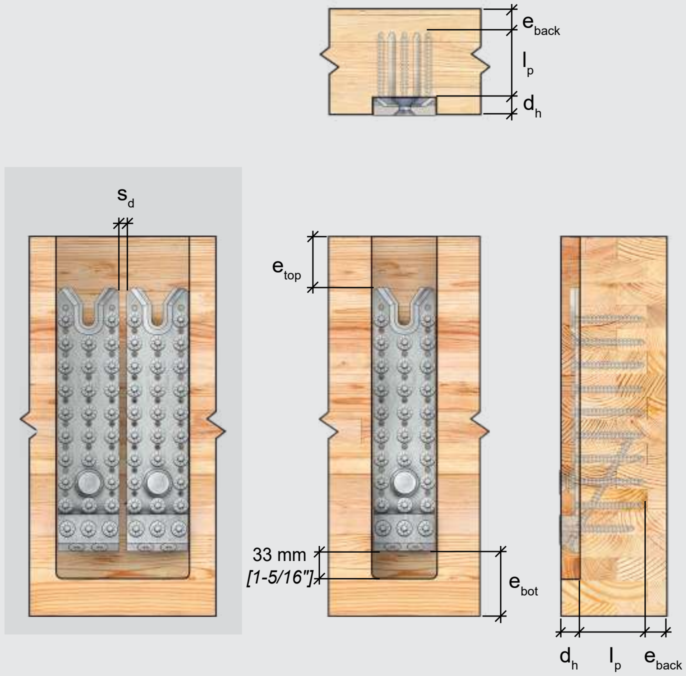


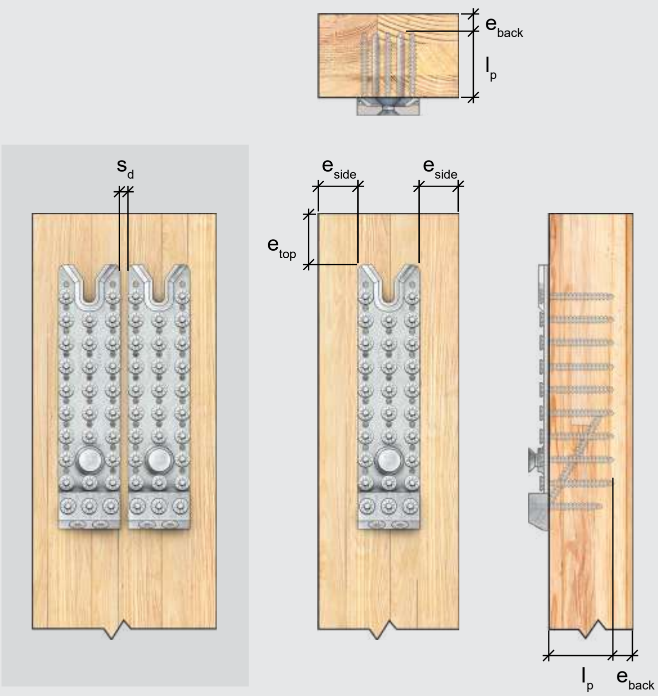
Table 2.16 - RICON S VS XL 390 x 80 Geometry Requirements for Primary Member (Beam/Girder)

RICON S VS XL		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}		
RICON S VS XL 390 x 80	Single	92	90	40	10	44	36	61	46	129	85	23	N/A
	Double	92	90	40	10	44	36	61	46	129	85	23	10

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. For any connection with an FRR where the RICON S VS XL is housed in the primary beam, the space below the RICON S VS XL must be filled with noncombustible material.
7. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Primary Member Geometry Requirements - Column



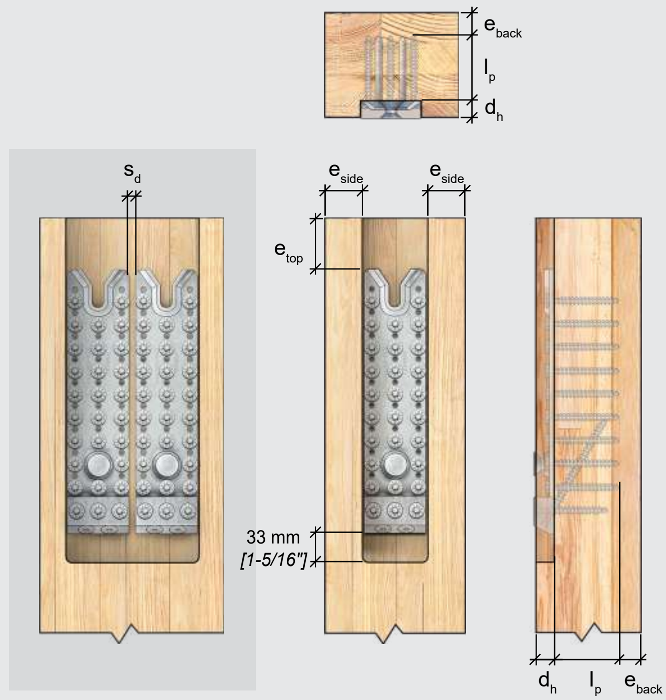


Table 2.17 - RICON S VS XL 390 x 80 Geometry Requirements for Primary Member (Column)

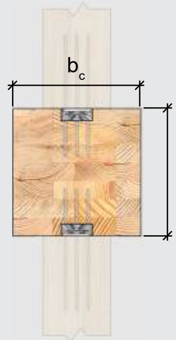
RICON S VS XL		Geometry Requirements [mm]											
				No FRR		45-min FRR		1-hr FRR		2-hr FRR			
Model	Configuration	l_p	e_{top}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	d_h	s_d
RICON S VS XL 390 x 80	Single	92	90	20	10	36	36	46	46	85	85	23	N/A
	Double	92	90	20	10	36	36	46	46	85	85	23	10

Notes:

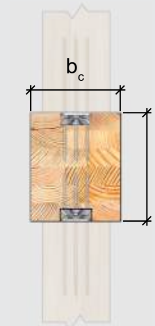
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for columns with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. For any connection with an FRR where the RICON S VS XL is housed in the column, the space below the RICON S VS XL must be filled with noncombustible material.
7. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Detailing - RICON S VS Additional Considerations

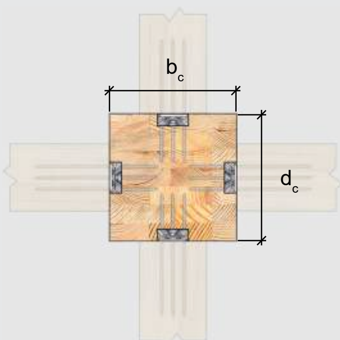
Geometry Requirements for Columns with Multiple Beam Hangers



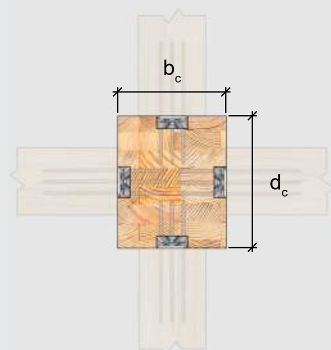
A
Hangers on Opposing Faces of a Square Column



B
Hangers on Opposing Faces of a Rectangular Column



C
Hanger on Each Face of a Square Column



D
Hanger on Each Face of a Rectangular Column

Table 2.18 - Minimum Column Sizes for Multiple RICON S VS Connectors

Model Series	Minimum Column Section Dimensions, b_c x d_c [mm x mm]							
	A Hangers on Opposing Faces of a Square Column				B Hangers on Opposing Faces of a Rectangular Column			
	No FRR	45-min FRR	1-hr FRR	2-hr FRR	No FRR	45-min FRR	1-hr FRR	2-hr FRR
RICON S VS 60	204 x 204	204 x 204	204 x 204	230 x 230	92 x 204	133 x 204	152 x 204	230 x 204
RICON S VS 80 and XL	244 x 244	244 x 244	244 x 244	250 x 250	120 x 244	153 x 244	172 x 244	250 x 244

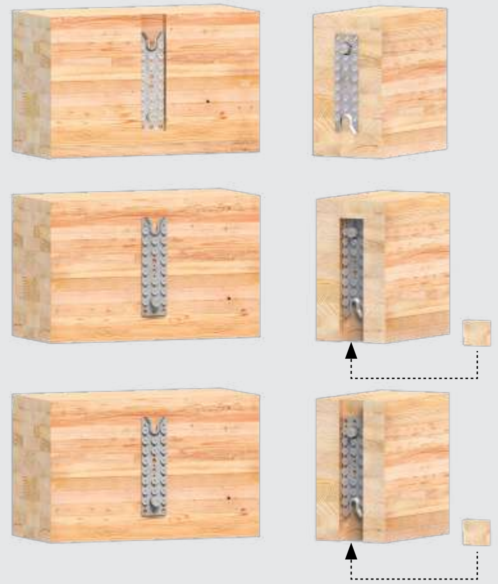
Model Series	Minimum Column Section Dimensions, b_c x d_c [mm x mm]							
	C Hanger on Each Face of a Square Column				D Hangers on Each Face of a Rectangular Column			
	No FRR	45-min FRR	1-hr FRR	2-hr FRR	No FRR	45-min FRR	1-hr FRR	2-hr FRR
RICON S VS 60	253 x 253	253 x 253	253 x 253	253 x 253	92 x 253	133 x 253	152 x 253	230 x 253
RICON S VS 80 and XL	309 x 309	309 x 309	309 x 309	309 x 309	120 x 309	153 x 309	172 x 309	250 x 309

Notes:

1. Tabulated column section dimensions are minimum values based on a 12.7 mm *[1/2 in.]* clearance between screw tips, minimum edge and end distances, and minimum wood cover requirements for FRR. Refer to Geometry Requirements for further details.
2. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
3. Tabulated column section dimensions assume hangers are centered within each column face and are housed in the column as shown.

Detailing - RICON S VS Housing Details

Housing Possibilities



Primary Beam Housing

- Most common housing for concealed installation
- Concealed from below

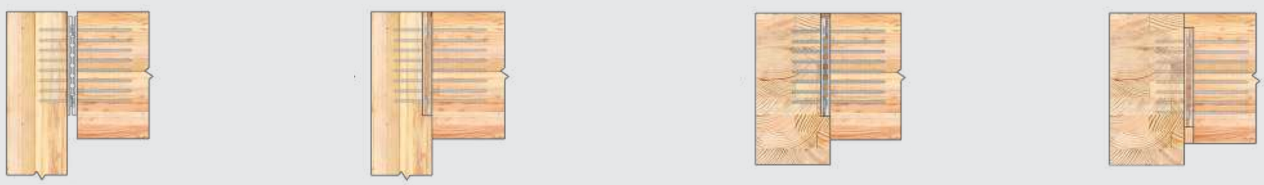
Secondary Beam Housing

- Joist housing from bottom up
- Concealed from below with a wood plug

Secondary Beam Through Housing

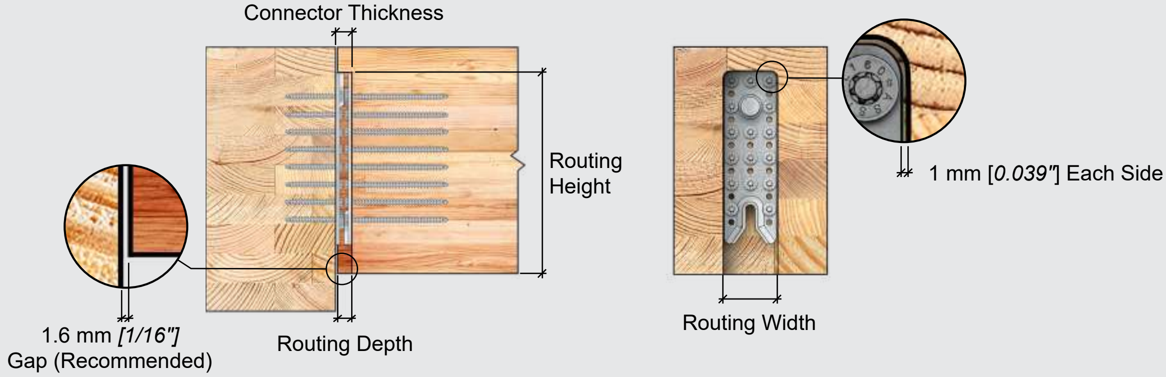
- Full-depth housing in joist
- Concealed from below with a wood plug
- Simplifies fabrication

Housing and Surface Detailing



Parallel Surface: The members must be parallel at the location of the connection to ensure proper hanger alignment and load transfer.

Gap Size: The gap size between wood members balances installation ease and fire performance, with larger gaps simplifying installation but reducing fire protection. A gap of 1.6 mm *[1/16 in.]* is recommended for proper installation to allow the secondary member to slide into place. The gap should be no more than 3.2 mm *[1/8 in.]* to address fire protection considerations. For more information, refer to Appendix A: Fire Protection (Page 115).



Routing Depth: The routing depth is the depth of the housing, d_h, noted in the Geometry Requirements and Routing Details sections This depth takes into account the thickness of the connector and the gap between members (recommended 1.6 mm *[1/16 in.]* herein—larger gaps will reduce d_h accordingly).

Routing Width: It is recommended to allow a clearance of 1 mm *[0.039 in.]* on each side of the connector:

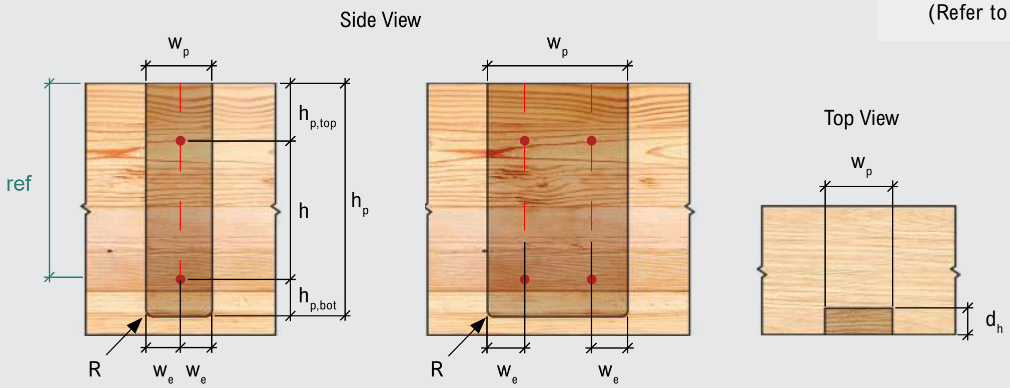
- RICON S VS 60 Series: 62 mm *[2.441 in.]*
- RICON S VS 80 Series (including RICON S VS XL): 82 mm *[3.228 in.]*

Routing Height: The routing height must be coordinated with the Engineer of Record. The height of the connector in the beam section has an impact on connector performance. Refer to Positioning Considerations for Reinforcement (Page 37) for further information.

Detailing - RICON S VS Housing Dimensions

Routing in Primary Member

Fastener Orientation
● Structural Positioning Screws
(Refer to Fastener Layout on Page 55)



Single Configuration **Double Configuration**

Table 2.21 - Routing Dimensions for RICON S VS Housed in Primary Member

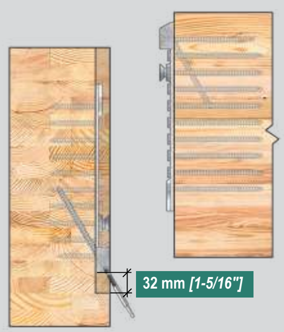
Model	Routing Dimensions, mm *[in.]*								
	h_p	$h_{p,top}$	h	$h_{p,bot}$	w_p Single	w_p Double	w_e	d_h	R
RICON S VS 140 x 60	**187** *[7.362]*	**116** *[4.567]*	**60** *[2.362]*	**11** *[0.433]*	**62** *[2.441]*	**130** *[5.118]*	**31** *[1.220]*	**23** *[0.922]*	**7.5** *[0.295]*
RICON S VS 200 x 60	**247** *[9.724]*	**116** *[4.567]*	**120** *[4.724]*	**11** *[0.433]*	**62** *[2.441]*	**130** *[5.118]*	**31** *[1.220]*	**23** *[0.922]*	**7.5** *[0.295]*
RICON S VS 200 x 80	**261** *[10.276]*	**130** *[5.118]*	**120** *[4.724]*	**11** *[0.433]*	**82** *[3.228]*	**172** *[6.772]*	**41** *[1.614]*	**23** *[0.922]*	**7.5** *[0.295]*
RICON S VS 290 x 80	**321** *[12.638]*	**100** *[3.937]*	**150** *[5.906]*	**71** *[2.795]*	**82** *[3.228]*	**172** *[6.772]*	**41** *[1.614]*	**23** *[0.922]*	**7.5** *[0.295]*
RICON S VS XL 390 x 80	**463** *[18.228]*	**160** *[6.299]*	**210** *[8.268]*	**93** *[3.661]*	**82** *[3.228]*	**172** *[6.772]*	**41** *[1.614]*	**23** *[0.922]*	**7.5** *[0.295]*

Notes:

1. Tabulated values are general guidelines for routing requirements. The EOR and fabricator are responsible for ensuring final routing dimensions account for all project-specific conditions.
2. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for h and R are fixed. Tabulated values for d_h are maximum allowable.
3. Tabulated values account for 1 mm *[0.039 in.]* on each side of and below the hanger. Larger installation tolerances will increase height and width values accordingly.
4. Tabulated values are based on a gap of 1.6 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
5. Refer to the Geometry Requirements tables for each respective beam hanger for additional information.
6. Tabulated values for h_p and $h_{p,bot}$ for the RICON S VS XL account for a 33 mm *[1-5/16 in.]* gap below the connector to allow the installation of the fasteners. The resulting hidden void should be protected from fire using industry-approved methods.
7. Manufacturers should adjust the tabulated values based on their specific routing bit sizes if different than R.

RICON S VS XL - Additional Routing Clearance Requirements

An additional housing clearance of 32 mm *[1-5/16 in.]* must be accounted for during design phase for the 45° inclined screws of the RICON S VS XL.

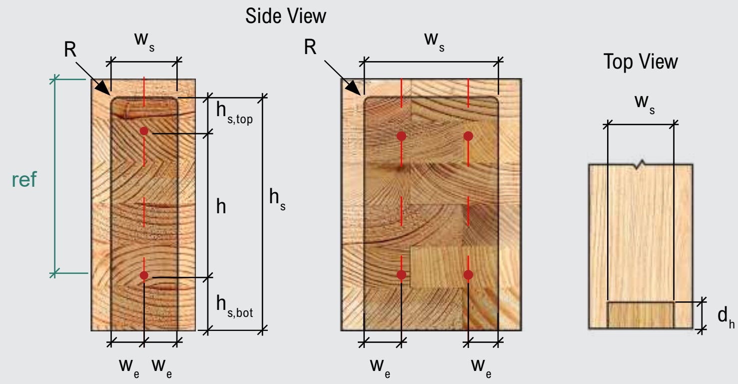


Notes:

1. A bit extender is recommended to facilitate installation.
2. Values provided in the Housing Dimensions section (Pages 51–52) already accommodate oversized housing.
3. To satisfy fire-resistance rating requirements, the cavity must be filled under the direction of the EOR.

Routing in Secondary Member

Fastener Orientation
● Structural Positioning Screws
(Refer to Fastener Layout on Page 55)



Single Configuration **Double Configuration**

Table 2.22 - Routing Dimensions for RICON S VS Housed in Secondary Member (Beam-End)

Model	Routing Dimensions, mm *[in.]*								
	h_s	$h_{s,top}$	h	$h_{s,bot}$	w_s Single	w_s Double	w_e	d_h	R
RICON S VS 140 x 60	**141** *[5.551]*	**11** *[0.433]*	**60** *[2.362]*	**70** *[2.756]*	**62** *[2.441]*	**130** *[5.118]*	**31** *[1.220]*	**23** *[0.922]*	**7.5** *[0.295]*
RICON S VS 200 x 60	**201** *[7.913]*	**11** *[0.433]*	**120** *[4.724]*	**70** *[2.756]*	**62** *[2.441]*	**130** *[5.118]*	**31** *[1.220]*	**23** *[0.922]*	**7.5** *[0.295]*
RICON S VS 200 x 80	**201** *[7.913]*	**11** *[0.433]*	**120** *[4.724]*	**70** *[2.756]*	**82** *[3.228]*	**172** *[6.772]*	**41** *[1.614]*	**23** *[0.922]*	**7.5** *[0.295]*
RICON S VS 290 x 80	**291** *[11.457]*	**71** *[2.795]*	**150** *[5.906]*	**70** *[2.756]*	**82** *[3.228]*	**172** *[6.772]*	**41** *[1.614]*	**23** *[0.922]*	**7.5** *[0.295]*
RICON S VS XL 390 x 80	**423** *[16.654]*	**93** *[3.661]*	**210** *[8.268]*	**120** *[4.724]*	**82** *[3.228]*	**172** *[6.772]*	**41** *[1.614]*	**23** *[0.922]*	**7.5** *[0.295]*

Notes:

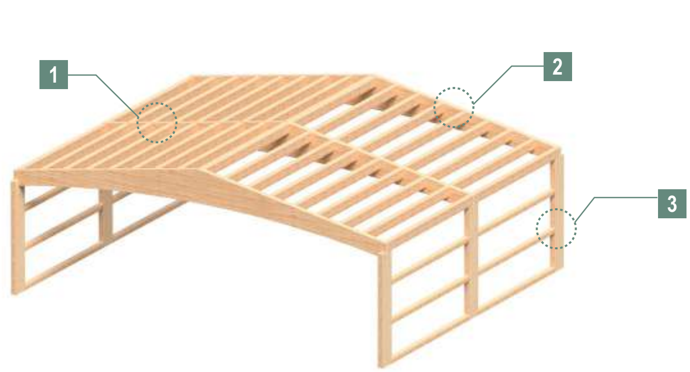
1. Tabulated values are general guidelines for routing requirements. The EOR and fabricator are responsible for ensuring final routing dimensions account for all project-specific conditions.
2. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for h and R are fixed. Tabulated values for d_h are maximum allowable.
3. Tabulated values account for 1 mm *[0.039 in.]* on each side of and above the hanger. Larger installation tolerances will increase height and width values accordingly.
4. Tabulated values are based on a gap of 1.6 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly..
5. Refer to the Geometry Requirements tables for each respective beam hanger for additional information.
6. Tabulated values for h_s and $h_{s,top}$ for the RICON S VS XL account for a 33 mm *[1-5/16 in.]* gap above the connector to allow the installation of the fasteners. The resulting hidden void should be protected from fire using industry-approved methods.
7. Manufacturers should adjust the tabulated values based on their specific routing bit sizes if different than R.

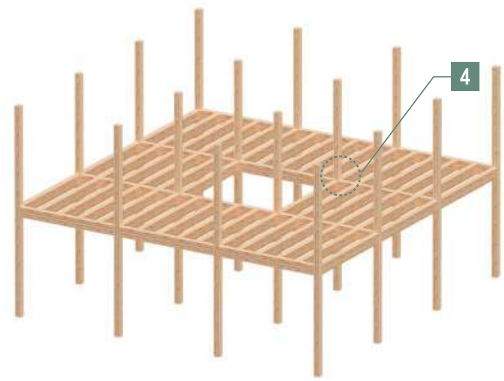
Clayton Community Centre

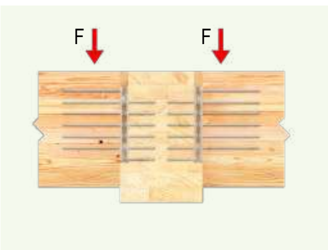
Surrey, British Columbia

Installation - RICON S VS Configurations

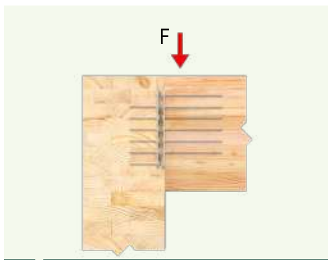
RICON S VS Connection Applications



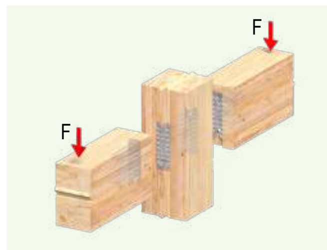




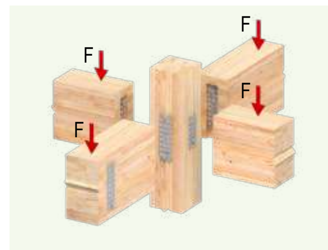
1 Multiple Beams-to-Girder



2 Beam-to-Girder

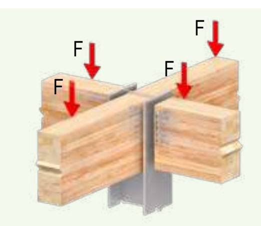


3 Beam-to-Column

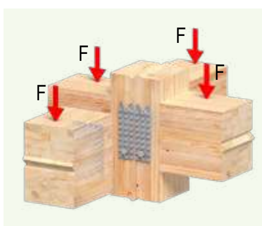


4 Multiple Beams-to-Column

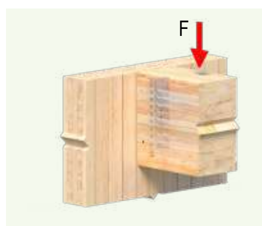
Alternative Connection Applications



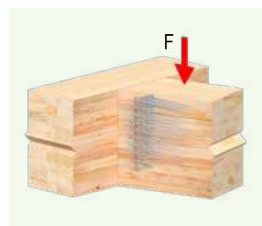
Wood Beam-to-Steel



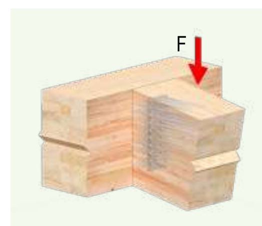
Double RICON S VS



Beam-to-CLT Wall



Skewed Configuration

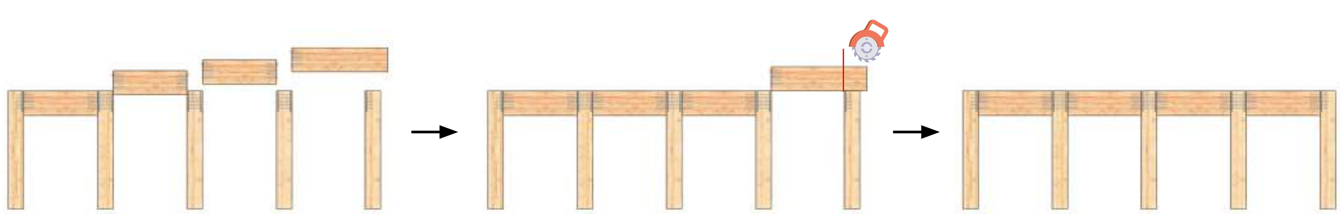


Sloped Configuration

Beam Length Tolerances and Sequencing

Installation sequencing is important, especially for buildings with multiple bays of post-and-beam framing. It is recommended to install the beams starting from one end of the building and progress along the column line. The last beam can be produced slightly over length and cut to size on-site to help mitigate any dimensional tolerance challenges. The RICON S VS features tapered collar bolts and openings that facilitate installation by guiding the secondary beam into place. Beams positioned up to 6 mm *[1/4 in.]* to either side or slightly out from the primary member will self-center as they slide down.

RICON S VS Installation Tolerance

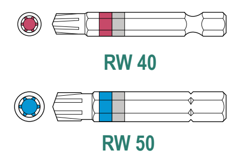


Installation - RICON S VS General Requirements

Tool Requirements

Tools - Use the Correct Bit

MTC Solutions fasteners should only be driven using RW bits, or appropriately sized star bits. This ensures good centering and positioning with optimal torque transmission. For the RICON S VS, use an RW 40 bit for 8 mm *[5/16 in.]* screws and an RW 50 bit for 10 mm *[3/8 in.]* screws.

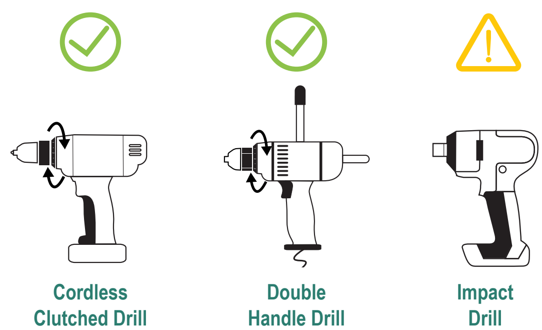


Tools - Use the Correct Drill

Use low-RPM, high-torque drills equipped with a feather (variable speed) trigger to install fasteners. Avoid excessive acceleration and deceleration during the drive-in process. Do not overtorque fasteners. Although impact guns are not expressly prohibited, their use is discouraged - particularly for beam hanger systems - due to an increased risk of overtorquing. Use the appropriate drill chuck size according to the fastener.

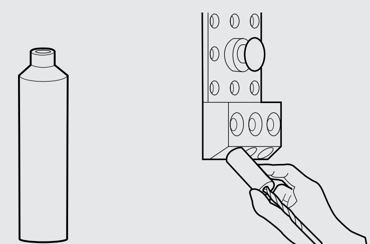
Table 2.23 - Recommended Torque, Drill Bits, and Power Drill

Nominal Fastener Diameter [D]		HSS Drill Bit Size		Power Voltage Drill	Allowable Insertion Torque	
mm	*[in.]*	mm	*[in.]*	V	N · m	*[lb. ft.]*
8	*[5/16]*	5	*[3/16]*	20	16.67	*[12.30]*
10	*[3/8]*	6	*[1/4]*	60	30.00	*[22.13]*



Tools - Predrilling Jig 6 mm *[1/4 in.]*

The Predrilling Jig ensures precise alignment of the RICON S VS XL 30° inclined fasteners. It guides the drill bit to create an accurate pilot hole, and ensures proper fastener seating. The hole in the jig accommodates standard imperial and metric drill bit diameters. For the 10 mm *[3/8 in.]* inclined fasteners, pilot holes 6 mm *[1/4 in.]* in diameter and 25 mm *[1 in.]* long are recommended.

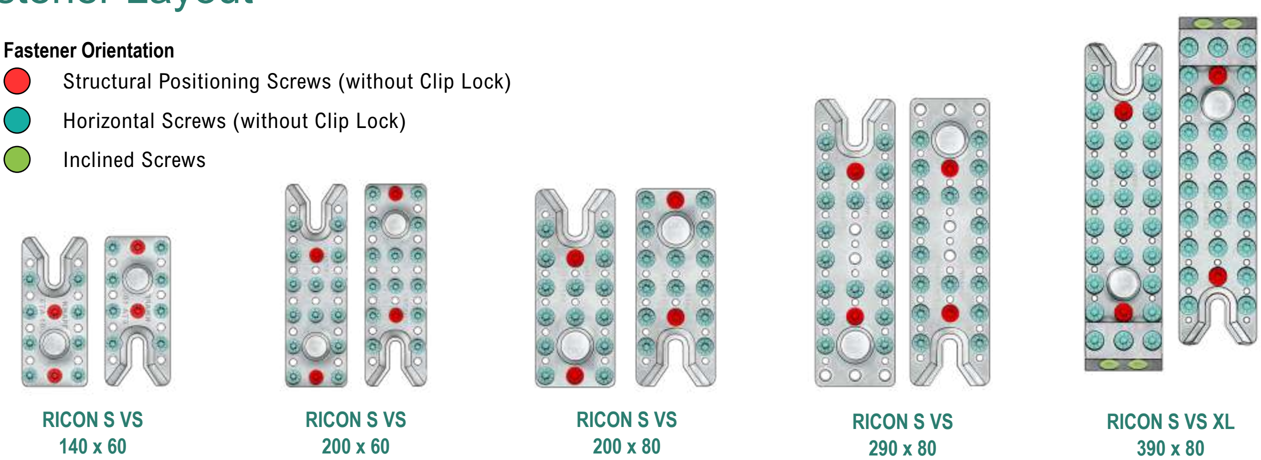


Predrilling Jig 6 mm *[1/4"]*

Fastener Layout

Fastener Orientation

- Structural Positioning Screws (without Clip Lock)
- Horizontal Screws (without Clip Lock)
- Inclined Screws



Note:

1. Alternative locations for positioning screws are required when using a Clip Lock System. For more information, see Page 38.

Installation - RICON S VS Guidelines

General Installation Steps

Estimated Installation Time

The estimated time for a single person to install a complete RICON S VS product is shown in Table 2.24.

This process includes the following steps:

1. Layout (~10%–15%)
2. Positioning (~15%–20%)
3. Pilot Holes (~20%–30%)
4. Screw Installation (~45%–55%)
5. Optional Measures (not included in the time installation % breakdown)

Table 2.24 - RICON S VS Estimated Installation Time

RICON S VS Model	Average Installation Time [min.]
140 x 60	9
200 x 60	13
200 x 80	13
290 x 80	14
XL 390 x 80	20

The estimated installation time can be improved upon with efficient fabrication and site practices such as:

1. Drilling pilot holes for the structural positioning screws at the time of fabrication
2. Utilizing templates to drill pilot holes for structural screws
3. Optimizing beam positioning to reduce worker fatigue

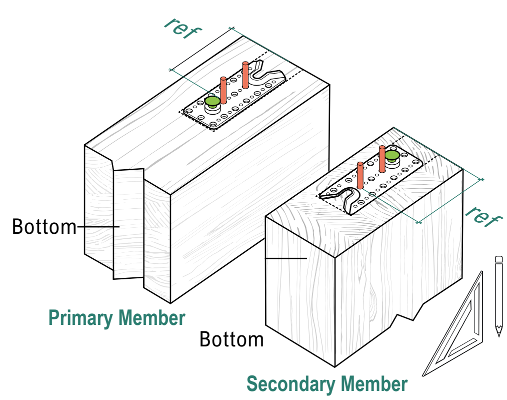
Step-by-Step Installation Guidelines

1.1 Layout - Reference Points

Begin by laying out the installation locations in the primary and secondary members using a pencil and square.

The connector's point of reference is the top of the member. The lower structural positioning screw should be measured from that point of reference.

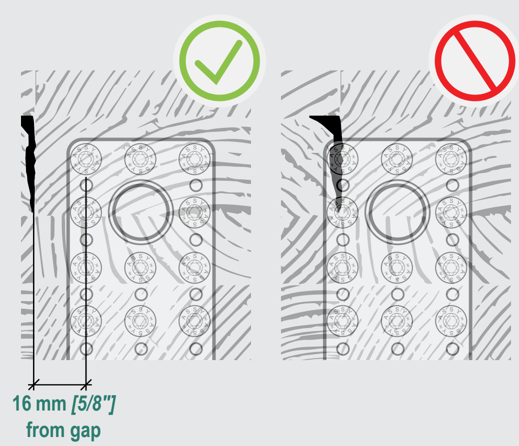
The collar bolt should be at the bottom on the primary member and on the top on the secondary member.



1.2 Layout - Split Lamination Considerations

It is recommended that vertical joints in split lamination glulam beams be tight at the time of manufacturing. Gaps between adjacent plies may occur due to wood shrinkage. Gaps up to 3.2 mm *[1/8 in.]* are acceptable for typical single-configuration RICON S VS installation.

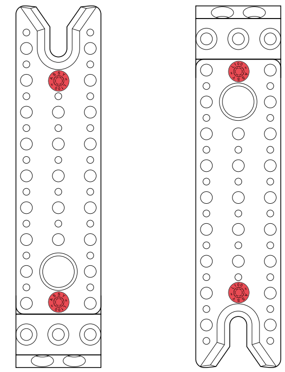
If gaps greater than 3.2 mm *[1/8 in.]* exist in the beam-end, the RICON S VS shall be positioned so that fasteners can be installed at least 16 mm *[5/8 in.]* away from those gaps, as measured from the center of the fastener.



Note: Double-configuration installations require glued bond between plies; gaps and voids are **not** permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.

2.1 Positioning - Structural Positioning Screw Installation

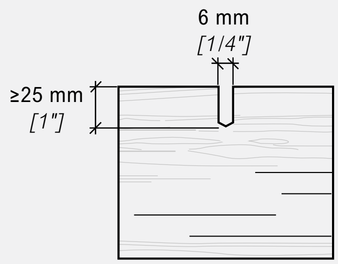
Positioning screws ensure accurate placement of the RICON S VS connector. To improve accuracy and reduce installation time, it is recommended to predrill the structural positioning screw locations during member fabrication. Note that structural screws cannot be reused if the connector requires adjustment. Install one structural positioning screw into the hole highlighted at the top of the plate. Check to ensure alignment is maintained and then install the second structural positioning screw into the hole highlighted at the bottom of the plate. If using a Clip Lock system Clip Lock Brace System for Uplift section (Page 38), an alternate positioning screw location will be required.

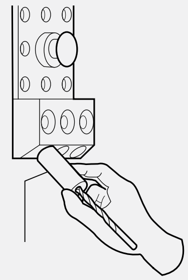


Primary Member Secondary Member

3.1 Pilot Holes - Recommendations

Pilot holes are optional; however, they facilitate screw thread engagement, help reduce splitting risks, ensure a proper penetration path which reduces screw wandering, and reduce insertion torque. For the structural fasteners used with the RICON S VS series, pilot holes 6 mm *[1/4 in.]* in diameter and 25 mm *[1 in.]* in length are recommended. The use of MTC Predrilling Jig for the inclined screws of the RICON S VS XL is recommended to ensure proper hole placement.

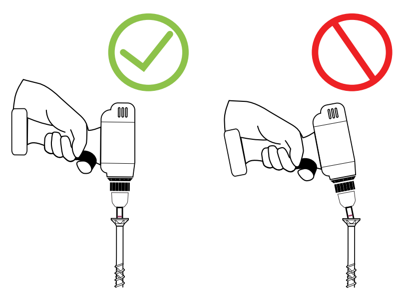




MTC Predrilling Jig

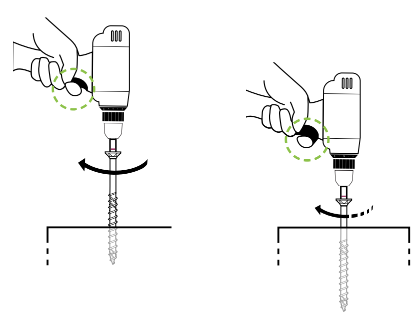
4.1 Screw Installation - Align Drill Bit Axis

Align the driver bit axis parallel to the fastener axis during installation to allow proper torque transmission and to avoid stripping.



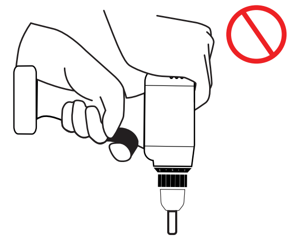
4.2 Screw Installation - Decrease RPM

To avoid overtorquing the screw, decrease the rotation speed about 12.7 mm *[1/2 in.]* away from the final installed position. This is crucial to prevent wood crushing due to overtorquing, which can impact beam hanger tolerances, potentially impeding overall connection assembly. This is especially important when using an impact drill.



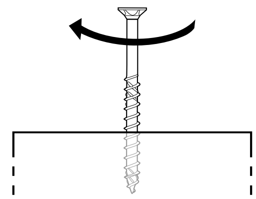
4.3 Screw Installation - Drill Pressure

Do not apply excessive pressure on the drill while driving the fastener to prevent fastener buckling or deviation during installation. Only apply the required force or use the recommended holder case to eliminate cam-out effects.



4.4 Screw Installation - One-Step Process

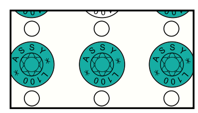
To avoid increased torque peaks caused by stopping and restarting the drive-in process, install the screw in one run until the head is lightly seated against the side member. If necessary, a torque wrench may be used to complete installation immediately after the screw has been driven.



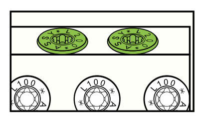
4.5 Screw Installation - Structural Screws

Install properly sized MTC-FTC screws in all horizontal holes. If using a Clip Lock system, refer to Step 5.1 and Page 38 for further information.

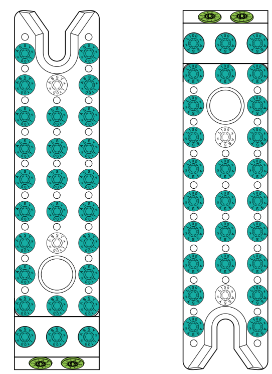
For the RICON S VS XL only: install 10 x 200 mm *[3/8 x 7-7/8 in.]* MTC-FTC screws into all inclined holes after all 90° horizontal screws have been installed.



Horizontal Screw



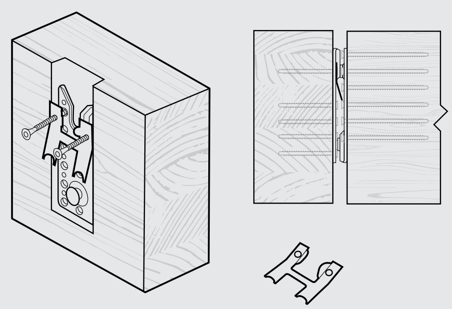
30°, Inclined Screws



Primary Member Secondary Member

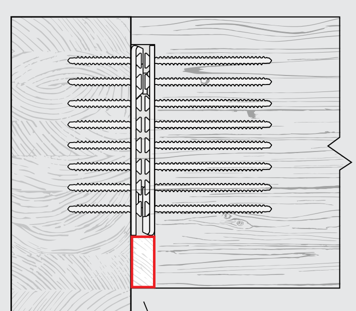
5.1 Optional Measures - Clip Lock Installation

The Clip Lock system must be installed with a modified screw pattern in the primary member. Refer to Page 38 for further details on the screw pattern for the Clip Lock.



5.2 Optional Measures - Wood Plug

Where connectors are housed in the secondary beam, it is recommended to seal the void in the routing below the connector for aesthetics and fire protection. A wood plug may be used, and installation instructions shall be provided by the EOR.



The Hive

Vancouver British Columbia

MEGANT

Pre-Engineered Connection System

The MEGANT is a pre-engineered beam-to-beam and beam-to-column connector manufactured from aluminum and consisting of plates and threaded rods for securing the connection. The MEGANT has been tested for the North American market.

AVAILABLE IN MULTIPLE SIZES

TESTED & PROVEN

UP TO 147 kN LSD

Pre-Installable

Pre-installable in a controlled shop environment for a faster on-site installation

Multi-Direction Installation

Facilitates beam installation from any direction (top, bottom, and sides)

Fire-Resistance-Rated

Fire-resistance rating up to 2 hours per CSA O86:24

Interstory Drift Tested

Drift ratio exceeding 4% in quasi-static rotational testing

Test-Derived Factored Resistances

Factored resistances derived from connector and fastener testing and in accordance with CSA O86:24

Drop-in Installation

A fast, streamlined repeatable installation process that significantly enhances efficiency

Design

- Force Transfer Principle
- Wood-to-Wood Design Values
- Seismic Performance
- Hanger Placement Considerations

Detailing

- MEGANT 60 Series Geometry Requirements
- MEGANT 100 Series Geometry Requirements
- MEGANT 150 Series Geometry Requirements
- Additional Detailing Considerations
- Housing Detailing and Dimensions

Installation

- Installation Configurations
- Tool Requirements
- Fastener Layout
- Step-by-Step Guidelines

STANDARDS AND CERTIFICATIONS

CSA O86:24

ISO 50001
Energy
Management
System

ETA-15/0667 2019

MEGANT Overview

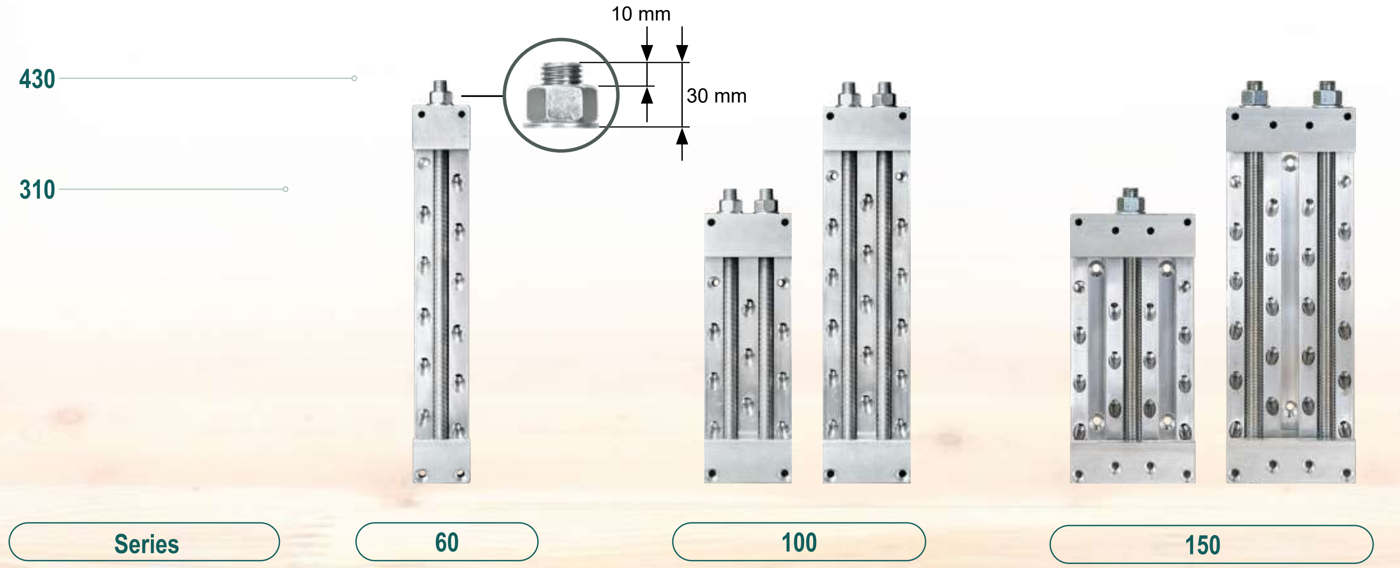


Table 3.1 - MEGANT Hardware Package Installation Overview

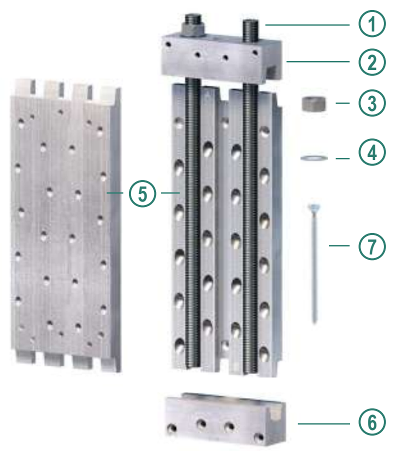
MEGANT		Plate Qty.	Fasteners		Threaded Rods		Installation Time
Series	Model		Type	Qty.	Type	Qty.	Min.
60	MEGANT 430 x 60	2	MTC-FTC 8 x 160 mm	32	M20 x 460 mm *Grade 8.8*	1	21
100	MEGANT 310 x 100	2	MTC-FCT 8 x 160 mm	34	M16 x 340 mm *Grade 8.8*	2	23
	MEGANT 430 x 100		MTC-FTC 8 x 160 mm	46	M16 x 460 mm *Grade 8.8*	2	27
150	MEGANT 310 x 150	2	MTC-FTC 8 x 160 mm	48	M20 x 340 mm *Grade 8.8*	1	31
	MEGANT 430 x 150		MTC-FTC 8 x 160 mm	64	M20 x 460 mm *Grade 8.8*	2	37

Notes:

1. Subsequent tabulated capacities in this chapter assume connectors are installed with specified MTC-FTC (see Table 1.1 on Page 13) fasteners specified in this table and in accordance with CCMC 13677-R.
2. The estimated installation time is based on a time study and includes steps for layout and positioning, drilling a 25 mm *[1 in.]* deep pilot hole for each fastener, structural screw installation for both plates, clamping jaw installation, and threaded rod installation. Refer to the General Installation Steps (Page 81) for more information.

One Installer
With Pilot Holes

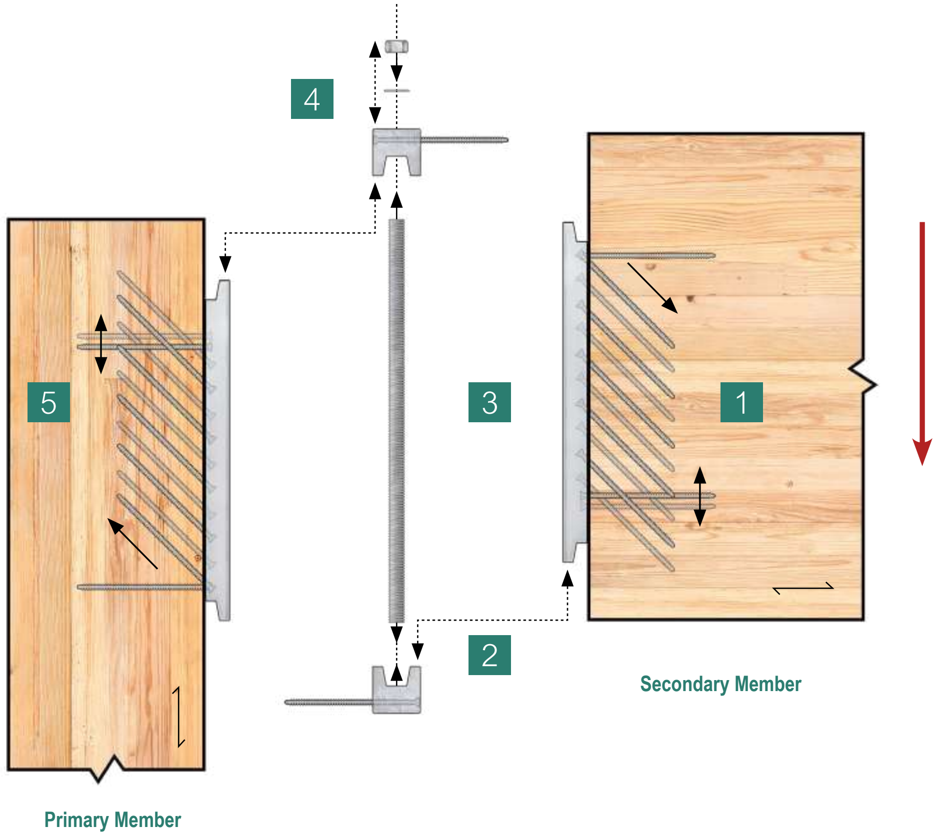
Product Kit Details



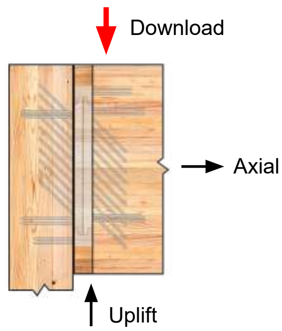
1. Threaded Rod
2. Clamping Jaw
3. Hex Nut
4. Washer
5. Connector Plates
6. Threaded Clamping Jaw
7. MTC-FTC

MEGANT Force Transfer Principle

The following figure highlights the flow of forces through various components of the MEGANT connector, showing why the fasteners and connector must be installed as specified.



1	The shear load in the secondary member transfers to the MEGANT plate through tension in the 45° screws and shear in the 90° screws.
2	The load in the MEGANT plate transfers to the lower jaw through bearing of the parts.
3	The load in the lower jaw transfers to the threaded rod through thread engagement, putting the threaded rod in tension, which is supported by the nut at the upper jaw.
4	The nut transfers the load to the upper jaw, which bears on the MEGANT plate in the primary member.
5	The MEGANT plate transfers the load to the primary member plate through tension in the 45° screws and shear in the 90° screws.



MEGANT Load Applications

Wood-to-Wood Design Values

Table 3.2 - Factored Resistances for MEGANT 60 in Wood-to-Wood Connections

MEGANT		Minimum Secondary Beam Section Dimensions [mm]				Relative Density [G]	Factored Resistances [kN]		
Model	Configuration	No FRR	45-min FRR	1-hr FRR	2-hr FRR		Download	Axial	Uplift
MEGANT 430 x 60	Single	89 x 530	133 x 530	152 x 541	230 x 609	≥ 0.42	64	17	11
						≥ 0.44	68	18	11
						≥ 0.46	74	20	12
						≥ 0.49	83	23	12
	Double	153 x 530	197 x 530	217 x 541	295 x 609	≥ 0.42	109	29	18
						≥ 0.44	115	31	19
						≥ 0.46	125	34	20
						≥ 0.49	141	38	20

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Tabulated factored resistances are applicable for wood-to-wood connections only. Screw installation must follow the patterns presented in the Installation section.
3. Factored resistances have decreased from the previous design guide due to the updated requirements of CSA O86:24. No change to product geometry or materials.
4. Minimum dimensions for secondary beams with no FRR are based on minimum end and edge distances.
5. The listed connector resistances may be limited by the splitting resistance perpendicular to grain and the effective shear resistance of the timber members. Refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124) for more information and available reinforcement strategies. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
6. Member sizes for other FRRs are permitted to be interpolated between the listed member sizes up to a maximum 2-hr FRR.
7. Alternative minimum beam sizes for members with an ASTM E1966 compliant fire-resistant joint can be found in Appendix A: Fire Protection (Page 115).
8. Factored resistances provided do not account for combined loading in multiple directions. Combined shear and axial loading must be verified per eq. 1 (Page 13).
9. Double-configuration installations require glued bond between plies; gaps and voids are not permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.

Table 3.3 - Factored Resistances for MEGANT 100 and 150 in Wood-to-Wood Connections

MEGANT		Minimum Secondary Beam Section Dimensions [mm]				Relative Density [G]	Factored Resistances [kN]		
Model	Configuration	No FRR	45-min FRR	1-hr FRR	2-hr FRR		Download	Axial	Uplift
MEGANT 310 x 100	Single	128 x 376	173 x 400	192 x 417	270 x 485	≥ 0.42	57	32	17
						≥ 0.44	60	33	18
						≥ 0.46	65	36	19
						≥ 0.49	73	41	19
	Double	232 x 376	277 x 400	296 x 417	374 x 485	≥ 0.42	97	54	29
						≥ 0.44	102	57	30
						≥ 0.46	110	62	32
						≥ 0.49	123	70	33
MEGANT 430 x 100	Single	128 x 496	173 x 520	192 x 537	270 x 605	≥ 0.42	89	34	17
						≥ 0.44	94	36	18
						≥ 0.46	102	39	19
						≥ 0.49	115	43	19
	Double	232 x 496	277 x 520	296 x 537	374 x 605	≥ 0.42	151	57	29
						≥ 0.44	159	60	30
						≥ 0.46	173	66	32
						≥ 0.49	195	73	33
MEGANT 310 x 150	Single	178 x 376	223 x 400	242 x 417	320 x 485	≥ 0.42	74	38	24
						≥ 0.44	78	40	25
						≥ 0.46	84	44	27
						≥ 0.49	94	50	29
	Double	332 x 376	377 x 400	396 x 417	474 x 485	≥ 0.42	126	64	41
						≥ 0.44	132	68	43
						≥ 0.46	143	74	45
						≥ 0.49	160	84	49
MEGANT 430 x 150	Single	178 x 496	223 x 520	242 x 537	320 x 605	≥ 0.42	114	40	24
						≥ 0.44	120	43	25
						≥ 0.46	131	47	27
						≥ 0.49	147	53	29
	Double	332 x 496	377 x 520	396 x 537	474 x 605	≥ 0.42	194	69	41
						≥ 0.44	205	73	43
						≥ 0.46	222	79	45
						≥ 0.49	250	90	49

Notes:

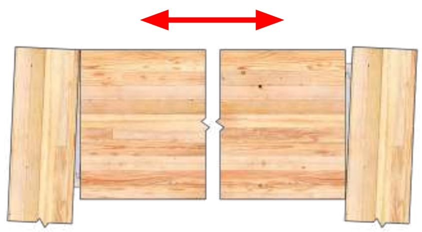
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Tabulated factored resistances are applicable for wood-to-wood connections only. Screw installation must follow the patterns presented in the Installation section.
3. Factored resistances have decreased from the previous design guide due to the updated requirements of CSA O86:24. No change to product geometry or materials.
4. Minimum dimensions for secondary beams with no FRR are based on minimum end and edge distances.
5. The listed connector resistances may be limited by the splitting resistance perpendicular to grain and the effective shear resistance of the timber members. Refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124) for more information and available reinforcement strategies. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
6. Member sizes for other FRRs are permitted to be interpolated between the listed member sizes up to a maximum 2-hr FRR.
7. Alternative minimum beam sizes for members with an ASTM E1966 compliant fire-resistant joint can be found in Appendix A: Fire Protection (Page 115).
8. Factored resistances provided do not account for combined loading in multiple directions. Combined shear and axial loading must be verified per eq. 1 (Page 13).
9. Double-configuration installations require glued bond between plies; gaps and voids are not permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.

MEGANT Seismic Performance

MTC has conducted extensive quasi-static, interstory, and component testing on the MEGANT connector. The results have demonstrated its robust performance under drift and axial demands.

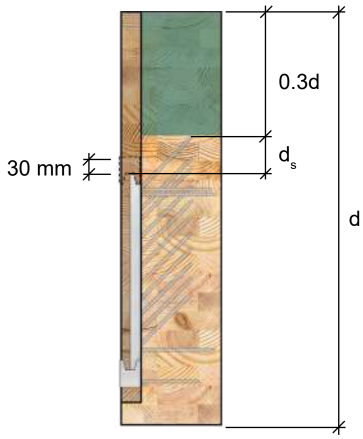
- The MEGANT connector can accommodate drifts over 4% while loaded, which satisfies the drift limits specified in NBCC 2024 Clause 4.1.8.13.
- The MEGANT connector has significant axial capacity while fully loaded to ensure the structural integrity of the connection is maintained during a wind or seismic event.

Contact MTC Technical Support for additional details for accommodating seismic loads in your design.

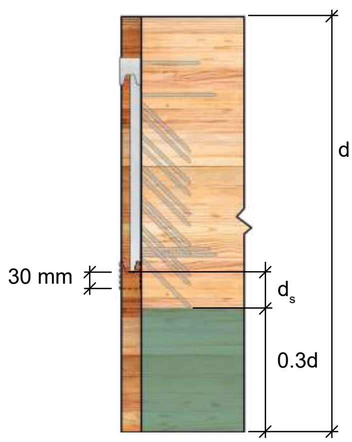


Positioning Considerations for Reinforcement

The hanger placement relative to the height of the beam can impact the need for reinforcement. Connectors in the primary beam should have the tip of the uppermost fastener in the top 30% of the member depth (0.3d), as shown in the bottom left figure. Connectors in the secondary beam should have the tip of the lowermost fastener in the bottom 30% (0.3d), as shown in the bottom right figure. Outside of these zones, the primary and secondary beams should be checked for splitting to determine if reinforcement is required. Note that these requirements do not apply to columns. For further information, refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124).



Primary Beam



Secondary Beam

Table 3.4 - MEGANT Screw Tip Distances

Model	d_s	
	mm	*[in.]*
MEGANT 430 x 60	70	*[2-3/4]*
MEGANT 310 x 100	40	*[1-9/16]*
MEGANT 430 x 100	40	*[1-9/16]*
MEGANT 310 x 150	40	*[1-9/16]*
MEGANT 430 x 150	40	*[1-9/16]*

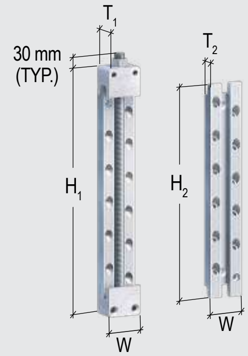
GIGANT
RICON S VS
MEGANT
Design | Detailing | Installation
APEX

Detailing - MEGANT 60 Series Geometry Requirements

MEGANT 60 Series - Connector Geometry

Table 3.5 - MEGANT 60 Geometry

Connector Geometry	Model
	MEGANT 430 x 60
	[mm]
H_1	430
H_2	370
T_1	40
T_2	20
W	60



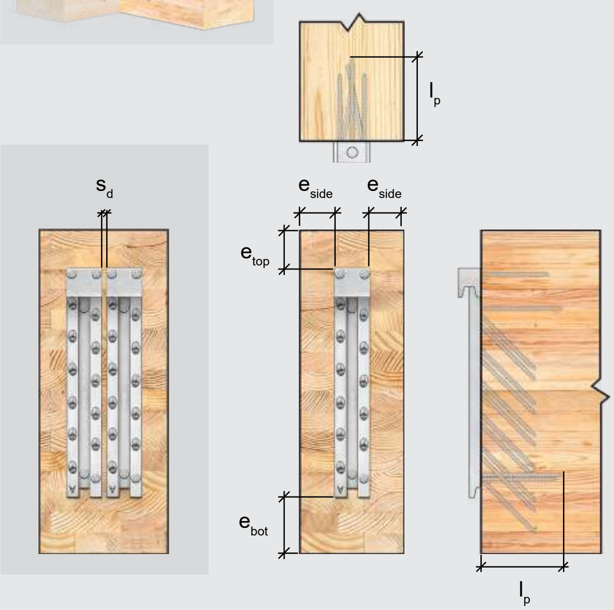
MEGANT 430 x 60

Note:

1. Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.

Secondary Member Geometry Requirements

Unhoused



Housed

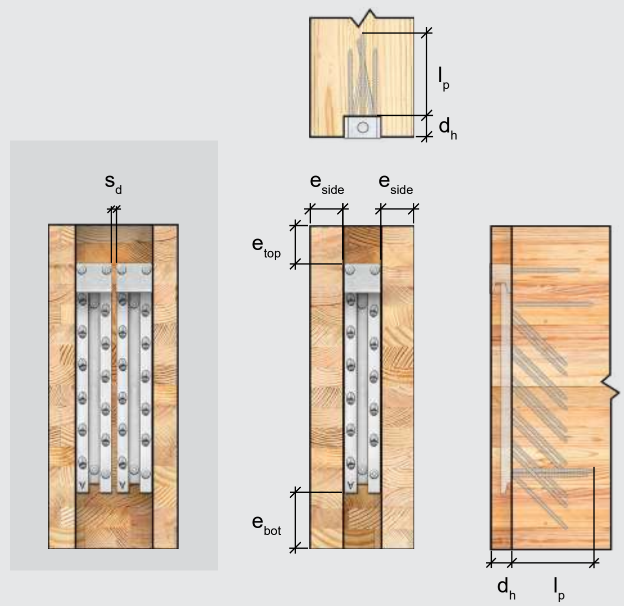


Table 3.6 - MEGANT 60 Geometry Requirements for Secondary Member

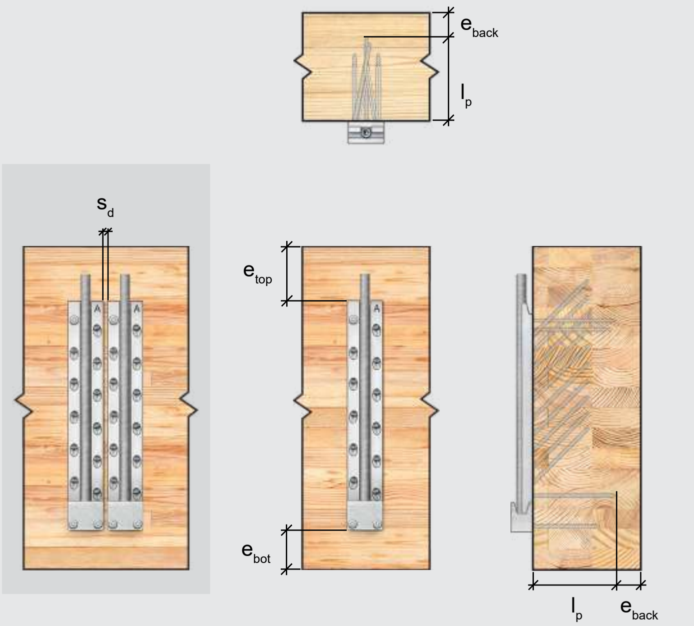
MEGANT 60		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}		
MEGANT 430 x 60	Single	152	50	14	80	36	80	46	91	85	159	38	N/A
	Double	152	50	14	80	36	80	46	91	85	159	38	5

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRRs are based on the unthreaded jaw being installed on top, with the threaded rod and nut being installed from above as shown in the examples above.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
7. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the members.

Primary Member Geometry Requirements - Beam/Girder

Unhoused



Housed

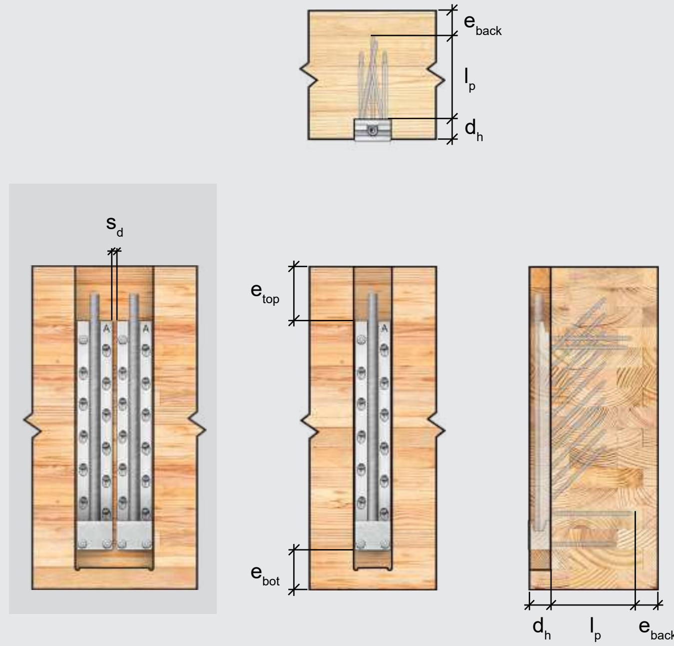


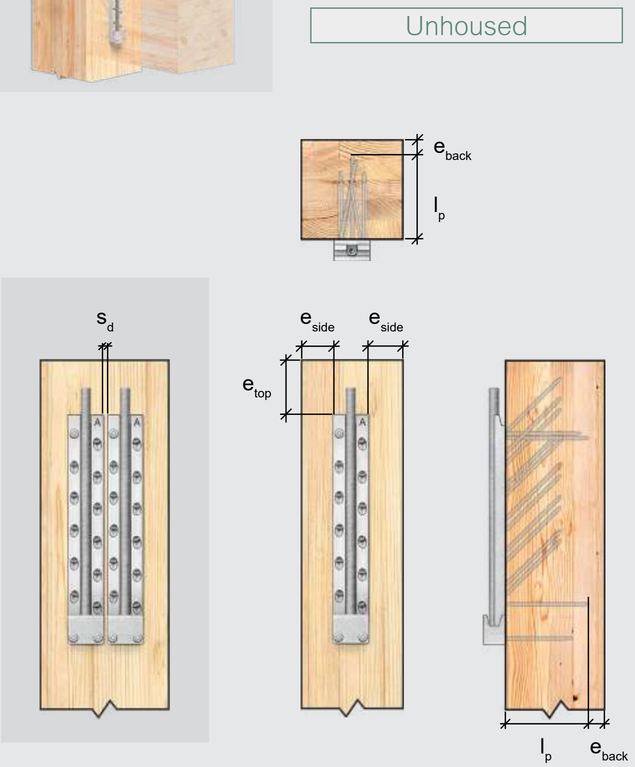
Table 3.7 - MEGANT 60 Geometry Requirements for Primary Member (Beam/Girder)

MEGANT 60		Geometry Requirements [mm]											
				No FRR		45-min FRR		1-hr FRR		2-hr FRR			
Model	Configuration	l_p	e_{top}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	d_h	s_d
MEGANT 430 x 60	Single	152	80	50	10	50	36	61	46	129	85	38	N/A
	Double	152	80	50	10	50	36	61	46	129	85	38	5

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam
6. Dimensions for FRRs are based on the threaded jaw being installed on the bottom, with the threaded rod and nut being installed from above as shown in the examples above.
7. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Primary Member Geometry Requirements - Column



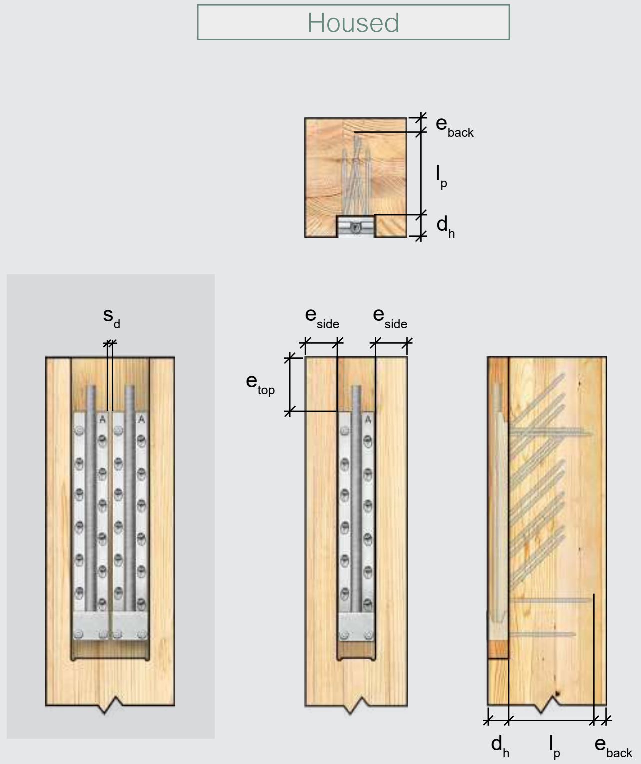


Table 3.8 - MEGANT 60 Geometry Requirements for Primary Member (Column)

MEGANT 60		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	**Configuration**			e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}		
MEGANT 430 x 60	**Single**	152	80	14	10	36	36	46	46	85	85	38	N/A
	Double	152	80	14	10	36	36	46	46	85	85	38	5

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for columns with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs are based on the threaded jaw being installed on the bottom, with the threaded rod and nut being installed from above as shown in the examples above.
7. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Detailing - MEGANT 100 Series Geometry Requirements

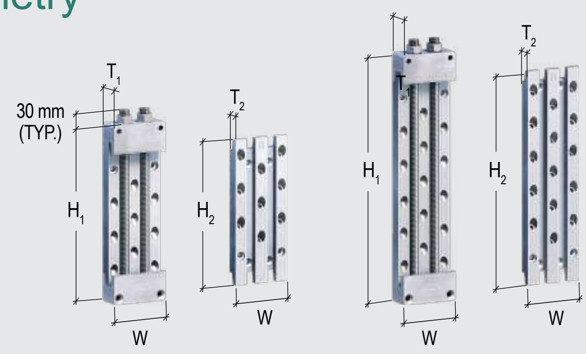
MEGANT 100 Series - Connector Geometry

Table 3.9 - MEGANT 100 Geometry

Connector Geometry	Model	
	MEGANT 310 x 100	MEGANT 430 x 100
	[mm]	
H_1	310	430
H_2	250	370
T_1	40	40
T_2	20	20
W	100	100

Note:

1. Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.



Secondary Member Geometry Requirements

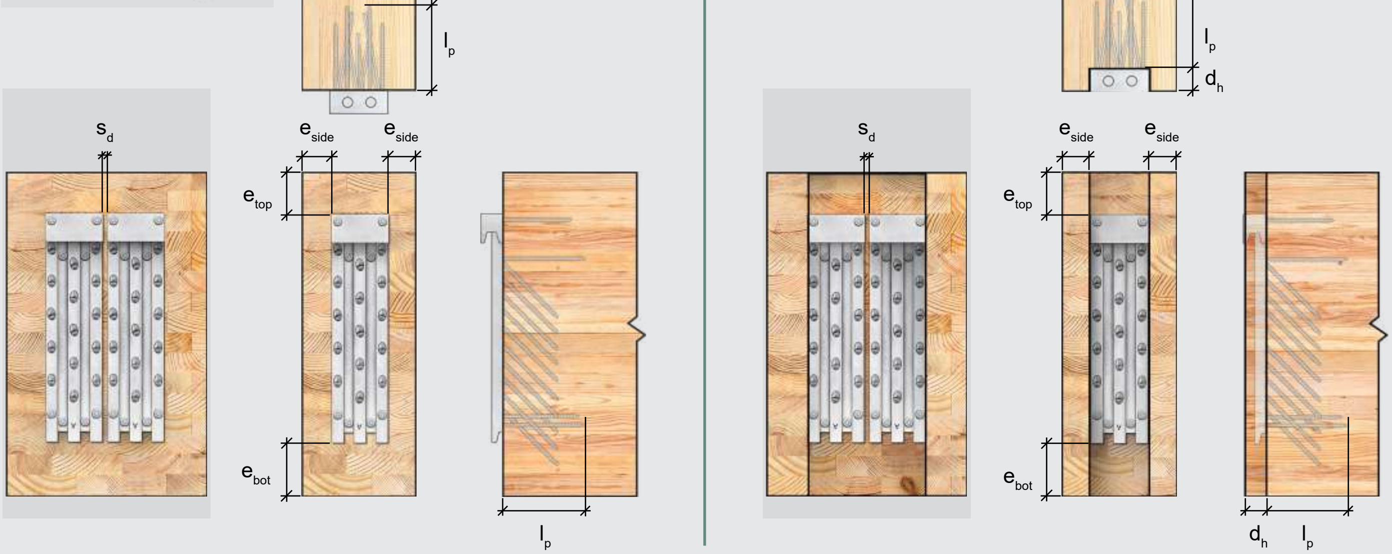
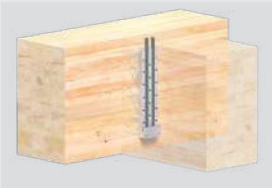


Table 3.10 - MEGANT 100 Geometry Requirements for Secondary Member

MEGANT 100		Geometry Requirements [mm]											
Model	Configuration	l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
				e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}		
MEGANT 310 x 100	Single	152	46	14	50	36	74	46	91	85	159	38	N/A
	Double	152	46	14	50	36	74	46	91	85	159	38	4
MEGANT 430 x 100	Single	152	46	14	50	36	74	46	91	85	159	38	N/A
	Double	152	46	14	50	36	74	46	91	85	159	38	4

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRRs are based on the unthreaded jaw being installed on top, with the threaded rod and nut being installed from above as shown in the examples above.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.



Primary Member Geometry Requirements - Beam/Girder

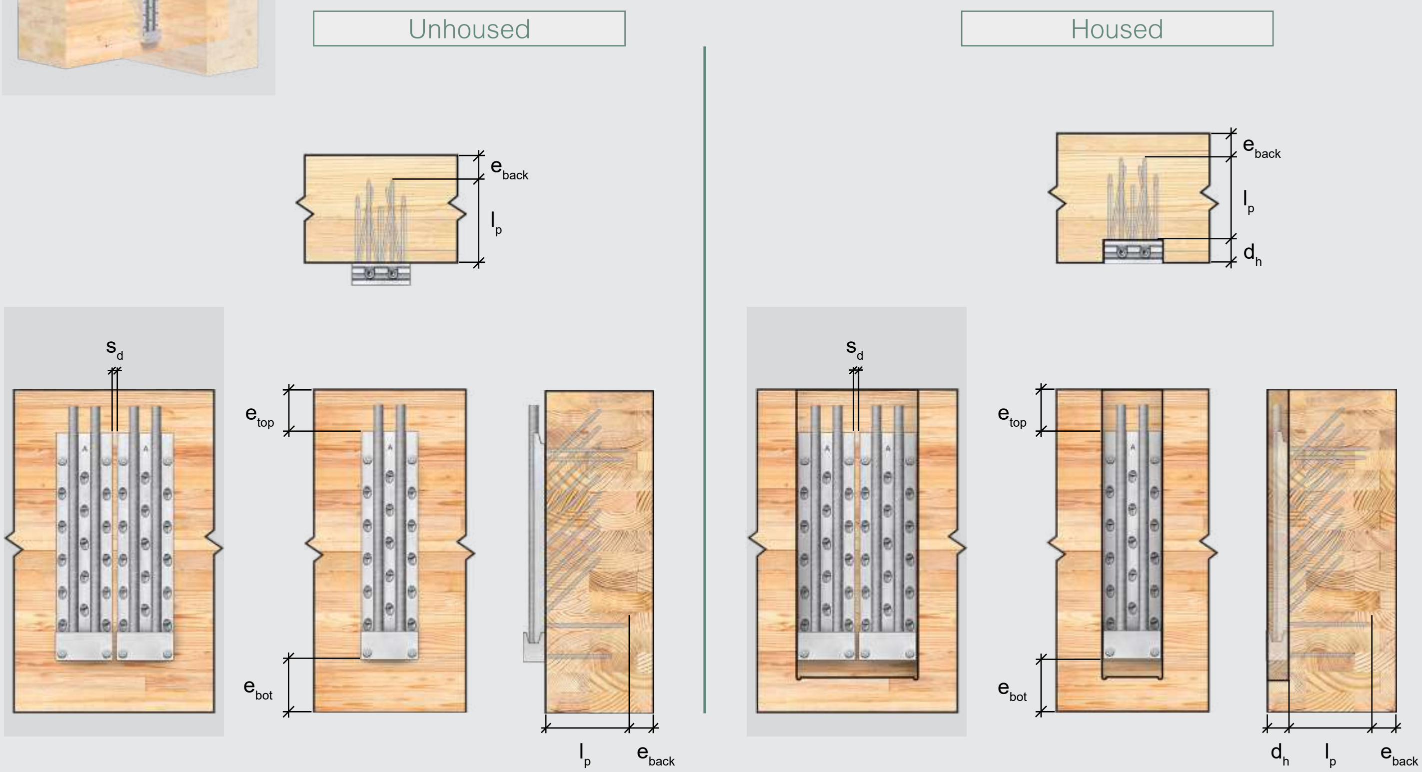


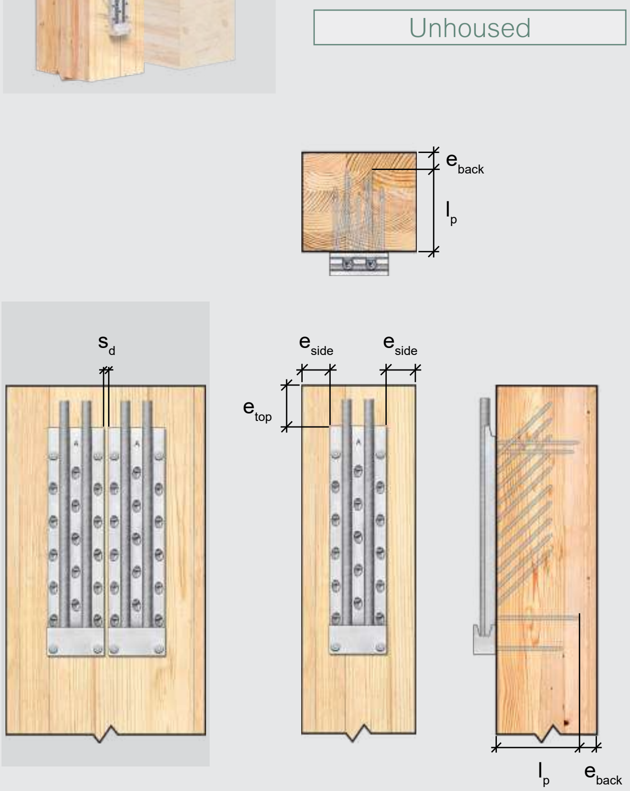
Table 3.11 - MEGANT 100 Geometry Requirements for Primary Member (Beam/Girder)

MEGANT 100		Geometry Requirements [mm]											
				No FRR		45-min FRR		1-hr FRR		2-hr FRR			
Model	Configuration	l_p	e_{top}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	d_h	s_d
MEGANT 310 x 100	**Single**	152	76	46	10	46	36	61	46	129	85	38	N/A
	Double	152	76	46	10	46	36	61	46	129	85	38	4
MEGANT 430 x 100	**Single**	152	76	46	10	46	36	61	46	129	85	38	N/A
	Double	152	76	46	10	46	36	61	46	129	85	38	4

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam
6. Dimensions for FRRs are based on the threaded jaw being installed on the bottom, with the threaded rod and nut being installed from above as shown in the examples above.
7. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Primary Member Geometry Requirements - Column



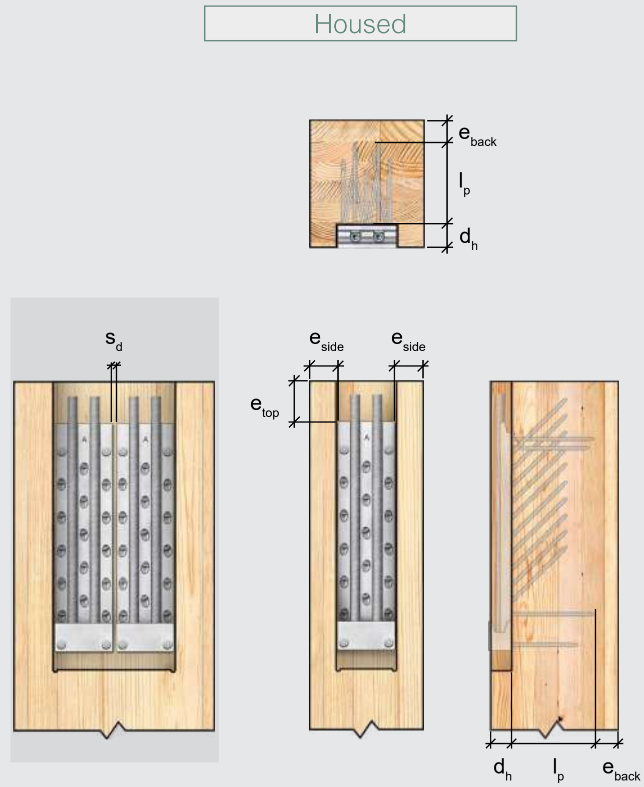


Table 3.12 - MEGANT 100 Geometry Requirements for Primary Member (Column)

MEGANT 100		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}		
MEGANT 310 x 100	**Single**	152	76	14	10	36	36	46	46	85	85	38	N/A
	Double	152	76	14	10	36	36	46	46	85	85	38	4
MEGANT 430 x 100	**Single**	152	76	14	10	36	36	46	46	85	85	38	N/A
	Double	152	76	14	10	36	36	46	46	85	85	38	4

Notes:

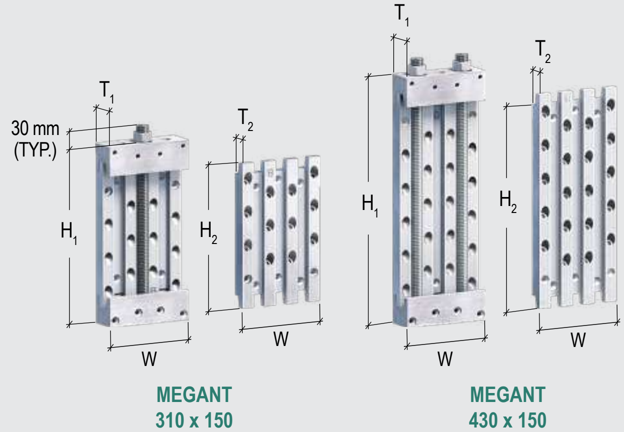
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for columns with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs are based on the threaded jaw being installed on the bottom, with the threaded rod and nut being installed from above as shown in the examples above.
7. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Detailing - MEGANT 150 Series Geometry Requirements

MEGANT 150 Series - Connector Geometry

Table 3.13 - MEGANT 150 Geometry

Connector Geometry	Model	
	MEGANT 310 x 150	MEGANT 430 x 150
	[mm]	
H_1	310	430
H_2	250	370
T_1	50	50
T_2	25	25
W	150	150



Note:
1. Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.

Secondary Member Geometry Requirements

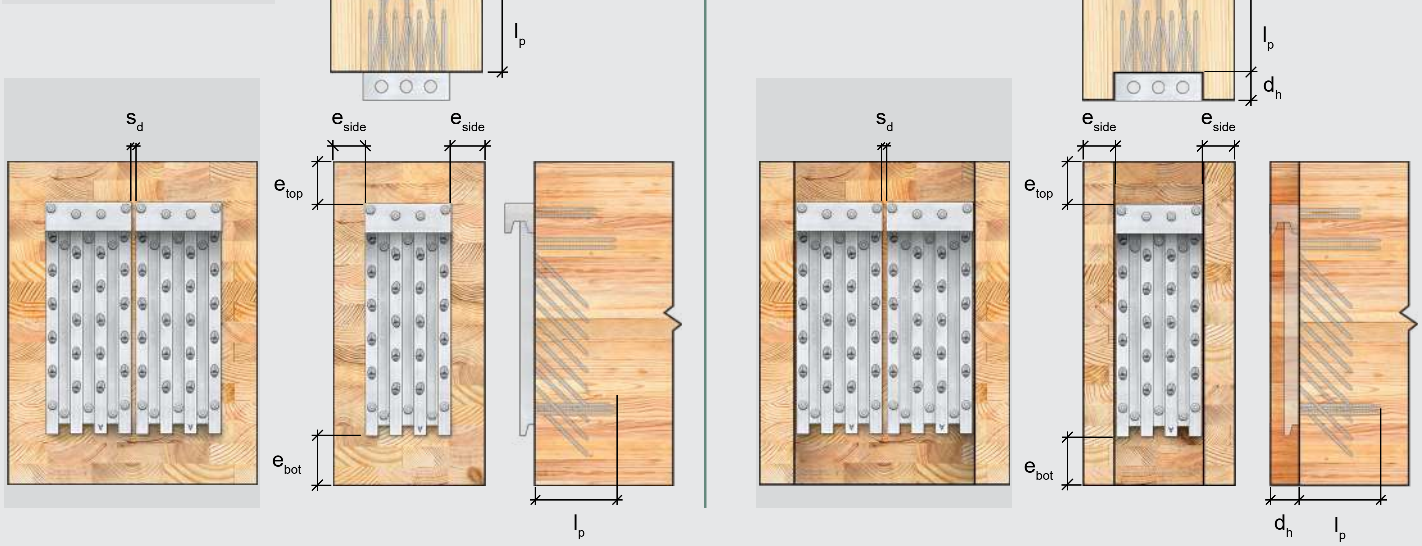
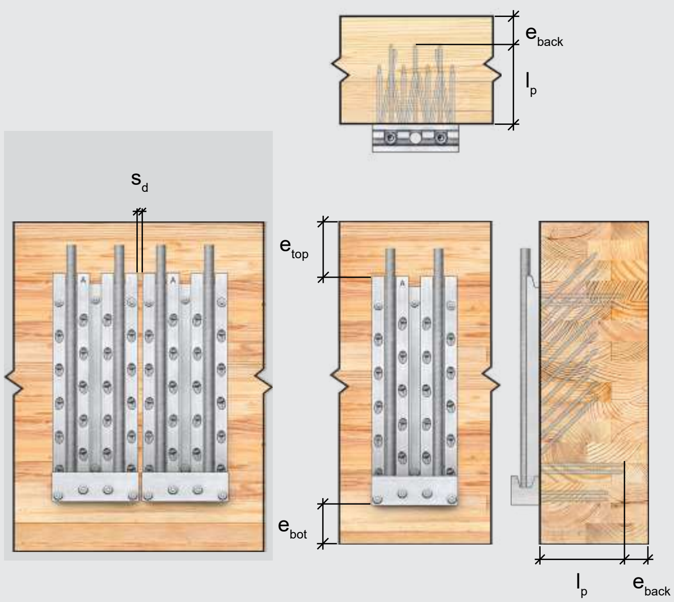


Table 3.14 - MEGANT 150 Geometry Requirements for Secondary Member

MEGANT 150		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}		
MEGANT 310 x 150	Single	147	46	14	50	36	74	46	91	85	159	48	N/A
	Double	147	46	14	50	36	74	46	91	85	159	48	4
MEGANT 430 x 150	Single	147	46	14	50	36	74	46	91	85	159	48	N/A
	Double	147	46	14	50	36	74	46	91	85	159	48	4

Notes:
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRRs are based on the unthreaded jaw being installed on top, with the threaded rod and nut being installed from above as shown in the examples above.
6. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Primary Member Geometry Requirements - Beam/Girder



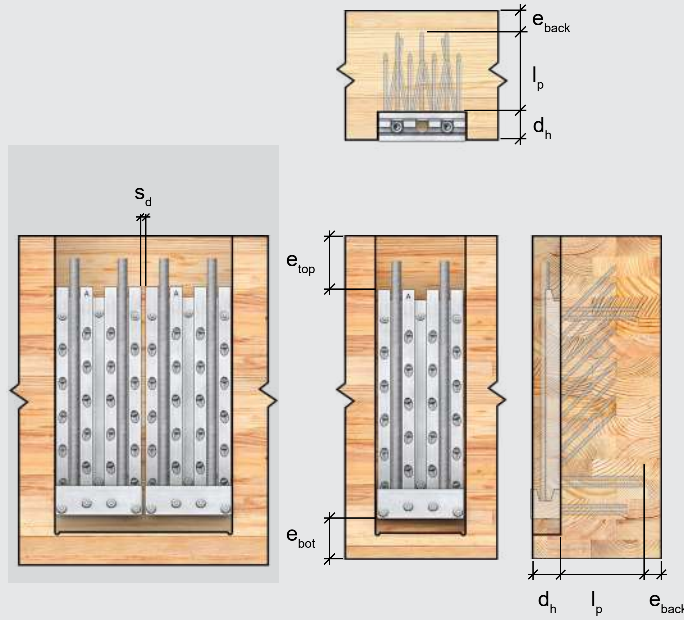


Table 3.15 - MEGANT 150 Geometry Requirements for Primary Member (Beam/Girder)

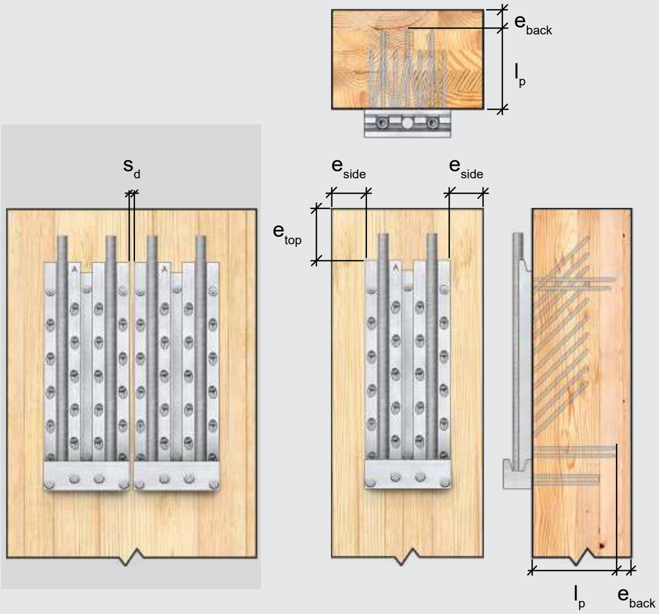
MEGANT 150		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}		
MEGANT 310 x 150	**Single**	147	76	46	10	46	36	61	46	129	85	48	N/A
	Double	147	76	46	10	46	36	61	46	129	85	48	4
MEGANT 430 x 150	**Single**	147	76	46	10	46	36	61	46	129	85	48	N/A
	Double	147	76	46	10	46	36	61	46	129	85	48	4

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam
6. Dimensions for FRRs are based on the threaded jaw being installed on the bottom, with the threaded rod and nut being installed from above as shown in the examples above.
7. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Primary Member Geometry Requirements - Column

Unhoused



Housed

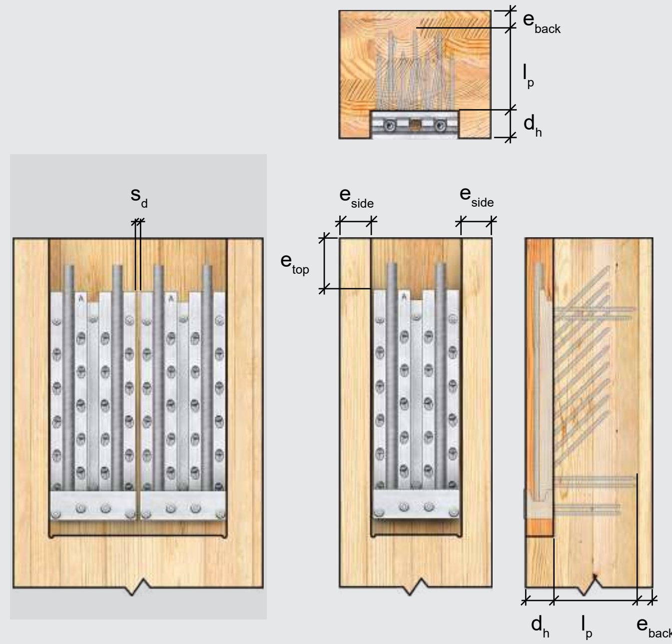


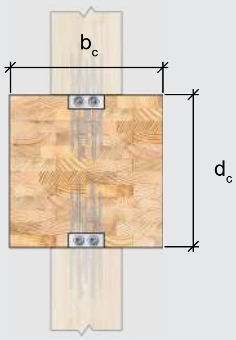
Table 3.16 - MEGANT 150 Geometry Requirements for Primary Member (Column)

MEGANT 150		Geometry Requirements [mm]											
				No FRR		45-min FRR		1-hr FRR		2-hr FRR			
Model	Configuration	l_p	e_{top}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	d_h	s_d
MEGANT 310 x 150	**Single**	147	76	14	10	36	36	46	46	85	85	48	N/A
	Double	147	76	14	10	36	36	46	46	85	85	48	4
MEGANT 430 x 150	**Single**	147	76	14	10	36	36	46	46	85	85	48	N/A
	Double	147	76	14	10	36	36	46	46	85	85	48	4

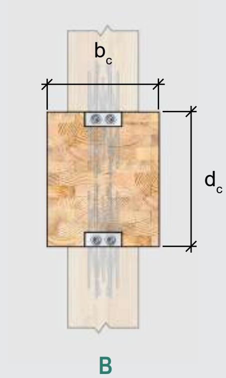
Notes:
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a recommended gap of 1.5875 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for columns with no FRR, are based on minimum end and edge distances.
5. Values for e_{top} are minimum requirements based on minimum end and edge distance, and may need to be adjusted to align with the hanger placement in the secondary beam.
6. Dimensions for FRRs are based on the threaded jaw being installed on the bottom, with the threaded rod and nut being installed from above as shown in the examples above.
7. Dimensions for FRRs other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.

Detailing - MEGANT Additional Considerations

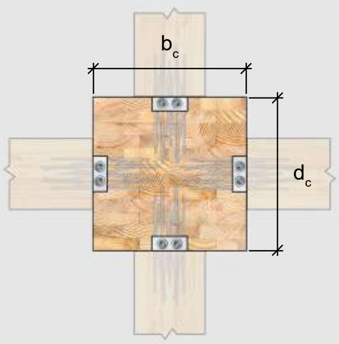
Geometry Requirements for Columns with Multiple Beam Hangers



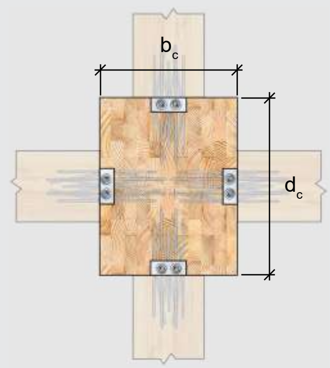
A
Hangers on Opposing Faces of a Square Column



B
Hangers on Opposing Faces of a Rectangular Column



C
Hanger on Each Face of a Square Column



D
Hanger on Each Face of a Rectangular Column

Table 3.17 - Minimum Column Sizes for Multiple MEGANT Connectors

Model	Minimum Column Section Dimensions, b_c x d_c [mm x mm]							
	A Hangers on Opposing Faces of a Square Column				B Hangers on Opposing Faces of a Rectangular Column			
	No FRR	45-min FRR	1-hr FRR	2-hr FRR	No FRR	45-min FRR	1-hr FRR	2-hr FRR
MEGANT 60 Series	394 x 394	394 x 394	394 x 394	394 x 394	89 x 394	133 x 394	152 x 394	230 x 394
MEGANT 100 Series	394 x 394	394 x 394	394 x 394	394 x 394	128 x 394	173 x 394	192 x 394	270 x 394
MEGANT 150 Series	404 x 404	404 x 404	404 x 404	404 x 404	178 x 404	223 x 404	242 x 404	320 x 404

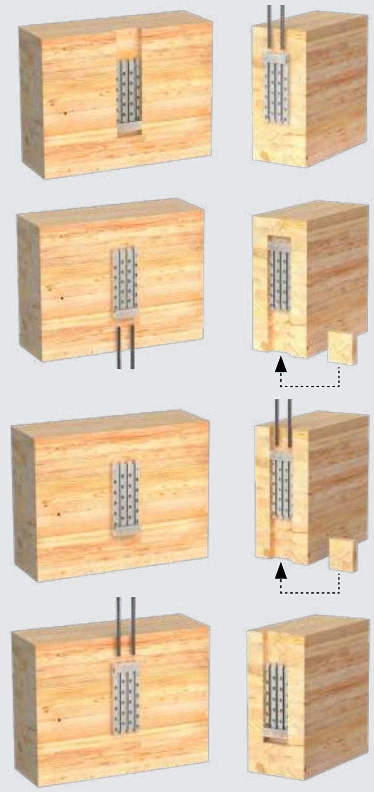
Model	Minimum Column Section Dimensions, b_c x d_c [mm x mm]							
	C Hanger on Each Face of a Square Column				D Hangers on Each Face of a Rectangular Column			
	No FRR	45-min FRR	1-hr FRR	2-hr FRR	No FRR	45-min FRR	1-hr FRR	2-hr FRR
MEGANT 60 Series	399 x 399	399 x 399	399 x 399	399 x 399	394 x 403	394 x 403	394 x 403	394 x 403
MEGANT 100 Series	439 x 439	439 x 439	439 x 439	439 x 439	394 x 446	394 x 446	394 x 446	394 x 446
MEGANT 150 Series	495 x 495	495 x 495	495 x 495	495 x 495	404 x 553	404 x 553	404 x 553	404 x 553

Notes:

1. Tabulated column section dimensions are minimum values based on a 12.7 mm *[1/2 in.]* clearance between screw tips, minimum edge and end distances, and minimum wood cover requirements for FRR. Refer to Geometry Requirements for further details.
2. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
3. Tabulated column section dimensions assume hangers are centered within each column face and are housed in the column as shown.

Detailing - MEGANT Housing Details

Housing Possibilities



Primary Beam Housing

- Most common housing for concealed installation.
- Concealed from below, the rod(s) can be installed from the top down.

Secondary Beam Housing

- Joist housing from bottom up.
- Concealed from below with a wood plug, requiring the rod(s) to be installed from bottom up.

Secondary Beam Through Housing

- Full-depth housing in joist.
- Concealed from below with a wood plug, the rod(s) can still be installed from the top.

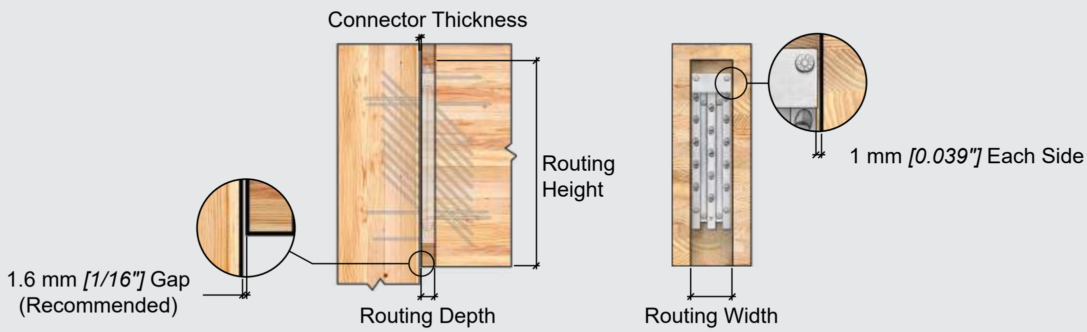
Secondary Beam Top Housing

- Joist housing from top down. Concealed from below. No wood plug required.
- Threaded rod(s) can be installed from top down.

Housing and Surface Detailing

Parallel Surface: The members must be parallel at the location of the connection to ensure proper hanger alignment and load transfer.

Gap Size: The gap size between wood members balances installation ease and fire performance, with larger gaps simplifying installation but reducing fire protection. A gap of 1.6 mm *[1/16 in.]* is recommended for proper installation to allow the secondary member to slide into place. The gap should be no more than 3.2 mm *[1/8 in.]* to address fire protection considerations. For more information, refer to Appendix A: Fire Protection (Page 115).



Routing Depth: The routing depth is the depth of the housing, d_h, noted in the Geometry Requirements and Housing Dimensions sections. This depth takes into account the thickness of the connector and the gap between members (recommended 1.6 mm *[1/16 in.]* herein—larger gaps will reduce d_h accordingly).

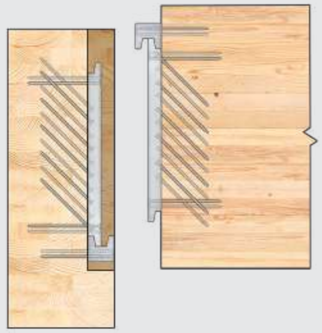
Routing Width: It is recommended to allow a clearance of 1 mm *[0.039 in.]* on each side of the connector:

- MEGANT 60 Series: 62 mm *[2.441 in.]*
- MEGANT 100 Series: 102 mm *[4.016 in.]*
- MEGANT 150 Series: 152 mm *[5.984 in.]*

Routing Height: The routing height must be coordinated with the EOR. The height of the connector in the beam section has an impact on connector performance. Refer to Positioning Considerations for Reinforcement (Page 65) for further information.

Detailing - MEGANT Housing Dimensions

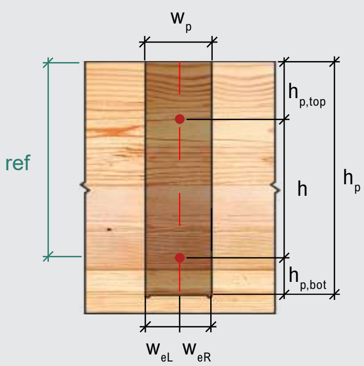
Routing in Primary Member



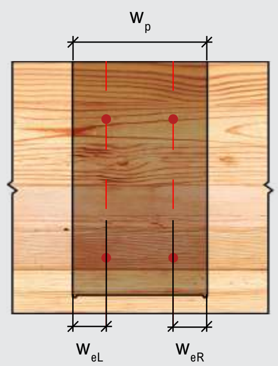
Fastener Orientation

● Structural Positioning Screws
(Refer to Fastener Layout on Page 80)

Side View



Single Configuration



Double Configuration

Top View

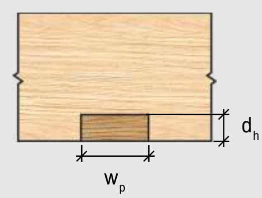


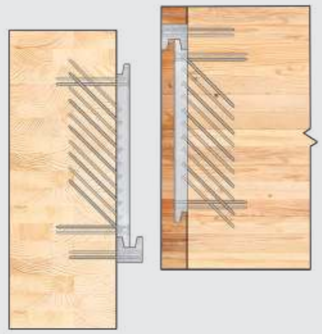
Table 3.18 - Routing Dimensions for MEGANT Housed in Primary Member

Model	Routing Dimensions, mm *[in.]*								
	h_p	$h_{p,top}$	h	$h_{p,bot}$	w_p Single	w_p Double	w_{eL}	w_{eR}	d_h
MEGANT 430 x 60	**503** *[19.803]*	**120** *[4.724]*	**290** *[11.417]*	**92** *[3.622]*	**62** *[2.441]*	**126.5** *[4.980]*	**31** *[1.220]*	**31** *[1.220]*	**38** *[1.512]*
MEGANT 310 x 100	**379** *[14.921]*	**111** *[4.370]*	**170** *[6.693]*	**97** *[3.819]*	**102** *[4.016]*	**206** *[8.110]*	**31** *[1.220]*	**71** *[2.795]*	**38** *[1.512]*
MEGANT 430 x 100	**499** *[19.646]*	**111** *[4.370]*	**290** *[11.417]*	**97** *[3.819]*	**102** *[4.016]*	**206** *[8.110]*	**31** *[1.220]*	**71** *[2.795]*	**38** *[1.512]*
MEGANT 310 x 150	**379** *[14.921]*	**121** *[4.764]*	**170** *[6.693]*	**87** *[3.425]*	**152** *[5.984]*	**306** *[12.047]*	**76** *[2.992]*	**76** *[2.992]*	**48** *[1.906]*
MEGANT 430 x 150	**499** *[19.646]*	**121** *[4.764]*	**290** *[11.417]*	**87** *[3.425]*	**152** *[5.984]*	**306** *[12.047]*	**76** *[2.992]*	**76** *[2.992]*	**48** *[1.906]*

Notes:

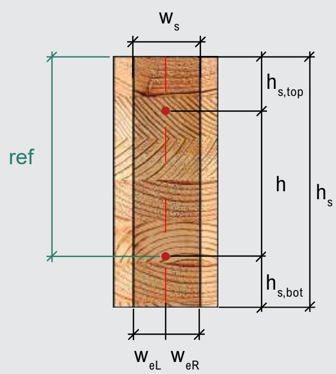
1. Tabulated values are general guidelines for routing requirements. The EOR and fabricator are responsible for ensuring final routing dimensions account for all project-specific conditions.
2. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for h are fixed. Tabulated values for d_h are maximum allowable.
3. Tabulated values for w_p, w_{eL}, and w_{eR} account for 1 mm *[0.039 in.]* on each side of the hanger. Larger installation tolerances will increase width values accordingly.
4. Tabulated values are based on a gap of 1.6 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
5. Tabulated values for h_p, $h_{p,top}$, and $h_{p,bot}$ account for a 30 mm *[1.181 in.]* gap above the connector for the nut assembly to allow for proper installation. The resulting hidden void should be protected from fire using industry-approved methods. Larger installation tolerances will increase height measurements accordingly.
6. Tabulated values assume square corners. Manufacturers should adjust the tabulated values based on their specific routing bit sizes. In order to account for the round corner created by routing tools, 6 mm *[1/4 in.]* overrun is permitted at the inside corners as indicated on the image above.
7. Refer to the Geometry Requirements tables for each respective beam hanger for additional information.

Routing in Secondary Member

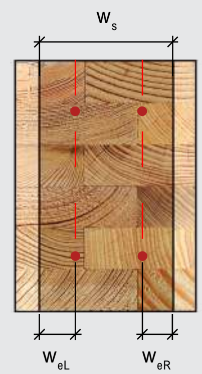


Fastener Orientation
● Structural Positioning Screws
(Refer to Fastener Layout on Page 80)

Side View



Single Configuration



Double Configuration

Top View

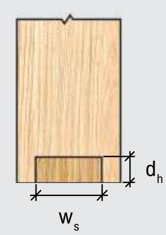


Table 3.19 - Routing Dimensions for MEGANT Housed in Secondary Member (Beam-End)

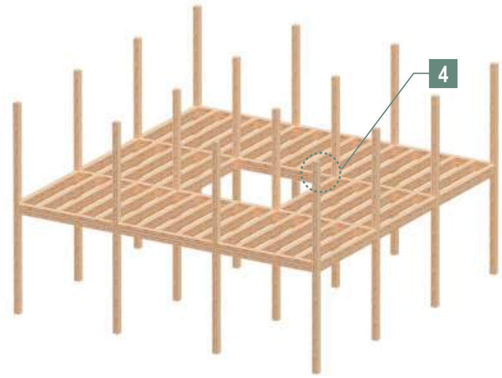
Model	Routing Dimensions, mm *[in.]*								
	h_s	$h_{s,top}$	h	$h_{s,bot}$	w_s Single	w_s Double	w_{eL}	w_{eR}	d_h
MEGANT 430 x 60	**530** *[20.866]*	**120** *[4.724]*	**290** *[11.417]*	**120** *[4.724]*	**62** *[2.441]*	**126.5** *[4.980]*	**31** *[1.220]*	**31** *[1.220]*	**38** *[1.512]*
MEGANT 310 x 100	**376** *[14.803]*	**121** *[4.764]*	**170** *[6.693]*	**85** *[3.346]*	**102** *[4.016]*	**206** *[8.110]*	**71** *[2.795]*	**31** *[1.220]*	**38** *[1.512]*
MEGANT 430 x 100	**496** *[19.528]*	**121** *[4.764]*	**290** *[11.417]*	**85** *[3.346]*	**102** *[4.016]*	**206** *[8.110]*	**71** *[2.795]*	**31** *[1.220]*	**38** *[1.512]*
MEGANT 310 x 150	**376** *[14.803]*	**111** *[4.370]*	**170** *[6.693]*	**95** *[3.740]*	**152** *[5.984]*	**306** *[12.047]*	**76** *[2.992]*	**76** *[2.992]*	**48** *[1.906]*
MEGANT 430 x 150	**496** *[19.528]*	**111** *[4.370]*	**290** *[11.417]*	**95** *[3.740]*	**152** *[5.984]*	**306** *[12.047]*	**76** *[2.992]*	**76** *[2.992]*	**48** *[1.906]*

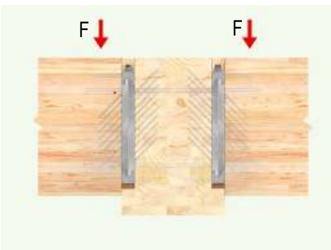
Notes:

1. Tabulated values are general guidelines for routing requirements. The EOR and fabricator are responsible for ensuring final routing dimensions account for all project-specific conditions.
2. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for h are fixed. Tabulated values for d_h are maximum allowable.
3. Tabulated values for w_s, w_{eL}, and w_{eR} account for 1 mm *[0.039 in.]* on each side of the hanger. Larger installation tolerances will increase width values accordingly.
4. Tabulated values are based on a gap of 1.6 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
5. Tabulated values for h_s, $h_{s,top}$, and $h_{s,bot}$ account for a 22 mm *[0.866 in.]* gap below the clamping jaw and an additional 30 mm *[1.181 in.]* above the connector for the nut assembly to allow for proper installation. The resulting hidden void should be protected from fire using industry-approved methods. Larger installation tolerances will increase height measurements accordingly.
6. Tabulated values assume square corners. Manufacturers should adjust the tabulated values based on their specific routing bit sizes in order to account for the round corner created by routing tools, 6 mm *[1/4 in.]* overrun is permitted at the inside corners as indicated on the image above.
7. Refer to the Geometry Requirements tables for each respective beam hanger for additional information.

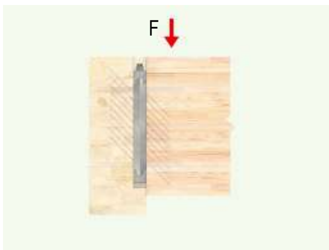
Installation - MEGANT Configurations

Possible Installation Configuration for MEGANT

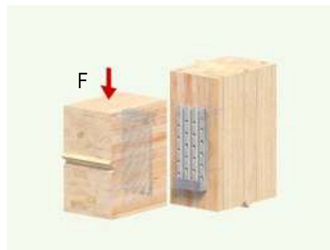




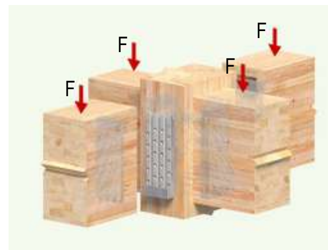
1 Multiple Beams-to-Girder



2 Beam-to-Girder

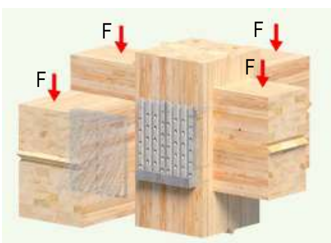


3 Beam-to-Column



4 Multiple Beams-to-Column

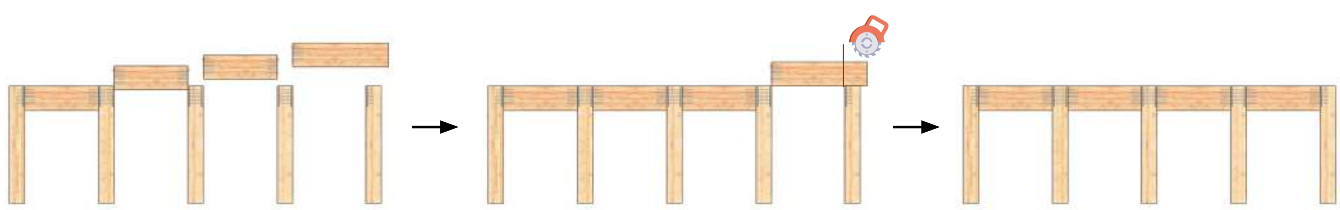
Alternative Ways to Connect



Double MEGANT

Beam Length Tolerances and Sequencing

Installation sequencing is important, especially for buildings with multiple bays of post-and-beam framing. It is recommended to install the beams starting from one end of the building and progressing along the column line. The last beam can be produced slightly over length and cut to size on-site to help mitigate any dimensional tolerance challenges. The MEGANT can be installed from above, below, or either side.

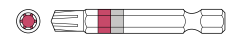


Installation - MEGANT General Requirements

Tool Requirements

Tools - Use the Correct Bit

MTC Solutions fasteners should only be driven using either RW bits or appropriately sized star bits. This ensures good centering and positioning with optimal torque transmission. For the MEGANT, use an RW 40 bit for 8 mm *[5/16 in.]* MTC-FTC screws.



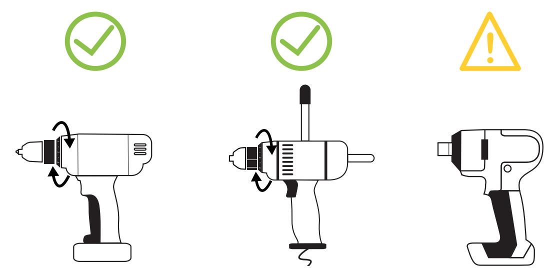
RW 40

Tools - Use the Correct Drill

Use low-RPM, high-torque drills equipped with a feather (variable speed) trigger to install fasteners. Avoid excessive acceleration and deceleration during the drive-in process. Do not overtorque fasteners. Although impact guns are not expressly prohibited, their use is discouraged - particularly for beam hanger systems - due to an increased risk of overtorquing. Use the appropriate drill chuck size according to the fastener.

Table 3.20 - Recommended Torque, Drill Bits, and Power Drill

Nominal Fastener Diameter [D]		HSS Drill Bit Size		Power Drill Voltage	Allowable Insertion Torque	
mm	*[in.]*	mm	*[in.]*	V	N · m	*[lb. ft.]*
8	*[5/16]*	5	*[3/16]*	20	16.67	*[12.30]*



Cordless Clutched Drill

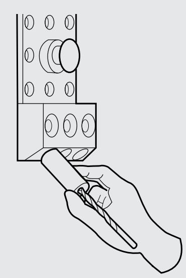
Double Handle Drill

Impact Drill

Tools - Predrilling Jig 5 mm *[3/16 in.]*

The Predrilling Jig ensures precise alignment of the RICON S VS XL 30° inclined fasteners. It guides the drill bit to create accurate pilot holes, and ensures proper fastener seating. The hole in the jig accommodates standard imperial and metric drill bit diameters. For the 8 mm *[5/16 in.]* inclined fasteners, pilot holes 5 mm *[3/16 in.]* in diameter and 25 mm *[1 in.]* long are recommended.

Predrilling Jig 5 mm *[3/16"]*

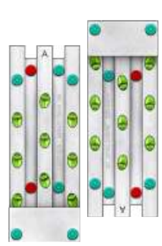


Fastener Layout

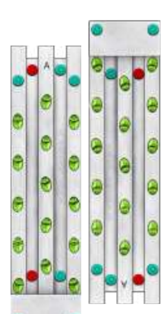
Fastener Orientation

- Structural Positioning Screws
- Horizontal Screws
- Inclined Screws

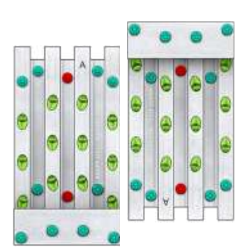
MEGANT 430 x 60



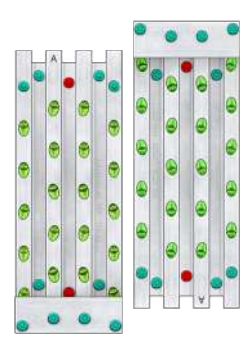
MEGANT 310 x 100



MEGANT 430 x 100



MEGANT 310 x 150



MEGANT 430 x 150

Installation - MEGANT Guidelines

General Installation Steps

Estimated Installation Time

The estimated installation time for a single person to install a complete MEGANT product is shown in Table 3.21.

This process includes the following steps:

1. Layout (~5-10%)
2. Positioning (~5-15%)
3. Pilot Holes (~20-30%)
4. Screw Installation (~40-50%)
5. Clamping Jaw Installation (~15-25%)
6. Optional Measures (not included in the time installation % breakdown)

Table 3.21 - MEGANT Estimated Installation Times

Megant Model	Average Installation Time [min.]
430 x 60	21
310 x 100	23
430 x 100	27
310 x 150	31
430 x 150	37

The estimated time can be improved upon with efficient fabrication and site practices such as:

1. Drilling pilot holes for the structural positioning screws at the time of fabrication
2. Utilizing templates to drill pilot holes for structural screws
3. Optimizing beam positioning to reduce work fatigue

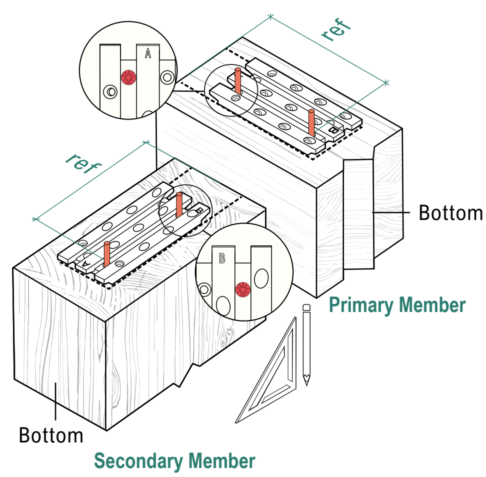
Step-by-Step Installation Guidelines

1.1 Layout - Reference Points

Begin by laying out the locations of the beam hanger on the primary and secondary members using a pencil and square. Position the MEGANT's plates for installation, ensuring the proper orientation is set on both the primary and secondary members. Each MEGANT plate is marked with an "A" on one end and a "B" on the opposite end.

- The "A" shall be oriented towards the top of the primary member
- The "B" shall be oriented towards the top of the secondary member

Note: When the inclined screws are installed, they will incline towards the end of the plate marked with an "A". It is critical to lay the pieces out in the correct orientation on both members, as the capacity of the hanger is dependent on the withdrawal of the fasteners in this orientation.

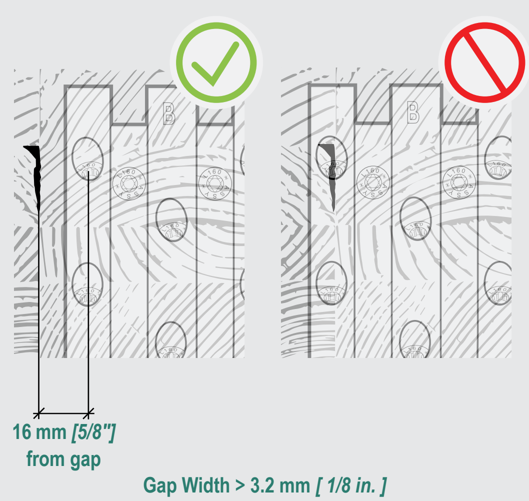


1.2 Layout - Split Lamination Considerations

It is recommended that vertical joints in split lamination glulam beams be tight at the time of manufacturing. Gaps between adjacent plies may occur due to wood shrinkage. Gaps up to 3.2 mm *[1/8 in.]* are acceptable for typical single-configuration MEGANT installation.

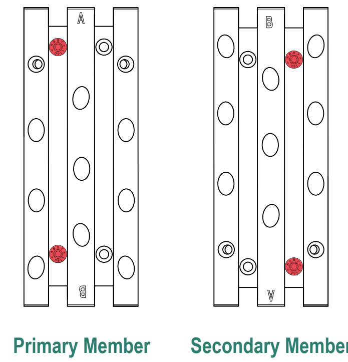
If gaps greater than 3.2 mm *[1/8 in.]* exist in the beam-end, the MEGANT shall be positioned so that fasteners can be installed at least 16 mm [5/8 in.] away from those gaps, as measured fron the center of the fastener.

Note: Double-configuration installations require glued bond between plies; gaps and voids are **not** permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.



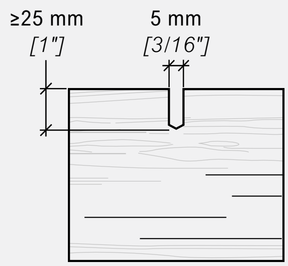
2.1 Positioning - Structural Positioning Screw Installation

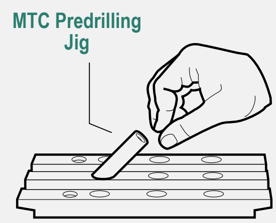
Positioning screws ensure accurate placement of the MEGANT connector. To improve accuracy and reduce installation time, it is recommended to predrill the structural positioning screw locations during member fabrication. Note that structural screws cannot be reused if the connector requires adjustment. Install one structural positioning screw into the hole highlighted at the top of the plate. Check to ensure alignment is maintained, and then install the second structural positioning screw into the hole highlighted at the bottom of the plate.



3.1 Pilot Holes - Recommendations

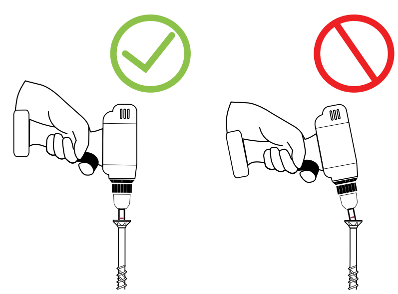
Pilot holes are optional; however, they allow for faster screw thread engagement, help reduce splitting risks, ensure a proper penetration path which reduces screw wandering, and reduce insertion torque. For the structural fasteners used with the MEGANT series, pilot holes 5 mm *[3/16 in.]* in diameter and 25 mm *[1 in.]* in length are recommended. The use of MTC Predrilling Jig for the inclined screws is recommended to ensure proper hole placement.





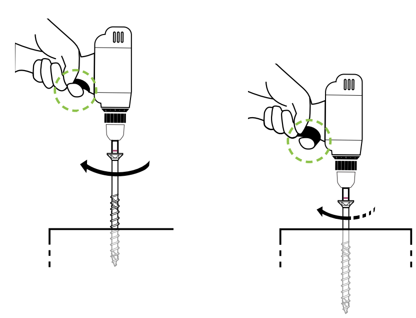
4.1 Screw Installation - Align Drill Bit Axis

Align the driver bit axis parallel to the fastener axis during installation to allow proper torque transmission and to avoid stripping.



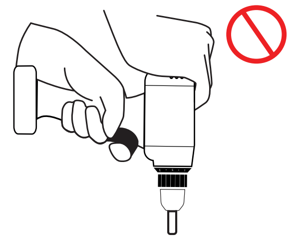
4.2 Screw Installation - Decrease RPM

To avoid overtorquing the screw, decrease the rotation speed about 12.7 mm *[1/2 in.]* away from the final installed position. This is crucial to prevent wood crushing due to overtorquing, which can impact beam hanger tolerances, potentially impeding overall connection assembly. This is especially important when using an impact drill.



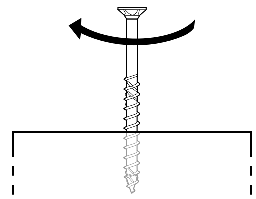
4.3 Screw Installation - Drill Pressure

Do not apply excessive pressure on the drill while driving the fastener to prevent fastener buckling or deviation during installation. Only apply the required force or use the recommended holder case to eliminate cam-out effects.



4.4 Screw Installation - One-Step Process

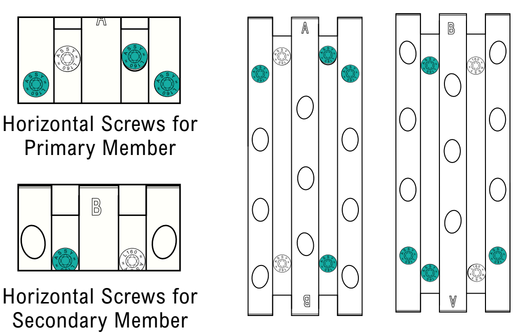
To avoid increased torque peaks caused by stopping and restarting the drive-in process, install the screw in one run until the head is lightly seated against the side member. If necessary, a torque wrench may be used to complete installation immediately after the screw has been driven.



4.5 Screw Installation - Remaining Shear Screws

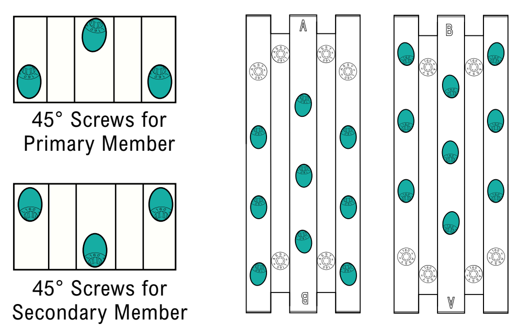
Install 8 x 160 mm *[5/16 x 6-1/4 in.]* MTC-FTC screws in the remaining horizontal holes, beginning adjacent to the structural positioning screws.

Note that some of the horizontal screws are angled inward by 15°.



4.6 Screw Installation - Inclined Screws

Install 8 x 160 mm *[5/16 x 6-1/4 in.]* MTC-FTC screws in all inclined holes after all horizontal screws have been installed.



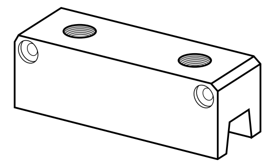
5.1 Clamping Jaws - General Information

Clamping jaws should be installed on each end of the connector plates with the countersunk holes facing away from the beam. Each MEGANT product kit comes with:

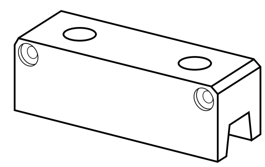
- One clamping jaw with threaded holes
- One clamping jaw with smooth/unthreaded holes

The threaded rods, without tightening, may be used to ensure both jaws are correctly positioned.

The unthreaded clamping jaw must remain accessible for tightening the connector plates together.

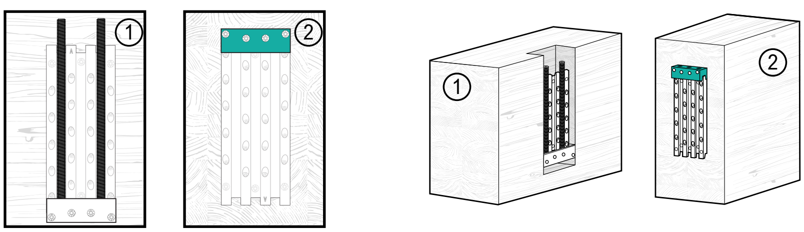


Threaded Clamping Jaw

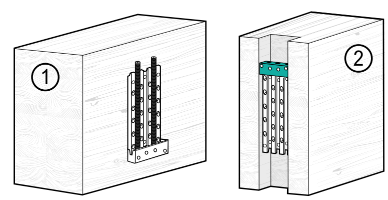


Unthreaded Clamping Jaw

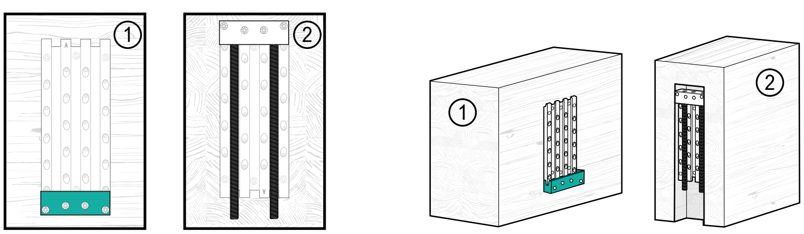
Drop-down Installation



Primary Member Housing



Secondary Member Through Housing



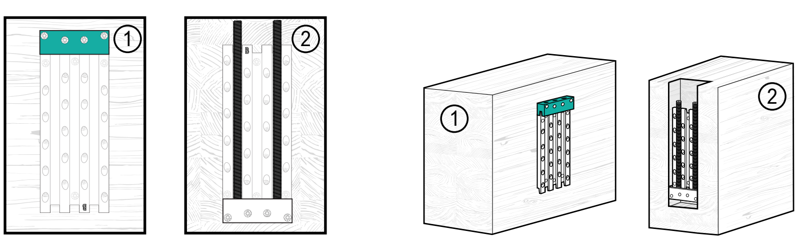
Secondary Member Bottom Housing

- Unthreaded Clamping Jaw
- ① Primary Member
- ② Secondary Member

Notes:

1. With through housing, the unthreaded jaw can be at either the top or bottom depending on access

Bottom-up Installation

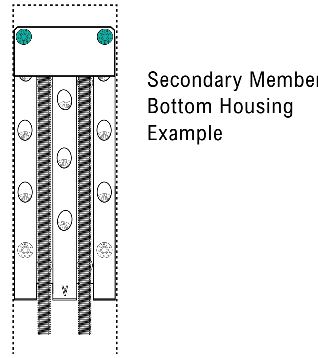


Secondary Member Top Housing

5.2 Clamping Jaws - Threaded Jaw Installation

Install the threaded clamping jaw on the housed member at the closed end with the grooved side seated firmly against the tongue of the connector plate. Insert the threaded rod(s) to help position the jaw on the connector plate.

Drill 5 mm x 25 mm *[3/16 in. x 1 in.]* pilot holes at the jaw screw locations, and then install MTC-FTC screws to secure the clamping jaw. Remove the threaded rod(s) and retain them for Step 5.3.

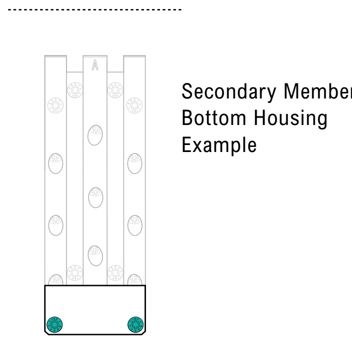


Clamping Jaw Screws, Secondary Member

5.3 Clamping Jaws - Unthreaded Jaw Installation

Install the unthreaded clamping jaw on the unhoused member at the same plate label (i.e., both jaws will be installed on either "A" end or "B" end). Insert the threaded rod(s) to help position the jaw on the connector plate.

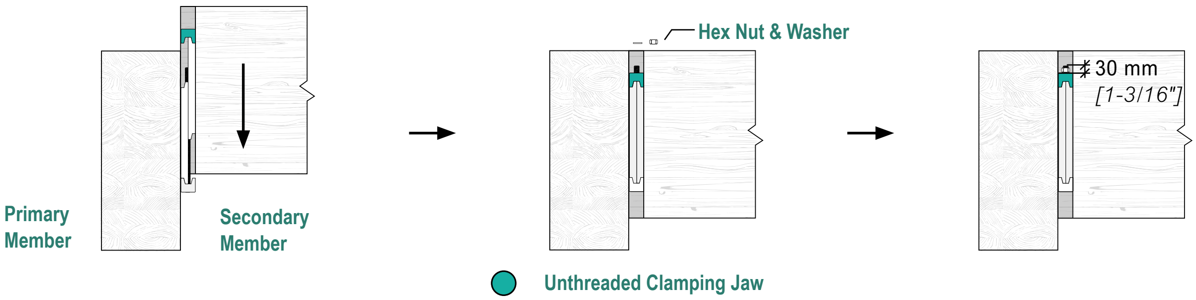
Drill 5 mm x 25 mm *[3/16 in. x 1 in.]* pilot holes at the jaw screw locations, and then install MTC-FTC screws to secure the clamping jaw. Remove the threaded rod(s) and retain them for Step 5.4.



Clamping Jaw Screws, Primary Member

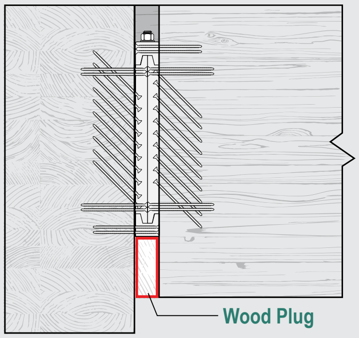
5.4 Clamping Jaws - Connecting the MEGANT Plates

Slide the two connector plates together. While the beam is unloaded, insert the rods through the unthreaded clamping jaw and until they are flush with the surface of the jaw. At this point, the threaded rod will be 30 mm *[1-3/16 in.]* proud of the unthreaded jaw. Each threaded rod is equipped with a hexagonal recess at one end. The end without this recess must be inserted into the threaded clamping jaw, allowing the accessible end to be turned using a hex key. Install the washer and nut on each rod. Tighten the nut to the recommended installation torque of 40 N.m. *[29.5 lb.·ft.]*.



6.1 Optional Measures - Wood Plug

Where connectors are housed in the secondary beam, it is recommended to fill in the routed void below the connector for aesthetics and fire protection. A wood plug may be used, and installation instructions shall be provided by the Engineer of Record.



APEX

Pre-Engineered Connection System

The APEX is a pre-engineered beam-to-column and beam-to-beam concealed connector designed for mass timber applications. Engineered, manufactured, and tested in North America, it is the highest capacity pre-engineered concealed beam hanger on the market. Engineered for efficient installation, it accommodates construction tolerances while providing a reliable, high-performance connection.

TESTED & PROVEN

MADE IN CANADA

UP TO 227 kN LSD

Exceptional Load Capacity

Highest off-the-shelf capacities available—making longer spans and heavier loads easily attainable

Fire-Resistance-Rated

Fire-resistance rating up to 2 hours per CSA O86:24

Interstory Drift Performance-Tested

Drift performance exceeding 4% while loaded verified through quasi-static rotational testing—supporting seismic design loads

Robust Installation Tolerances

Built-in axial, horizontal, and rotational tolerances (±3.2 mm and ±0.5°) enable true drop-in installation, accommodating variation and misalignments with a secure fit

Efficient Logistics & Reliable Supply

Locally manufactured in Canada and the U.S. for shorter lead times, reduced delay risk, and a more responsive supply chain—helping projects stay on schedule

Simple, Fast, Drop-In Installation

Easy installation from identical plates and a pre-engineered screw pattern, faster installs, and tolerance-friendly drop-in fit—all contributing to a safer job site and lower labor costs

Design

- Wood-to-Wood Design Values
- Seismic Performance
- Hanger Placement Considerations
- Sloped and Skewed Design

Detailing

- APEX 100 Series Geometry Requirements
- APEX 150 Series Geometry Requirements
- Additional Detailing Considerations
- Housing Details and Dimensions

Installation

- Installation Configuration
- APEX Tolerances
- Tool Requirements
- Fastener Layout
- Step-by-Step Guidelines

STANDARDS

ASTM D7147	CSA O86:24

Canadian Engineered. Unrivaled Strength.

The new standard in mass timber connections is here, and it's proudly **Canadian engineered, manufactured, and tested**. The APEX beam hanger is the result of fifteen years of expertise and four years of dedicated research and development by our MTC engineering team, focused on innovation and growth.

Rigorously tested and designed to CSA O86:24, APEX is now the new state-of-the-art beam-to-column and beam-to-girder connection for mass timber, available on demand.

This new product represents a commitment from MTC Solutions to the industry: to provide more locally manufactured products. This approach changes the game for Canadian mass timber projects by improving project costs, enhancing supply chain reliability, and reducing the environmental impact.

American Made, Tested & Proven

The APEX beam hanger is also proudly manufactured in the USA from high-grade aluminum, offering American projects a decisive advantage by solving critical supply chain challenges.

This system eliminates tariff uncertainty and drastically reduces procurement lead times with a high-performance connector available locally and on demand. The result is significant cost savings, unwavering supply chain reliability, and the uncompromising quality of American manufacturing.

APEX Overview

Table 4.1 - APEX Hardware Package Installation Overview

APEX		Plate Qty.	Fasteners				Installation Time
			Primary Member		Secondary Member		
Series	Model		Type	Qty.	Type	Qty.	min.
100	APEX S	2	MTC-FTC 10 x 200 mm	17	MTC-FTC 10 x 200 mm	17	13
	APEX M	2	MTC-FTC 10 x 200 mm	20	MTC-FTC 10 x 200 mm	20	15
150	APEX L	2	MTC-FTC 10 x 200 mm	29	MTC-FTC 10 x 200 mm	29	20
	APEX XL	*Coming soon*					

One Installer
With Pilot Holes

Product Kit Details

Notes:

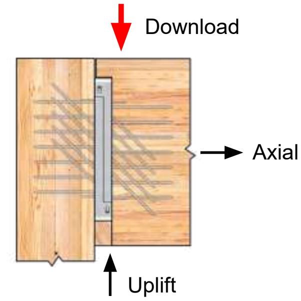
1. Subsequent tabulated capacities in this chapter assume connectors are installed with MTC-FTC (see Table 1.1 on Page 13) fasteners specified in this table and in accordance with CCMC 13677-R..
2. The estimated installation time is based on a time study and includes steps for layout and positioning, installation of nonstructural positioning screws, drilling a 25 mm *[1 in.]* deep pilot hole for each fastener, and structural screw installation for both plates. Refer to Page 105 for more information.
3. Each product kit includes four 6 x 80 mm *[1/4 x 3-1/8 in.]* MTC-PTC (see Table 1.1 on Page 13) nonstructural positioning screws.

Design - APEX Technical Information

Wood-to-Wood Design Values

Table 4.2 - Factored Resistances for APEX Series in Wood-to-Wood Connections

APEX		Minimum Secondary Beam Section Dimensions [mm]				Relative Density [G]	Factored Resistance [kN]	
Model	Configuration	No FRR	45-min FRR	1-hr FRR	2-hr FRR		Download	Axial
APEX S	Single	113 x 504	174 x 533	194x 549	272 x 617	≥ 0.42	159	13
						≥ 0.44	168	14
						≥ 0.46	171	15
						≥ 0.49	171	17
	Double	196 x 504	282 x 533	301 x 549	379 x 617	≥ 0.42	270	23
						≥ 0.44	286	24
						≥ 0.46	291	26
						≥ 0.49	291	30
APEX M	Single	113 x 564	174 x 593	194 x 609	272 x 677	≥ 0.42	190	13
						≥ 0.44	201	14
						≥ 0.46	211	16
						≥ 0.49	211	18
	Double	196 x 564	282 x 593	301 x 609	379 x 677	≥ 0.42	323	23
						≥ 0.44	342	24
						≥ 0.46	358	26
						≥ 0.49	358	30
APEX L	Single	166 x 444	225 x 479	244 x 495	322 x 563	≥ 0.42	210	24
						≥ 0.44	222	25
						≥ 0.46	227	28
						≥ 0.49	227	32
	Double	302 x 444	383 x 479	403 x 495	481 x 563	≥ 0.42	357	41
						≥ 0.44	377	43
						≥ 0.46	386	47
						≥ 0.49	386	54
APEX XL	Single	*Coming soon*						
	Double							

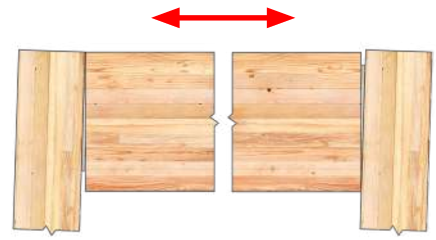


APEX Load Applications

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Tabulated factored resistances are applicable for wood-to-wood connections only. Screw installation must follow the patterns presented in the Installation section.
3. Minimum dimensions for secondary beams with no FRR are based on minimum end and edge distances.
4. The listed connector resistances may be limited by the splitting resistance perpendicular to grain and the effective shear resistance of the timber members. Refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124) for more information and available reinforcement strategies. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
5. Member sizes for other FRRs are permitted to be linearly interpolated between the listed member sizes up to a maximum 2-hr FRR.
6. Alternative minimum beam sizes for members with an ASTM E1966 compliant fire-resistant joint can be found in Appendix A: Fire Protection (Page 115).
7. Factored resistances provided do not account for combined loading in multiple directions. Combined gravity and axial loading must be verified per eq. 1 (Page 13).
8. APEX hangers require glued bond between plies; gaps and voids are not permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.

APEX Seismic Performance



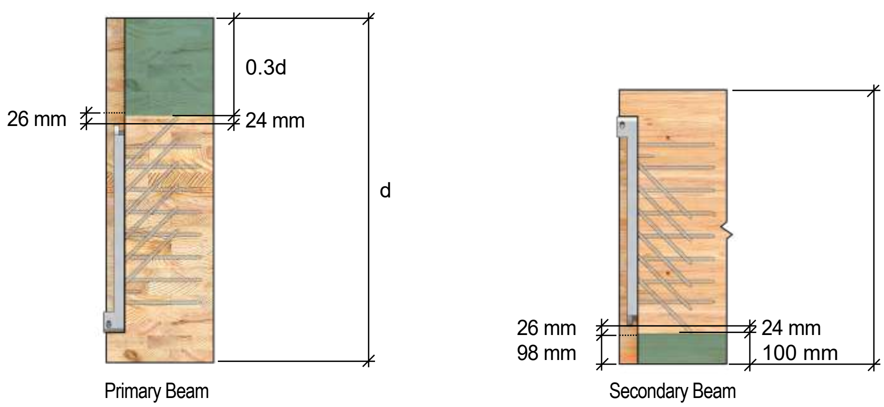
MTC has conducted extensive quasi-static, interstory, and component testing on the APEX connector. The results have demonstrated its robust performance under drift and axial demands.

- The APEX can accommodate drifts of over 4% while loaded, which satisfies the drift limits specified in NBCC 2024 Clause 4.1.18.13.
- The APEX connector has significant axial capacity while fully loaded to ensure the structural integrity of the connection is maintained during a wind or seismic event.

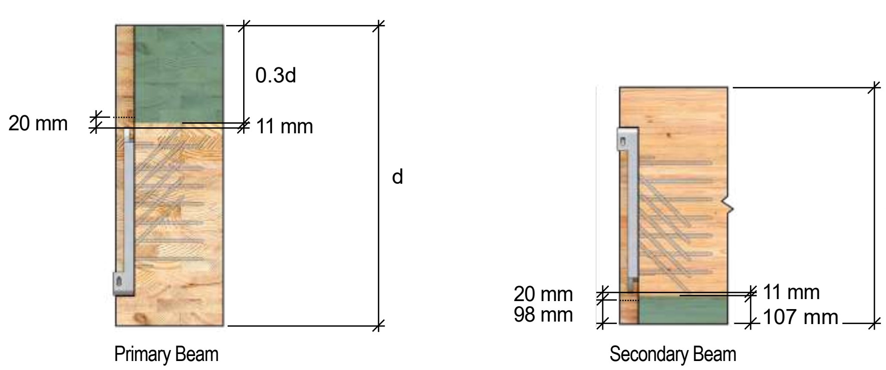
Contact MTC Technical Support for additional details for accommodating seismic loads in your design.

Positioning Considerations for Reinforcement

The hanger placement relative to the height of the beam can impact the need for reinforcement. Connectors in the primary beam should have the uppermost fastener in the top 30% of the member depth (0.3d), as shown below. Connectors in the secondary beam should have the tip of the lowermost inclined fastener within 100 mm of the bottom of the beam for APEX 100 Series and 107 mm of the bottom of the beam for APEX 150 Series. This is in alignment with 98 mm wood cover to the hanger for fire protection. Outside of these zones, the primary and secondary beams should be checked for splitting to determine if reinforcement is required. Note that these requirements do not apply to columns. For further information, refer to Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain (Page 124).



APEX 100 series



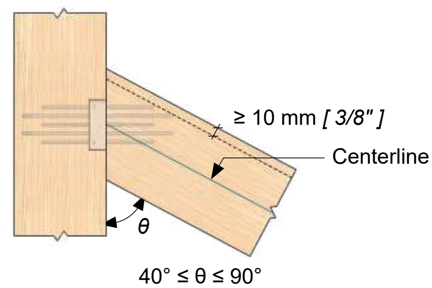
APEX 150 series

Design - APEX Sloped and Skewed Configurations

Skewed Connection Configuration

For APEX connectors installed in skewed connectors, the angle of skew, θ, shall be limited between 40 and 90 degrees ($40° \leq \theta \leq 90°$). A minimum distance of 10 mm *[3/8 in.]* must be maintained between the joist edge and the tips of the fasteners, and all geometry requirements must be satisfied. Under these conditions, the factored resistance of the connector is not reduced. The connector must be aligned with the centerline of the joist; otherwise, eccentricities and resulting moments must be accounted for by the Engineer of Record.

Skewed Configuration: Joist-to-Beam Connection

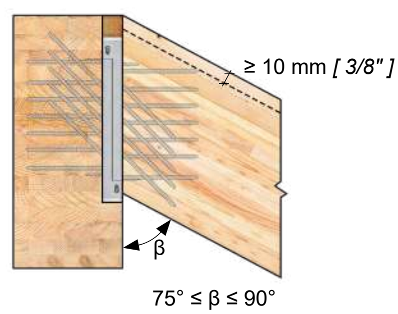


Skewed Configuration: Joist-to-Beam or Column Connection (Top View)

Sloped Connection Configurations

APEX connectors in sloped configurations require attention to the angle of the secondary member relative to the angle of the screws. The APEX utilizes screws installed at a 45° angle from the shear plane ($\beta = 45°$). As the slope of the secondary member changes, the angle between the fasteners and the wood grain will change, affecting the withdrawal capacity of the screws. As a result, the slope of the secondary member is limited to 75° to 90°. A reduction factor, R_β, must be applied to the tabulated factored resistance based on the slope of the secondary beam, as shown in Table 4.12 below.

Sloped Configuration: Rafter-to-Ridge Beam Connection



Sloped Configuration: Rafter-to-Ridge Beam Connection (Side View)

Table 4.12 - Reduction Factor, R_β, for APEX Series in Sloped Connection Configuration

Slope of Secondary Member, β	β = 90°	β = 85°	β = 80	β = 75
R_β	1.0	0.90	0.88	0.87

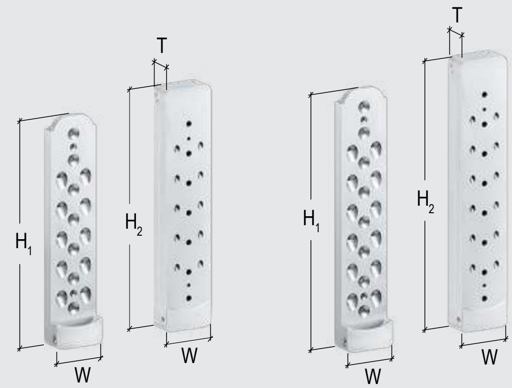
1. Values may be interpolated.
2. Values are derived from CSA O86:24 Clause 12.12.8.
3. Factored resistances of the connector must be adjusted with the reduction factor provided in the table.

Detailing - APEX 100 Series Geometry Requirements

APEX 100 Series - Connector Geometry

Table 4.3 - APEX 100 Geometry

Connector Geometry	Model	
	APEX S	APEX M
	[mm]	
H_1	463.53	523.53
H_2	489.53	549.53
W	101.6	101.6
T	50.8	50.8



APEX S   APEX M

Note:

1. Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.

Secondary Member Geometry Requirements

Unhoused   Housed

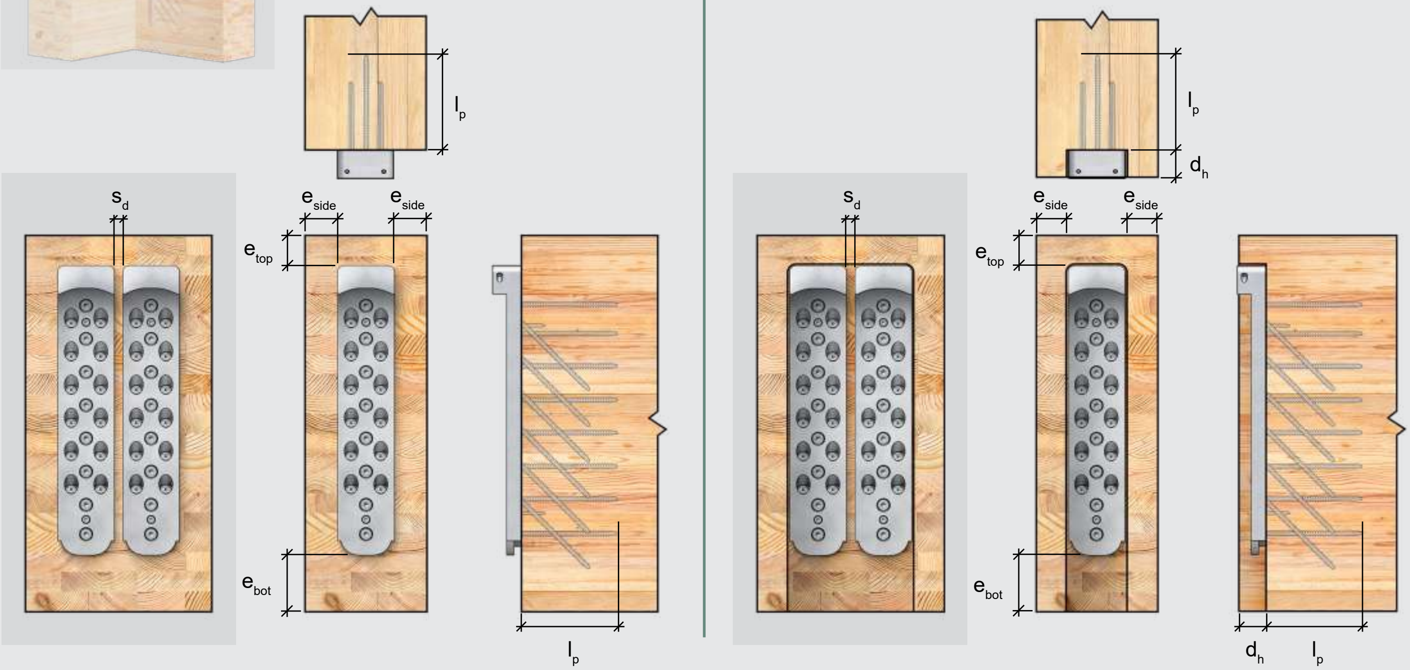


Table 4.4 - APEX 100 Geometry Requirements for Secondary Member

APEX 100		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}		
APEX S	Single	176	7	6	33	36	62	46	78	85	146	49	N/A
	Double	176	7	6	33	36	62	46	78	85	146	49	6
APEX M	Single	176	7	6	33	36	62	46	78	85	146	49	N/A
	Double	176	7	6	33	36	62	46	78	85	146	49	6

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a gap between primary and secondary member of 1.6 mm *[1/16 in.]*. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRR's other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the members.

Primary Member Geometry Requirements - Beam/Girder

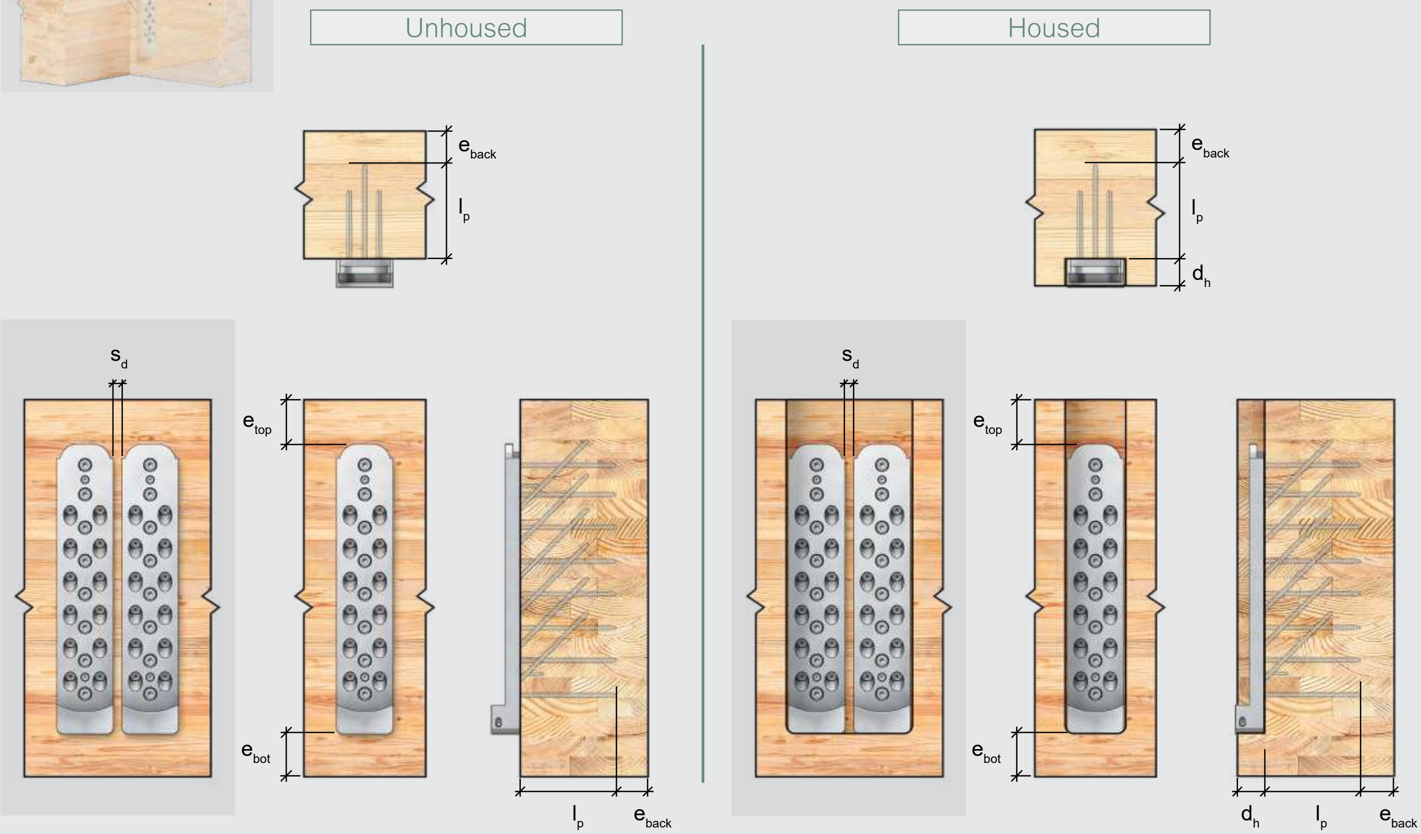


Table 4.5 - APEX 100 Geometry Requirements for Primary Member (Beam/Girder)

APEX 100		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}		
APEX S	**Single**	176	33	7	10	36	36	52	46	120	85	49	N/A
	Double	176	33	7	10	36	36	52	46	120	85	49	6
APEX M	**Single**	176	33	7	10	36	36	52	46	120	85	49	N/A
	Double	176	33	7	10	36	36	52	46	120	85	49	6

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a gap between primary and secondary member of 1.6 mm *[1/16 in.]*. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRR's other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the members.

Primary Member Geometry Requirements - Column

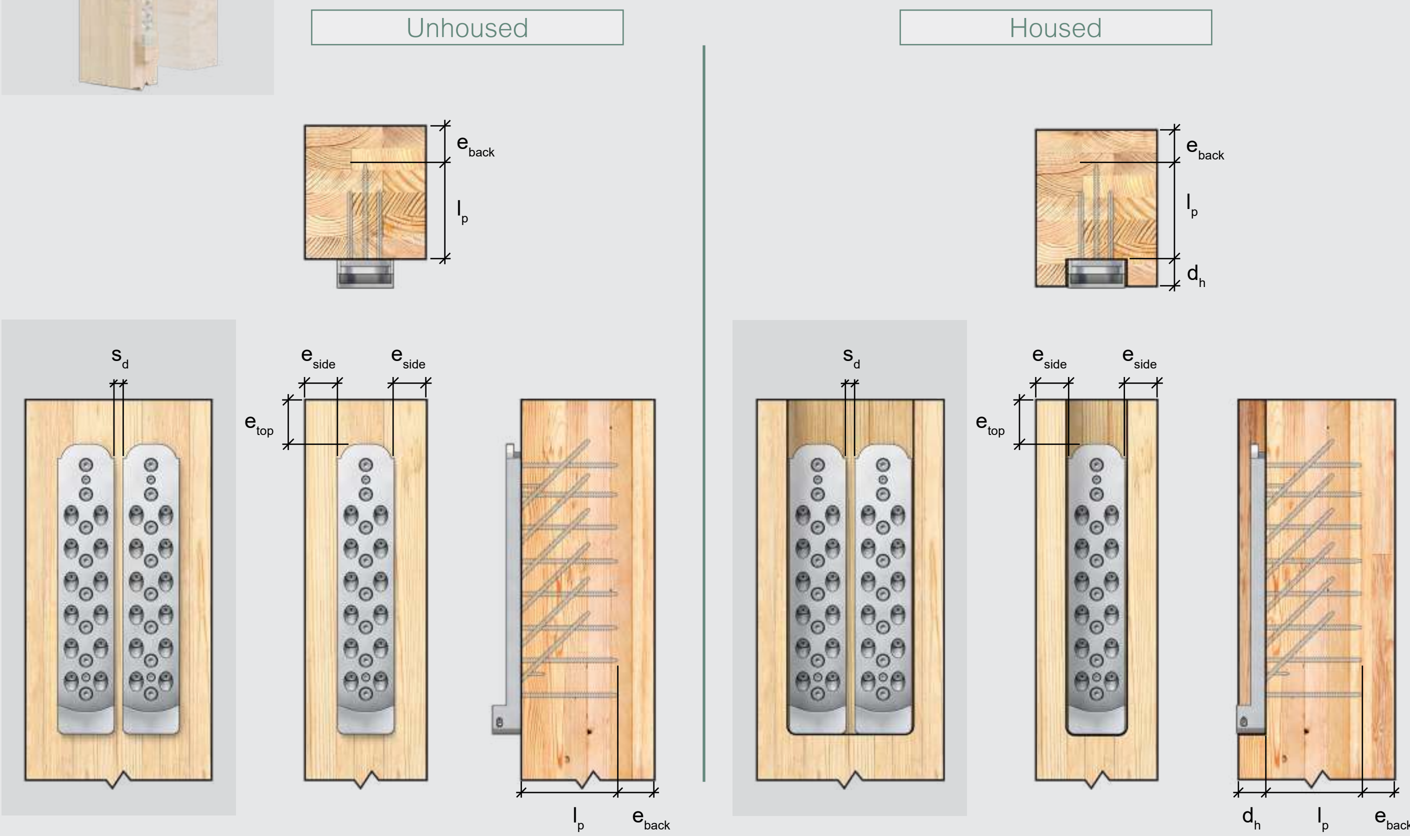


Table 4.6 - APEX 100 Geometry Requirements for Primary Member (Column)

APEX 100		Geometry Requirements [in.]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	**Configuration**			e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}		
APEX S	**Single**	176	33	6	10	36	36	46	46	85	85	49	N/A
	Double	176	33	6	10	36	36	46	46	85	85	49	6
APEX M	**Single**	176	33	6	10	36	36	46	46	85	85	49	N/A
	Double	176	33	6	10	36	36	46	46	85	85	49	6

Notes:

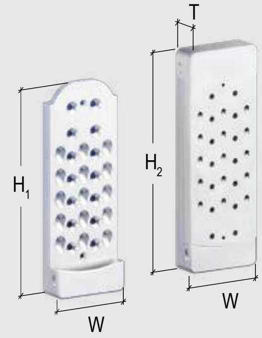
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a gap between primary and secondary member of 1.6 mm *[1/16 in.]*. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for columns with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRR's other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the members.

Detailing - APEX 150 Series Geometry Requirements

APEX 150 Series - Connector Geometry

Table 4.7 - APEX 150 Geometry

Connector Geometry	Model	
	APEX L	APEX XL
	[mm]	
H_1	422.33	Coming Soon
H_2	442.33	
W	152.4	
T	50.8	



APEX L

Note:

1. Refer to Appendix D: Product Specifications (Page 133) for additional product specifications.

Secondary Member Geometry Requirements

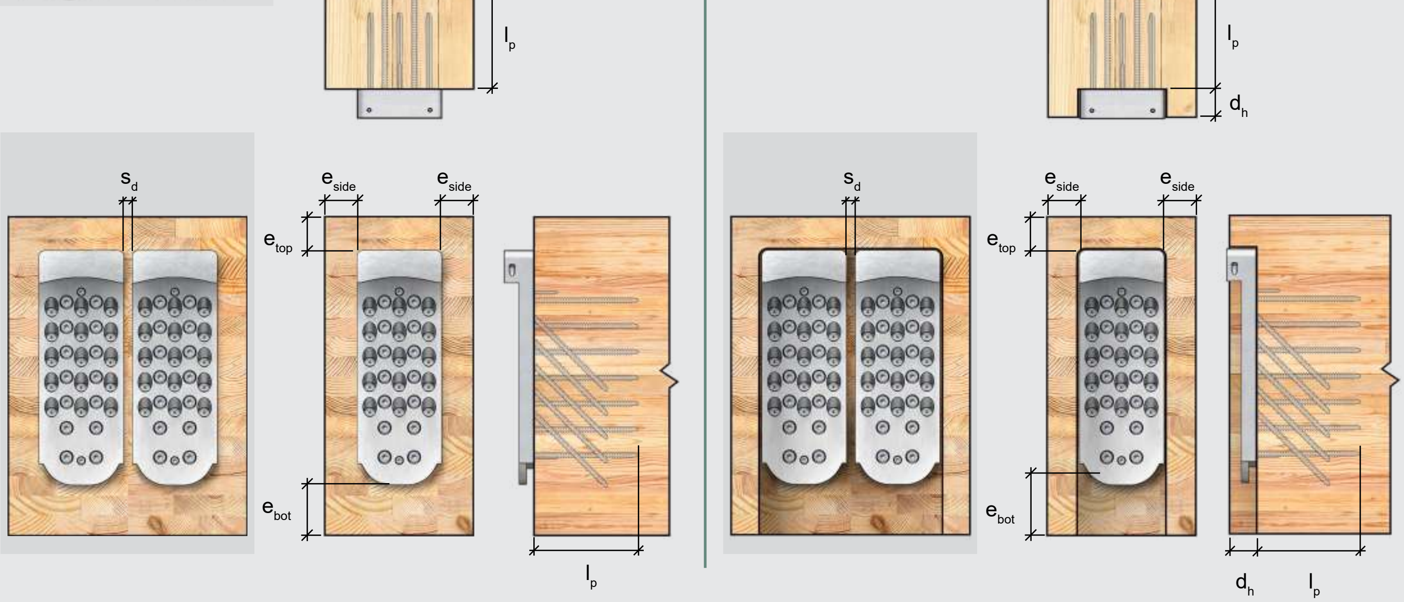


Table 4.8 - APEX 150 Geometry Requirements for Secondary Member

APEX 150		Geometry Requirements [mm]											
		l_p	e_{top}	No FRR		45-min FRR		1-hr FRR		2-hr FRR		d_h	s_d
Model	Configuration			e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}	e_{side}	e_{bot}		
APEX L	Single	176	1	7	21	36	56	46	72	85	140	49	N/A
	Double	176	1	7	21	36	56	46	72	85	140	49	6
APEX XL	Single	Coming soon											
	Double												

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a gap between primary and secondary member of 1.6 mm *[1/16 in.]*. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for secondary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRR's other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the members.

Primary Member Geometry Requirements - Beam/Girder

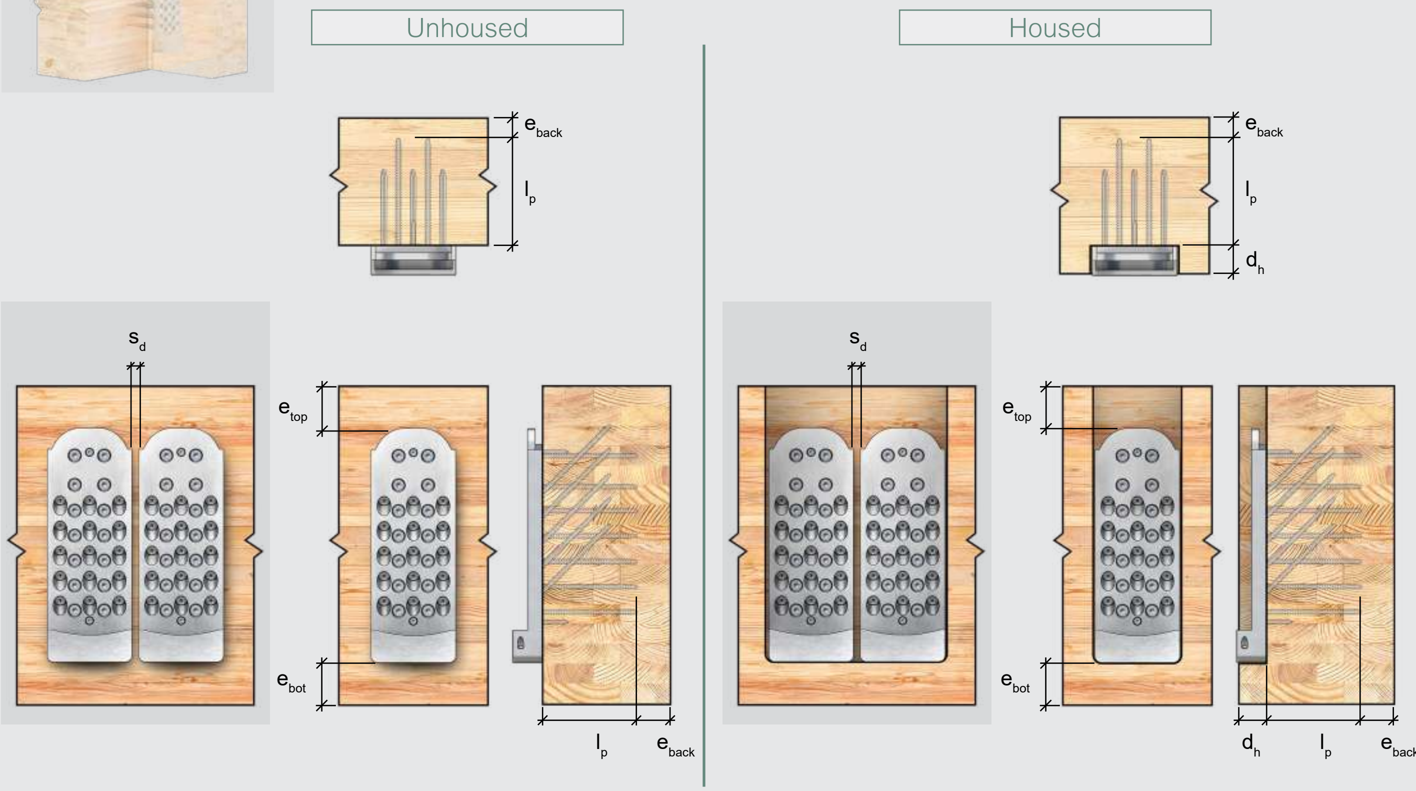


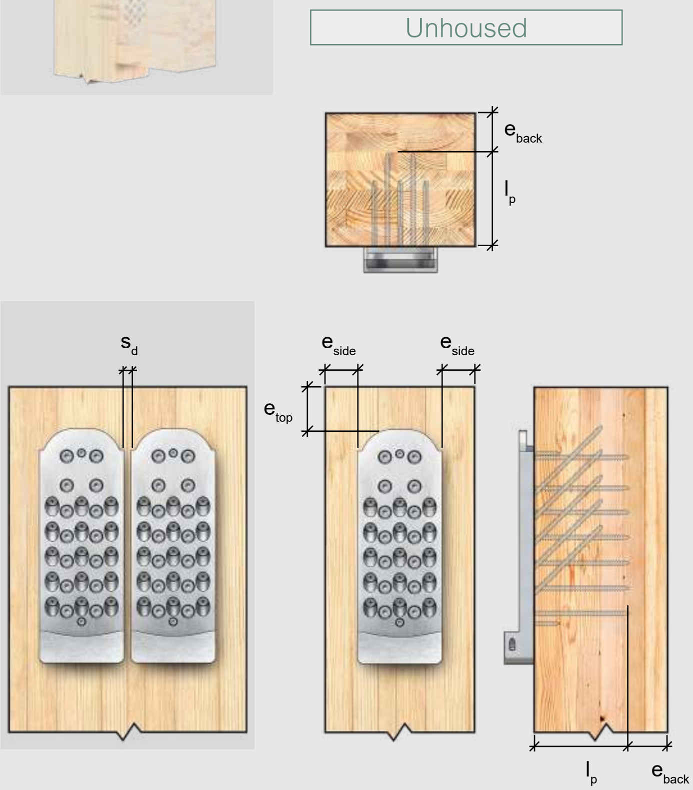
Table 4.9 - APEX 150 Geometry Requirements for Primary Member (Beam/Girder)

APEX 150		Geometry Requirements [mm]											
				No FRR		45-min FRR		1-hr FRR		2-hr FRR			
Model	**Configuration**	l_p	e_{top}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	e_{bot}	e_{back}	d_h	s_d
APEX L	**Single**	176	21	1	10	36	36	52	46	120	85	49	N/A
	Double	176	21	1	10	36	36	52	46	120	85	49	6
APEX XL	**Single**	*Coming soon*											
	Double												

Notes:

1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a gap between primary and secondary member of 1.6 mm *[1/16 in.]*. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for primary beams with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRR's other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the members.

Primary Member Geometry Requirements - Column



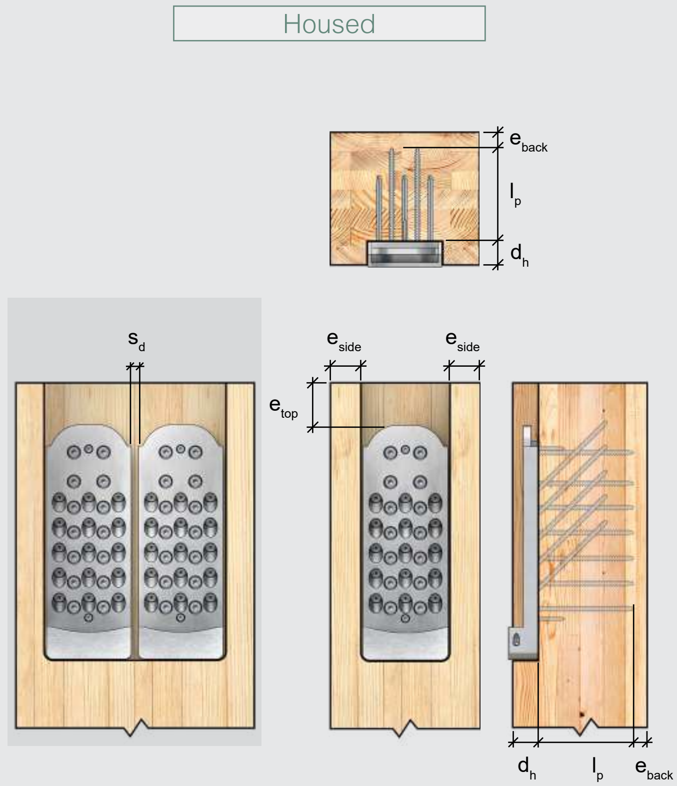


Table 4.10 - APEX 150 Geometry Requirements for Primary Member (Column)

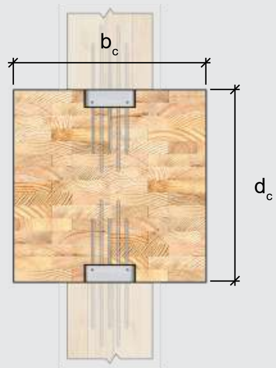
APEX 150		Geometry Requirements [mm]											
				No FRR		45-min FRR		1-hr FRR		2-hr FRR			
Model	Configuration	l_p	e_{top}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	e_{side}	e_{back}	d_h	s_d
APEX L	Single	176	21	7	10	36	36	46	46	85	85	49	N/A
	Double	176	21	7	10	36	36	46	46	85	85	49	6
APEX XL	Single	*Coming soon*											
	Double												

Notes:

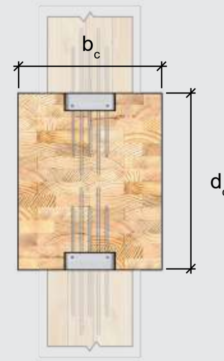
1. Connection design must meet all relevant requirements of the General Notes to the Designer section.
2. Screw installation must follow the patterns presented in the Installation section.
3. Tabulated values presented are the minimum required unless noted otherwise. Tabulated values for l_p are to the deepest screw penetration and are fixed. Tabulated values for d_h are maximum values based on a gap between primary and secondary member of 1.6 mm *[1/16 in.]*. Larger gaps will reduce d_h accordingly.
4. Tabulated values that are not dependent on FRR, as well as those for columns with no FRR, are based on minimum end and edge distances.
5. Dimensions for FRR's other than those shown above may be linearly interpolated up to a maximum 2-hr FRR.
6. Placement of a connector within the depth of the beam must be verified by the EOR for splitting perpendicular to grain resistance as well as the effective shear resistance of the members.

Detailing - APEX Additional Considerations

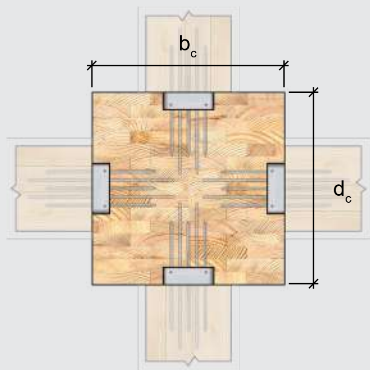
Geometry Requirements for Columns with Multiple Beam Hangers



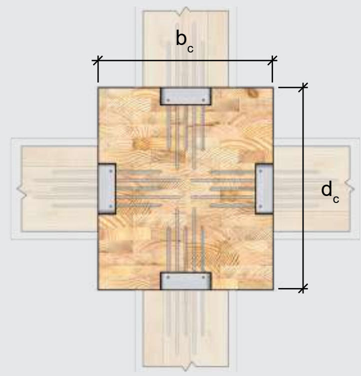
A
Hangers on Opposing Faces of a Square Column



B
Hangers on Opposing Faces of a Rectangular Column



C
Hanger on Each Face of a Square Column



D
Hanger on Each Face of a Rectangular Column

Table 4.11 - Minimum Column Sizes for Multiple APEX Connectors

Model Series	Minimum Column Section Dimensions, b_c x d_c [mm x mm]							
	A Hangers on Opposing Faces of a Square Column				B Hangers on Opposing Faces of a Rectangular Column			
	No FRR	45-min FRR	1-hr FRR	2-hr FRR	No FRR	45-min FRR	1-hr FRR	2-hr FRR
APEX 100	462 x 462	462 x 462	462 x 462	462 x 462	113 x 462	174 x 462	194 x 462	272 x 462
APEX 150	462 x 462	462 x 462	462 x 462	462 x 462	166 x 462	225 x 462	244 x 462	322 x 462

Model Series	Minimum Column Section Dimensions, b_c x d_c [mm x mm]							
	C Hanger on Each Face of a Square Column				D Hangers on Each Face of a Rectangular Column			
	No FRR	45-min FRR	1-hr FRR	2-hr FRR	No FRR	45-min FRR	1-hr FRR	2-hr FRR
APEX 100	528 x 528	528 x 528	528 x 528	528 x 528	462 x 528	462 x 528	462 x 528	462 x 528
APEX 150	581 x 581	581 x 581	581 x 581	581 x 581	462 x 581	462 x 581	462 x 581	462 x 581

Notes:

1. Tabulated column section dimensions are minimum values based on a 12.7 mm *[1/2 in.]* clearance between screw tips, minimum edge and end distances, and minimum wood cover requirements for FRR. Refer to Geometry Requirements for further details.
2. It is the responsibility of the EOR to ensure the primary and secondary members have adequate capacity to resist connection forces.
3. Tabulated column section dimensions assume hangers are centered within each column face ad are housed in the column as shown.

Detailing - APEX Housing Details

Housing Possibilities

Primary Member Housing

- Most common housing for concealed installation
- Concealed from below

Secondary Beam Housing

- Joist housing from bottom up
- Concealed from below with a shop-installed wood plug

Secondary Beam Through Housing

- Full-depth housing in joist
- Concealed from below with a shop-installed wood plug
- Simplifies fabrication

Housing and Surface Detailing

Surface-Mounted

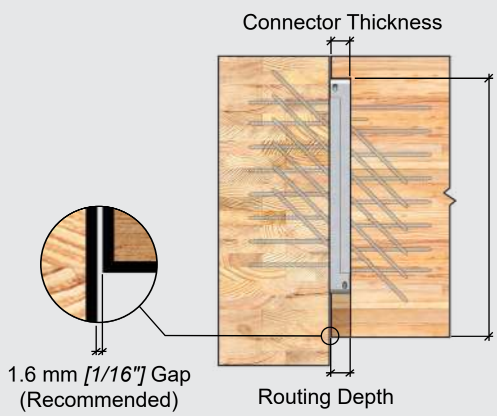
Housed in Primary Member (Column)

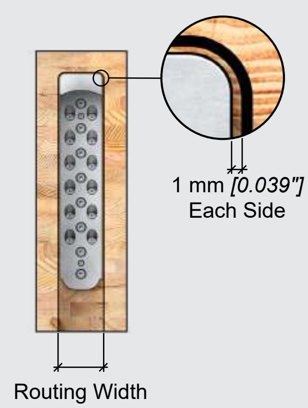
Housed in Primary Member (Girder)

Housed in Secondary Member (Joist or Purlin)

Parallel Surface: The members must be parallel at the location of the connection to ensure proper hanger alignment and load transfer.

Gap Size: The gap size between wood members balances installation ease and fire performance, with larger gaps simplifying installation but reducing fire protection. A gap of 1.6 mm *[1/16 in.]* is recommended for proper installation to allow the secondary member to slide into place. The gap should be no more than 3.2 mm *[1/8 in.]* to address fire protection considerations. For more information, refer to Appendix A: Fire Protection (Page 115).





Routing Depth: The routing depth is the depth of the housing, d_h, noted in the Geometry Requirements and Routing Details sections This depth takes into account the thickness of the connector and the gap between members (recommended 1.6 mm *[1/16 in.]* herein—larger gaps will reduce d_h accordingly).

Routing Width: It is recommended to allow a clearance of 1 mm *[0.039 in.]* on each side of the connector:

- APEX 100 Series: 103.6 mm *[4.079 in.]*
- APEX 150 Series: 154.4 mm *[6.079 in.]*

Routing Height: The routing height must be coordinated with the Engineer of Record. The height of the connector in the beam section has an impact on connector performance. Refer to Positioning Considerations for Reinforcement (Page 65) for further information.

Detailing - APEX Housing Dimensions

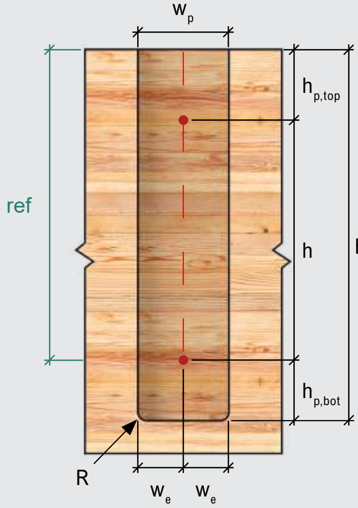
Routing in Primary Member

Fastener Orientation

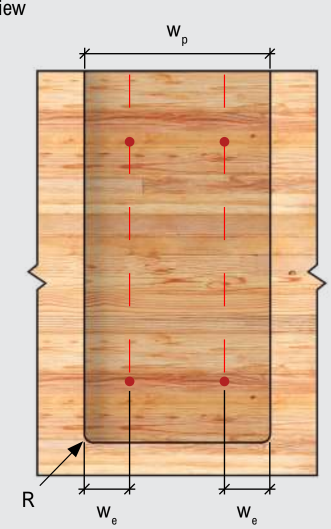
Structural Positioning Screws

(Refer to Fastener Layout (Page 104))

Side View



Single Configuration



Double Configuration

Top View

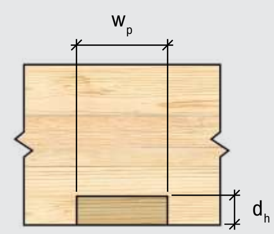


Table 4.13 - Routing Dimensions for APEX Housed in Primary Member

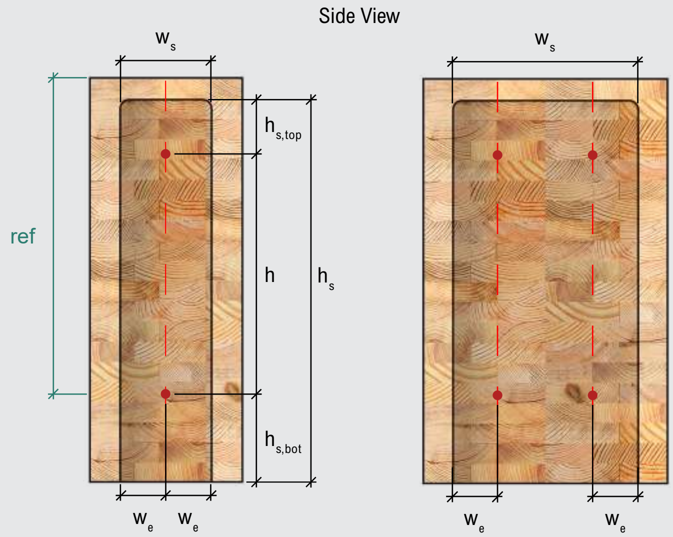
Model	Routing Dimensions, mm *[in.]*								
	h_p	$h_{p,top}$	h	$h_{p,bot}$	w_p Single	w_p Double	w_e	d_h	R
APEX S	**497.8** *[19.600]*	**97.7** *[3.847]*	**296.5** *[11.673]*	**103.6** *[4.080]*	**103.6** *[4.080]*	**211.2** *[8.315]*	**51.8** *[2.039]*	**49** *[1.938]*	**12.7** *[0.500]*
APEX M	**557.8** *[21.962]*	**97.7** *[3.847]*	**356.5** *[14.035]*	**103.6** *[4.080]*	**103.6** *[4.080]*	**211.2** *[8.315]*	**51.8** *[2.039]*	**49** *[1.938]*	**12.7** *[0.500]*
APEX L	**444.2** *[17.489]*	**65.3** *[2.572]*	**304.8** *[12.000]*	**74.1** *[2.918]*	**154.4** *[6.079]*	**312.8** *[12.315]*	**77.2** *[3.039]*	**49** *[1.938]*	**12.7** *[0.500]*
APEX XL	*Coming soon*								

Notes:

1. Tabulated values are general guidelines for routing requirements. The EOR and fabricator are responsible for ensuring final routing dimensions account for all project-specific conditions.
2. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for h and R are fixed. Tabulated values for d_h are maximum allowable.
3. Tabulated values account for 1 mm *[0.039 in.]* on each side of and below the hanger. Larger installation tolerances will increase height and width values accordingly.
4. Tabulated values are based on a gap of 1.6 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
5. Refer to the Geometry Requirements tables for each respective beam hanger for additional information.
6. Manufacturers should adjust the tabulated values based on their specific routing bit sizes if different than R.

Routing in Secondary Member

Fastener Orientation
Structural Positioning Screws
(Refer to Fastener Layout (Page 104))



Single Configuration

Double Configuration

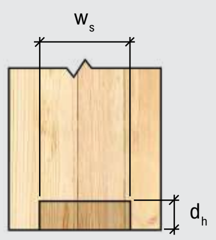


Table 4.14 - Routing Dimensions for APEX Housed in Secondary Member (Beam-End)

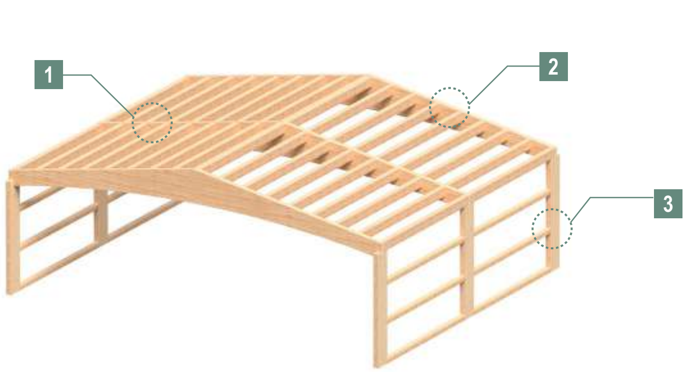
Model	Routing Dimensions, mm *[in.]*								
	h_s	$h_{s,top}$	h	$h_{s,bot}$	w_s Single	w_s Double	w_e	d_h	R
APEX S	**497.8** *[19.600]*	**103.6** *[4.080]*	**296.5** *[11.673]*	**97.7** *[3.847]*	**103.6** *[4.079]*	**211.2** *[8.315]*	**51.8** *[2.039]*	**49** *[1.938]*	**12.7** *[0.500]*
APEX M	**557.8** *[21.962]*	**103.6** *[4.080]*	**356.5** *[14.035]*	**97.7** *[3.847]*	**103.6** *[4.079]*	**211.2** *[8.315]*	**51.8** *[2.039]*	**49** *[1.938]*	**12.7** *[0.500]*
APEX L	**444.2** *[17.489]*	**74.1** *[2.918]*	**304.8** *[12.000]*	**65.3** *[2.572]*	**154.4** *[6.079]*	**312.8** *[12.315]*	**77.2** *[3.039]*	**49** *[1.938]*	**12.7** *[0.500]*
APEX XL	*Coming soon*								

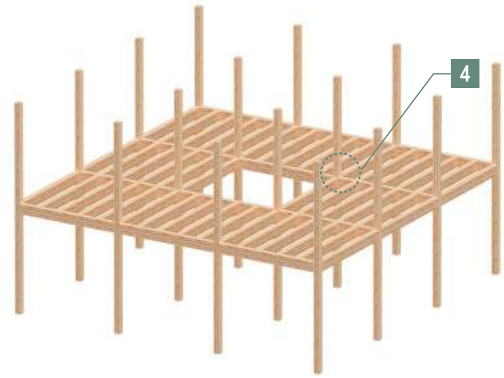
Notes:

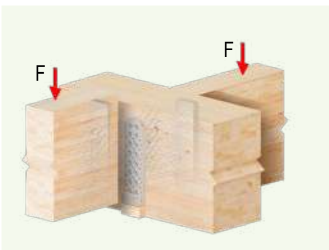
1. Tabulated values are general guidelines for routing requirements. The EOR and fabricator are responsible for ensuring final routing dimensions account for all project-specific conditions.
2. Tabulated values are minimum requirements unless noted otherwise. Tabulated values for h and R are fixed. Tabulated values for d_h are maximum allowable.
3. Tabulated values account for 1 mm *[0.039 in.]* on each side of and above the hanger. Larger installation tolerances will increase height and width values accordingly.
4. Tabulated values are based on a gap of 1.6 mm *[1/16 in.]* between the primary and secondary member. Larger gaps will reduce d_h accordingly.
5. Refer to the Geometry Requirements tables for each respective beam hanger for additional information.
6. Manufacturers should adjust the tabulated values based on their specific routing bit sizes if different than R.

Installation - APEX Configurations

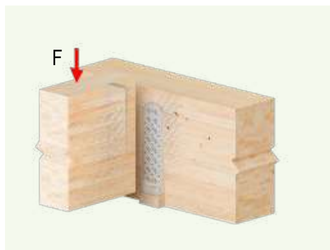
APEX Connection Applications



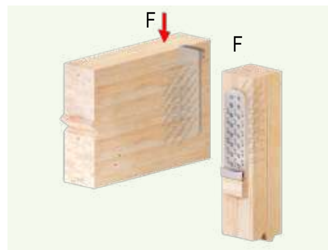




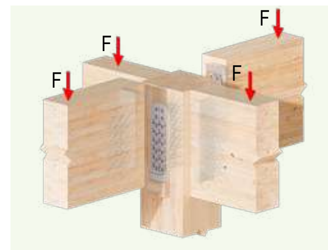
1 Multiple Beams-to-Girder



2 Beam-to-Girder

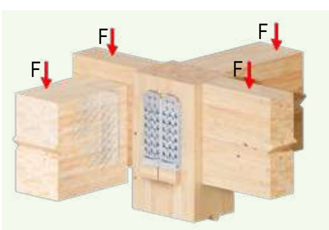


3 Beam-to-Column

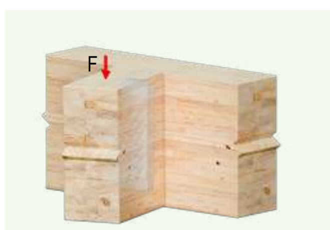


4 Multiple Beams-to-Column

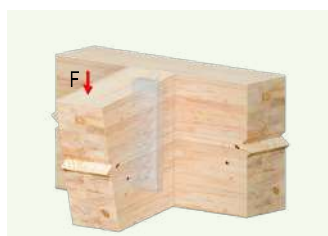
Alternative Connection Applications



Double APEX



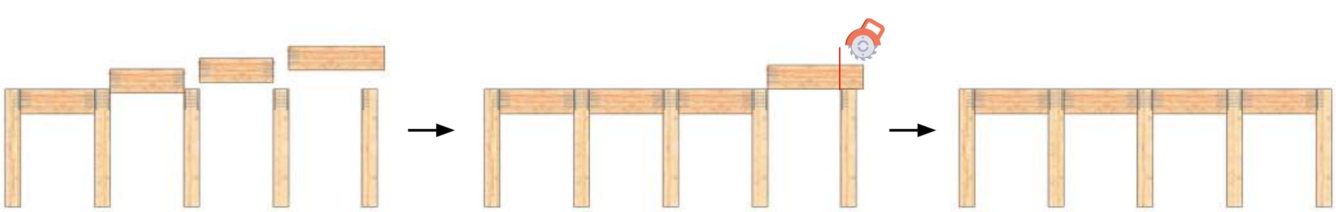
Skewed Configuration

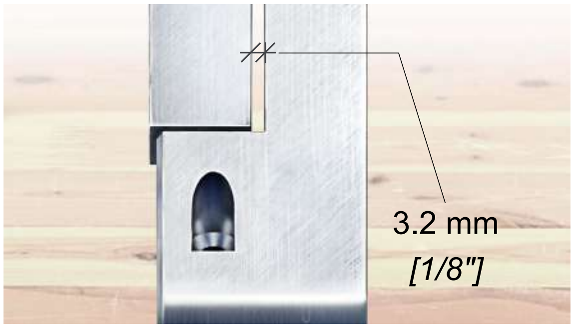


Sloped Configuration

Installation Sequencing Recommendations

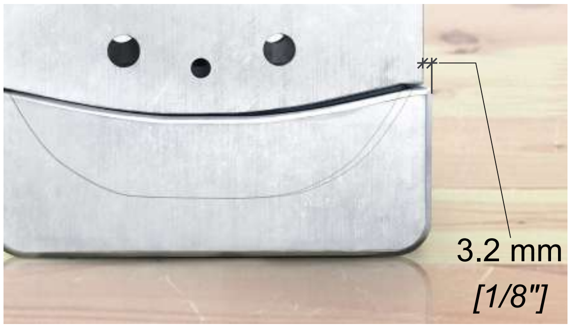
Installation sequencing is important, especially for buildings with multiple bays of post-and-beam framing. It is recommended to install beams starting from one end of the building and progress along the column line. The last beam can be produced slightly over length and cut to size on-site to help mitigate any dimensional tolerance challenges.





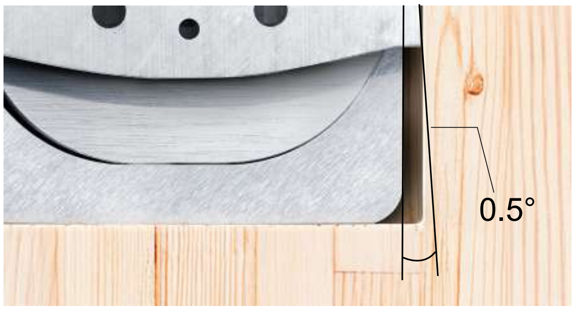
Axial Tolerance

The APEX connector provides a built-in 3.2 mm *[1/8 in.]* of axial tolerance, giving crews the flexibility needed for quick, drop-in installations. This is achieved without compromising the tight gaps essential for fire rating resistance while maintaining the clean aesthetics of mass timber, and ensuring a secure and fully seated connection.



Horizontal Tolerance

Mass timber glulam beams typically span from 4 m *[13 ft.]* to 25 m *[82 ft.]*, and in the most extreme cases, can go up to 46 m *[164 ft.]* long. With these lengths in mind, it's easy to understand why it is critical that a beam hanger system allows for horizontal tolerance to accommodate minor misalignments between supporting members. The APEX offers 3.2 mm *[1/8 in.]* of horizontal tolerance.



Rotational Tolerance

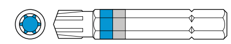
Following the same design principle as our horizontal tolerance, we have engineered a rotational tolerance of 0.5° to accommodate potential minor misalignments between supporting members.

Installation - APEX General Requirements

Tool Requirements

Tools - Use the Correct Bit

MTC Solutions fasteners should only be driven using RW bits, or appropriately sized star bits. This ensures good centering and positioning with optimal torque transmission. For the APEX, use an RW 50 bit for the10 mm *[3/8 in.]* screws.



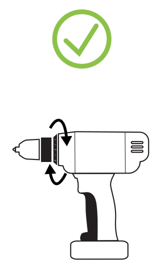
RW 50

Tools - Use the Correct Drill

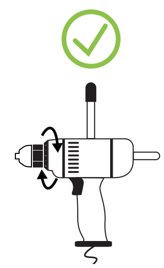
Use low-RPM, high-torque drills equipped with a feather (variable speed) trigger to install fasteners. Avoid excessive acceleration and deceleration during the drive-in process. Do not overtorque fasteners. Although impact guns are not expressly prohibited, their use is discouraged - particularly for beam hanger systems - due to an increased risk of overtorquing. Use the appropriate drill chuck size according to the fastener.

Table 4.15 - Recommended Torque, Drill Bits, and Power Drill

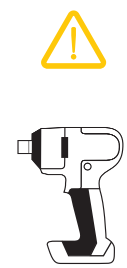
Nominal Fastener Diameter [D]		HSS Drill Bit Size		Power Drill Voltage	Allowable Insertion Torque	
mm	*[in.]*	mm	*[in.]*	V	N · m	*[lb. ft.]*
10	*[3/8]*	6.4	*[1/4]*	60	30.00	*[22.13]*



Cordless Clutched Drill



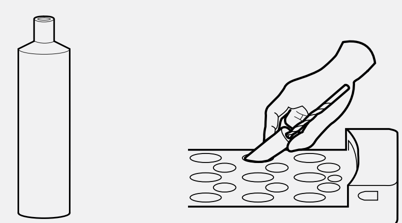
Double Handle Drill



Impact Drill

Tools - APEX Predrilling Jig

The Predrilling Jig ensures precise alignment of the APEX inclined fasteners. It guides the drill bit to create an accurate pilot hole, and ensures proper fastener seating. The hole in the jig accommodates standard imperial and metric drill bit diameters. For the 10 mm *[3/8 in.]* inclined fasteners, pilot holes 6.4 mm *[1/4 in.]* in diameter and 25 mm *[1 in.]* long are recommended.

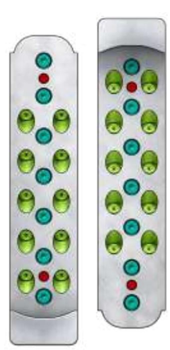


APEX Predrilling Jig

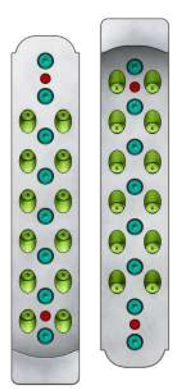
Fastener Layout

Fastener Orientation

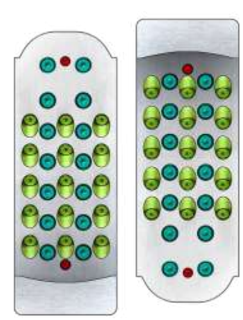
- Nonstructural Positioning Screws
- Horizontal Screws
- Inclined Screws



APEX S



APEX M



APEX L

Coming soon

APEX XL

Installation - APEX Guidelines

General Installation Steps

Estimated Installation Time

The estimated time for a single person to install a complete APEX product is shown in Table 4.16

This process includes the following steps:

1. Layout (~10%)
2. Positioning (~10%–15%)
3. Pilot Holes (~20%–25%)
4. Screw Installation (~50%–60%)
5. Optional Measures (not included in the time installation % breakdown)

Table 4.16 - APEX Estimated Installation Time

APEX Model	Average Installation Time [min.]
S	13
M	15
L	20
XL	

The estimated installation time can be improved upon with efficient fabrication and site practices such as:

1. Drilling pilot holes for the nonstructural positioning screws at the time of fabrication
2. Utilizing templates to drill pilot holes for structural screws
3. Optimizing beam positioning to reduce worker fatigue

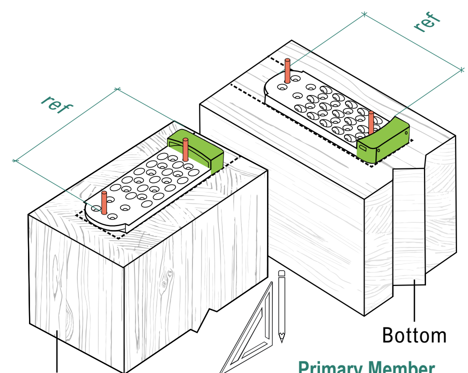
Step-by-Step Installation Guidelines

1.1 Layout - Reference Points

Begin by laying out the installation locations in the primary and secondary members using a pencil and square.

The connector's point of reference is the top of the member. The lower nonstructural positioning screw should be measured from that point of reference.

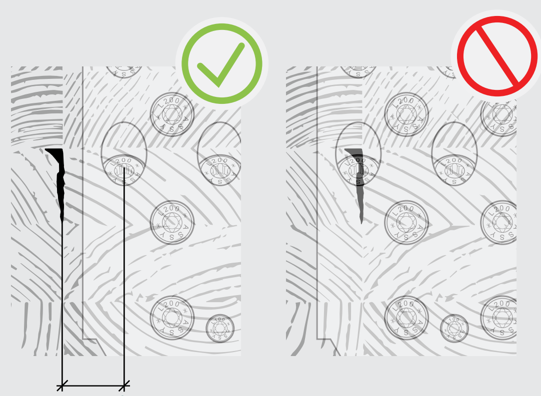
The pocket should be at the bottom on the primary member and on the top on the secondary member.



1.2 Layout - Split Lamination Considerations

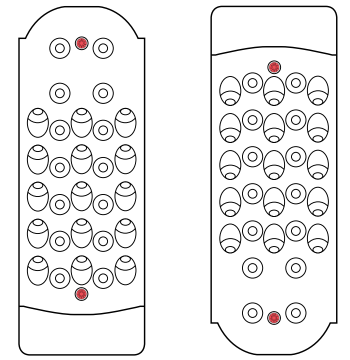
It is recommended that vertical joints in split lamination glulam beams be tight at the time of manufacturing. Gaps between adjacent plies may occur due to wood shrinkage. APEX installation requires glued bond between plies due to its high capacity; gaps and voids are not permitted. Split-laminated members shall be edge-glued or block-laminated and fabricated with pressure from all sides to ensure full contact between plies and no voids.

If gaps exist in the end grain, the APEX must be positioned so that fasteners can be installed at least 16 mm *[5/8 in.]* away from these gaps.



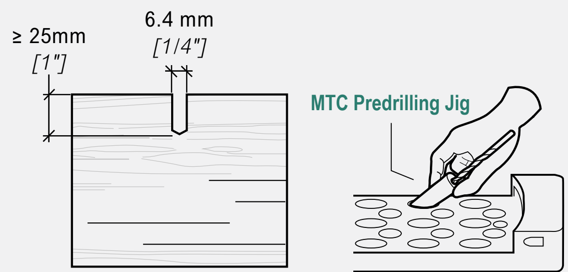
2.1 Positioning - Nonstructural Positioning Screw Installation

Positioning screws ensure accurate placement of the APEX connector. To improve accuracy and reduce time, it is recommended to predrill the nonstructural positioning screw locations during member fabrication. Install one nonstructural positioning screw into the hole highlighted at the top of the plate. Check to ensure alignment is maintained and then install the second nonstructural positioning screw into the hole highlighted at the bottom of the plate.



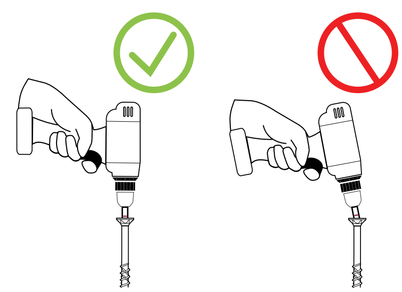
3.1 Pilot Holes - Recommendations

Pilot holes are optional; however, they facilitate screw thread engagement, help reduce splitting risks, ensure a proper penetration path which reduces screw wandering, and reduce insertion torque. For the structural fasteners used with the APEX series, pilot holes 6.4 mm *[1/4 in.]* in diameter and 25 mm *[1 in.]* in length are recommended. The use of MTC Predrilling Jig for the inclined screws of the APEX is recommended to ensure proper hole placement.



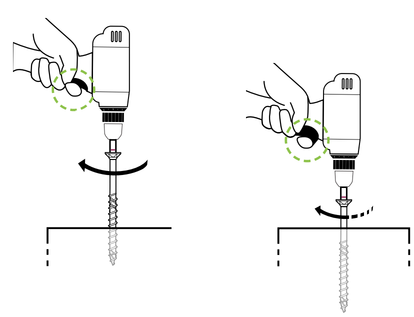
4.1 Screw Installation - Align Drill Bit Axis

Align the driver bit axis parallel to the fastener axis during installation to allow proper torque transmission and to avoid stripping.



4.2 Screw Installation - Decrease RPM

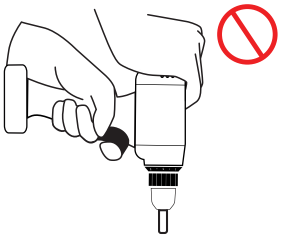
To avoid overtorquing the screw, decrease the rotation speed about 12.7 mm *[1/2 in.]* away from the final installed position. This is crucial to prevent wood crushing due to overtorquing, which can impact beam hanger tolerances, potentially impeding overall connection assembly. This is especially important when using an impact drill.



GIGANT | RICON S VS | MEGANT | APEX | Design | Detailing | Installation

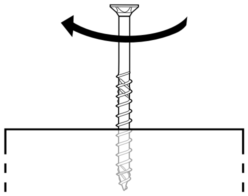
4.3 Screw Installation - Drill Pressure

Do not apply excessive pressure on the drill while driving the fastener to prevent fastener buckling or deviation during installation. Only apply the required force or use the recommended holder case to eliminate cam-out effects.



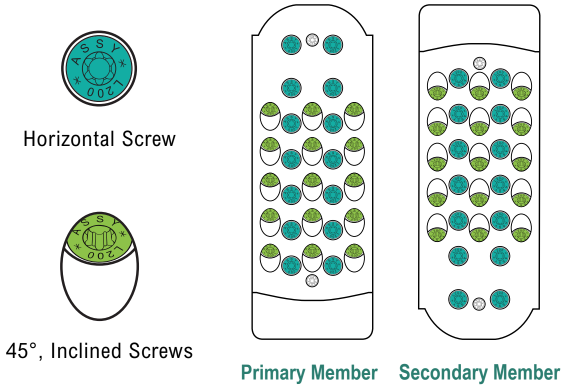
4.4 Screw Installation - One-Step Process

To avoid increased torque peaks caused by stopping and restarting the drive-in process, install the screw in one run until the head is lightly seated against the side member. If necessary, a torque wrench may be used to complete installation immediately after the screw has been driven.



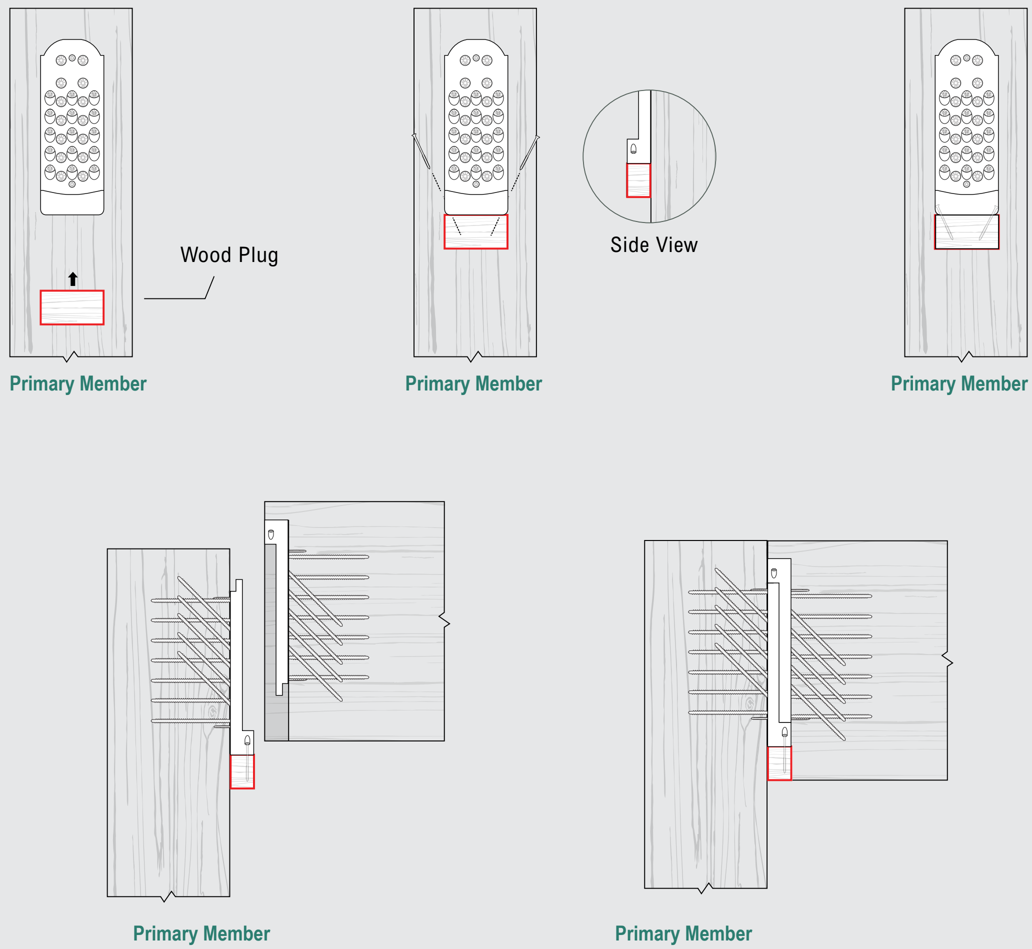
4.5 Screw Installation - Structural Screws

Install the 10 mm x 200 mm *[3/8 x 7-7/8 in.]* MTC-FTC screws in all horizontal holes first. Once all horizontal screws are installed, install the 10 mm x 200 mm *[3/8 x 7-7/8 in.]* MTC-FTC screws in all inclined holes.



5.1 Optional Measures - Pre-Installed Wood Plug

Where connectors are housed in the secondary beam, it is recommended to seal the void in the routing below the connector for aesthetics and fire protection. The APEX system is equipped with diagonal holes so that a wood plug may be pre-installed on the non-routed member in the shop or on site before the secondary beam is lifted into place.



Formula 1 Paddock

Montreal, Quebec

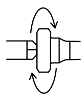
Steve Monpetit, FABG Architects

Accessories

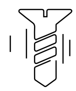
Bits

Patented Bits for ASSY Fasteners

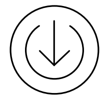
The ASSY RW is a hardened bit designed for quick and efficient installation of MTC fasteners. Suitable bits for each fastener are listed in its specification table.



Snug Fit



Reduced Wobbling



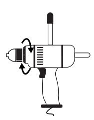
Optimum Torque Transfer

RW 30 RW 40 RW 50

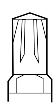
Bit Holder Socket

Bit Holder Socket for RW 50 Bits

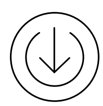
The Bit Holder Socket is designed to hold RW 50 Bits on large double handle drills. The socket can be used with the magnetic bit holder case to facilitate the installation of larger-diameter screws which requires higher torque.



Suitable for Large Drills



RW 50 Compatible

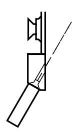


Optimum Torque Transfer

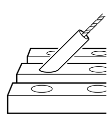
Predrilling Jig

Eases Predrilling for Inclined Fasteners

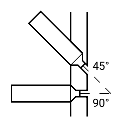
Our Predrilling Jig is a versatile installation accessory designed to support more consistent and precise fastener installation with less effort and in less time than conventional predrilling processes. The original predrilling jig is available in three sizes to accommodate 8 mm, 10 mm, and *[5/16 in., 3/8 in., and 1/2 in.]* MTC-FTC fasteners, it is compatible with the inclined fasteners of the MEGANT and RICON S VS XL as well as custom steel-to-wood connections (with 45° Wedge Washers, 90° Cup Washers, or appropriately machined holes in steel plates of various thicknesses). The APEX predrilling jig acommodates 10 mm MTC-FTC fasteners for APEX connectors. The inner diameters, d, accommodate standard imperial and metric drill bit diameters recommended for predrilling (5 mm, 6 mm, and 7 mm *[3/16, 1/4, and 17/64 in.]* respectively). The outer diameters, D, and shoulder geometries mirror the head of the fastener for rapid positioning and alignment, while a tight tolerance at the tip ensures a snug fit with minimal play in the receiving hole.



RICON S VS XL
Compatible



MEGANT
Compatible



Compatible with
Multiple Angles

Recommended Diameters of Predrilled and Pilot Holes

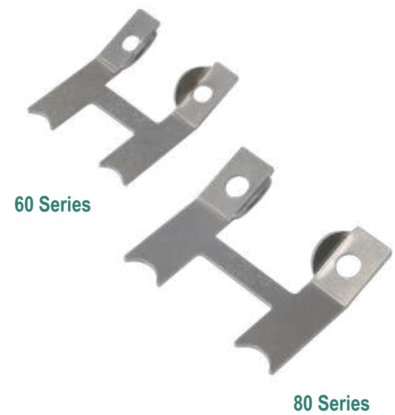
Nominal Fastener Diameter [D]	Predrilled Hole Diameter	Pilot Hole Diameter	Steel Plate Hole Diameter
mm *[in.]*			
6 *[1/4]*	**4** *[5/32]*	**≤ 4** *[5/32]*	**7** *[9/32]*
8 *[5/16]*	**5** *[3/16]*	**≤ 5** *[3/16]*	**9** *[3/8]*
10 *[3/8]*	**6** *[1/4]*	**≤ 6** *[1/4]*	**11** *[7/16]*
12 *[1/2]*	**7** *[17/64]*	**≤ 7** *[17/64]*	**13** *[17/32]*
14 *[9/16]*	**8** *[5/16]*	**≤ 8** *[5/16]*	**N/A** *[N/A]*

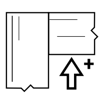
Notes:

1. The predrilling length should be equivalent to the embedment length of the fastener.
2. Pilot holes are intended to facilitate the installation of the fasteners by reducing splitting risks, ensuring a proper penetration path and faster thread engagement with the wood fiber. A minimum pilot hole depth of 25 mm *[1 in.]* is recommended to obtain the aforementioned benefits.
3. Predrilled holes that exceed the diameters listed above may reduce the capacity of the screws.
4. These recommendations are applicable to MTC fasteners.
5. Connection design must meet all the relevant requirements outlined in the Notes to the Designer section.

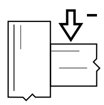
Clip Lock Brace System for Uplift

Clip Lock brace systems are additional components available for the RICON S VS beam hanger system. The Clip Lock is a special thin steel plate designed to fit into and lock the RICON S VS beam hanger plates together, providing a resistance to uplift forces. The Clip Lock is installed with the hanger on the primary beam or column, and as the secondary beam is lowered into place, providing resistance to uplift loads. These components are installed using the same screws used to fasten the beam hanger plates into the wood member. A new screw pattern applies to the primary member to allow the Clip Lock to be installed properly, which results in a reduced download capacity.





Uplift Force
Resistance



Reduced
Downward Force

Google at 1265 Borregas

Sunnyvale, California

Courtesy of Mark Wickens

Appendix

Appendix A: Fire Protection

Mass timber assemblies can demonstrate required fire performance using the Encapsulated Mass Timber Construction (EMTC) methods defined in the NBCC or through exposed mass timber construction. EMTC requires timber elements to be protected by encapsulating materials, typically Type X gypsum board or concrete toppings, that delay charring and heat exposure. In contrast, exposed mass timber construction relies on the inherent charring behavior of wood and having sufficient wood cover around connectors to achieve the desired fire-resistance rating (FRR).

This appendix provides guidance for the design of beam hanger connections used in exposed mass timber construction, outlining calculation-based methods to determine the required wood cover around embedded steel components in accordance with CSA O86:24 Annex B and other recognized references.

Balancing Connector Fire Protection and Member Sizing

Exposed mass timber construction requires a comprehensive design approach such that connection details and fire-resistance ratings are both considered during the initial member sizing design. Sizing beam and column members without considering the required wood cover for the chosen connector can lead to conflicts during detailing. If the member is sized first and connector design is deferred, the required cover for fire protection may exceed the available section thickness, leaving no space to install the beam hanger or compromising the FRR.

Proposed Member Sizing Design Flow

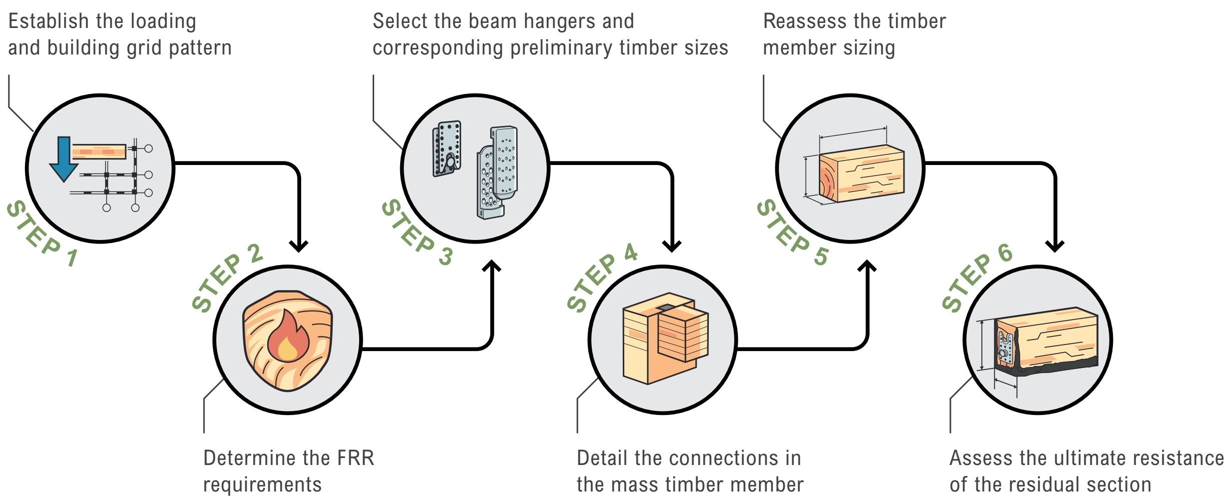


Figure A.1 - Proposed Member Sizing Design Flow

Design Note:
Identifying the connector system during preliminary design is key. This ensures that both the structural capacity of the member and the required wood cover can be satisfied without increasing member dimensions later in the project.

Fire-Resistance Rating (FRR) Methods for Beam Hanger Connections

The FRR of a timber connection can be established by calculated means or a tested approach. There are several recognized approaches in North America for demonstrating compliance with FRR requirements. These methods differ in assumptions, modeling approach, and documentation requirements, and are summarized below.

1. Calculation Method per CSA O86:24 Annex B (Fire-Rated Joint Not Required),
2. Alternative Calculation Method per American Wood Council (AWC) Fire Design Specification (FDS-24) (Fire-Rated Joint Required), or
3. Full-scale testing per CAN/ULC-S101 (or ASTM E119).

This appendix will address the standard calculation method per CSA, as well as the alternative calculation method per FDS-24 that an Engineer of Record (EOR) may choose to use.

Method 1: Calculation per CSA O86:24 Annex B without Fire-Rated Joint

All minimum beam sizes and geometry requirements for fire ratings presented in this design guide are based upon the calculation method presented in CSA O86:24 Annex B and assume no fire-rated caulking or tape is present between the supported and supporting members. This method assumes the gap between members is small enough that heat transfer is negligible. Based on a series of fire tests of glulam beam-to-column joints connected with MTC hangers, MTC recommends a maximum gap of 3.2 mm *[1/8 in.]*. In this approach, metal connectors are considered to be properly protected from fire if the wood cover surrounding the connector is sufficient to insulate it from damaging temperatures. The char layer depth for one-dimensional charring, $x_{c,o}$, as defined in CSA O86:24 Annex B.4.3 may be used provided that corner rounding is explicity considered in rectangular members.

$$x_{c,o} = \beta_o \cdot t \qquad \textbf{(eq. A.1)}$$

Where:

β_o one-dimensional charring rate, equal to 0.65 mm/min for glulam and CLT products

t fire exposure duration in minutes

In addition to the char layer depth, designers must determine the thickness of the zero-strength layer, x_t, in mm behind the char front. CSA O86:24 Clause B.5 prescribes a 7 mm thick zero-strength layer for fire exposures longer than 20 minutes.

Therefore, the required wood cover depth, d_p, in mm may be calculated, as follows:

$$d_p = x_{c,o} + x_t \qquad \textbf{(eq. A.2)}$$

In addition, two- or three-sided exposure produces corner rounding where the intersecting char fronts meet. EORs must verify that there is sufficient wood cover at corners to account for this corner rounding effect and to permit the use of the one-dimensional char depth. This may require placing the connector slightly higher within the beam or increasing the member width.

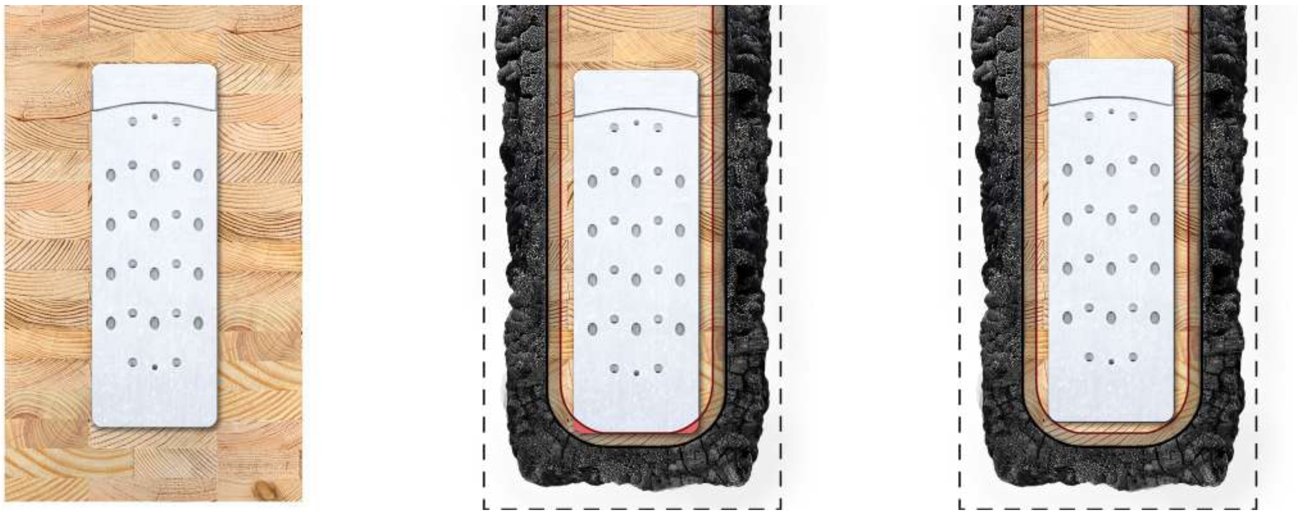


Figure A.2 - Corner Rounding Effects

The corner-rounding radius, r_{corner}, in mm should be taken as equal to the char depth.

$$r_{corner} = x_{c,o} \qquad \textbf{(eq. A.3)}$$

Detailing of connections with a FRR should consider the following:

1. It is recommended that the gap between abutting members not exceed 3.2 mm *[1/8 in.]*.
2. To allow construction tolerance, a gap of at least at least 1 mm *[0.039 in.]* is recommended between members.
3. Continuous wood cover must surround all embedded steel surfaces.

Method 2: Alternative Calculation per FDS-24 with Fire-Rated Joint

When an approved fire-rated joint is installed between the supported and supporting members, alternative fire design calculation methods such as FDS-24 result in reduced wood cover compared to the requirements of CSA O86:24, which can result in smaller member sizes. These methods may be used on a project-specific basis as an alternative to the CSA O86:24 procedures (Method 1), bu this would require approval from the Authority Having Jurisdiction (AHJ). FDS-24 and CSA O86:24 Annex B.9 refer to AWC's Technical Report 10 (TR10) for further background. The most common solutions for an approved fire-rated joint include the use of fire caulking and/or intumescent tape, applied in accordance with the manufacturer's specifications.

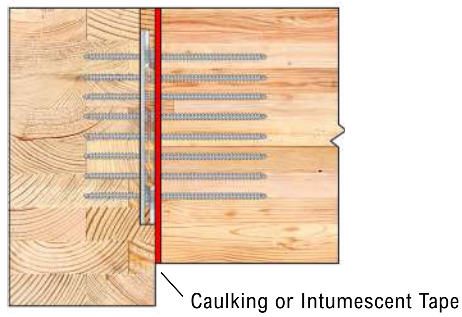


Figure A.3 - Fire-Resistant Joint

With an approved fire-rated joint and following FDS-24, the required depth of wood cover, d_p, can then be calculated based on the following equation:

$$d_p = 1.14 \cdot a_{char} \quad \textbf{(eq. A.4)}$$

Where:

a_{char} is given as $1.5(FRR)^{0.813}$ in in./hr for a standard char rate in FDS-24

The char depths and corresponding required wood cover for various FRR's are provided in Table A.1.

Table A.1 - Required Wood Cover for Connectors Protected by a Fire-Rated Joint (TR10 / FDS-24 Method)

FRR	Char Depth, a_{char}		Wood Cover Depth, d_p	
hr	mm	[in.]	mm	[in.]
0.75	**30**	[1.2]	**34**	[1.4]
1	**38**	[1.5]	**43**	[1.7]
1.5	**53**	[2.1]	**60**	[2.4]
2	**67**	[2.6]	**76**	[3.0]

Tables A.2, A.3, A.4 and A.5 provide alternative minimum beam sizes for the beam hangers presented in this design guide when used in conjunction with a fire-resistant joint that complies with the provisions of TR10 and FDS-24.

Table A.2 - GIGANT Alternative Minimum Beam Sizes for Connections with a Fire-Rated Joint

GIGANT Model	Alternative Minimum Secondary Beam Section Dimensions per FDS-24 (mm x mm) 45-min FRR	1-hr FRR	2-hr FRR
GIGANT 120 x 40	109 x 184	127 x 196	193 x 239
GIGANT 150 x 40	109 x 210	127 x 222	193 x 265
GIGANT 180 x 40	109 x 246	127 x 258	193 x 301

Notes:

1. Member sizes assume a FRR joint between members that complies with ASTM E1966 in accordance with TR10 and FDS-24.

Table A.3 - RICON S VS Alternative Minimum Beam Sizes for Connections with a Fire-Rated Joint

RICON S VS Model	Configuration	Alternative Minimum Secondary Beam Section Dimensions per FDS-24 (mm x mm) 45-min FRR	1-hr FRR	2-hr FRR
RICON S VS 140 x 60	**Single**	129 x 226	147 x 238	213 x 281
	Double	197 x 226	215 x 238	281 x 281
RICON S VS 200 x 60	**Single**	129 x 286	147 x 298	213 x 341
	Double	197 x 286	215 x 298	281 x 341
RICON S VS 200 x 80	**Single**	149 x 300	167 x 312	233 x 355
	Double	239 x 300	257 x 312	323 x 355
RICON S VS 290 x 80	**Single**	149 x 360	167 x 372	233 x 415
	Double	239 x 360	257 x 372	323 x 415
RICON S VS XL 390 x 80	**Single**	149 x 475	167 x 487	233 x 530
	Double	239 x 475	257 x 487	323 x 530

Notes:

1. Member sizes assume a FRR joint between members that complies with ASTM E1966 in accordance with TR10 and FDS-24..

Table A.4 - MEGANT Alternative Minimum Beam Sizes for Connections with a Fire-Rated Joint

MEGANT		Alternative Minimum Secondary Beam Section Dimensions per FDS-24 (mm x mm)		
Model	Configuration	45-min FRR	1-hr FRR	2-hr FRR
MEGANT 430 x 60	Single	129 x 530	147 x 537	213 x 580
	Double	193 x 530	211 x 537	277 x 580
MEGANT 310 x 100	Single	169 x 382	187 x 413	253 x 456
	Double	273 x 382	291 x 413	357 x 456
MEGANT 430 x 100	Single	169 x 502	187 x 533	253 x 576
	Double	273 x 502	291 x 533	357 x 576
MEGANT 310 x 150	Single	219 x 382	237 x 413	303 x 456
	Double	373 x 382	391 x 413	457 x 456
MEGANT 430 x 150	Single	219 x 502	237 x 533	303 x 576
	Double	373 x 502	391 x 533	457 x 576

Notes:

1. Member sizes assume a FRR joint between members that complies with ASTM E1966 in accordance with TR10 and FDS-24.

Table A.5 - APEX Alternative Minimum Beam Sizes for Connections with a Fire-Rated Joint

APEX		Alternative Minimum Secondary Beam Section Dimensions per FDS-24 (mm x mm)		
Model	Configuration	45-min FRR	1-hr FRR	2-hr FRR
APEX S	Single	170 x 533	188x 545	254 x 588
	Double	282 x 533	300 x 545	366 x 588
APEX M	Single	170 x 593	188 x 605	254 x 648
	Double	282 x 593	300 x 605	366 x 648
APEX L	Single	221 x 479	239 x 491	305 x 534
	Double	384 x 479	402 x 491	467 x 534

Notes:

1. Member sizes assume a FRR joint between members that complies with ASTM E1966 in accordance with TR10 and FDS-24.

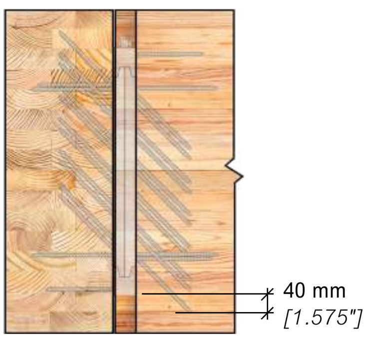
Standard Detailing Guidelines for MTC Products

Void Below Connectors: Some connector models, such as the RICON S VS XL and the MEGANT series, require a void below them to facilitate proper installation. Unless otherwise indicated, the void must be filled with appropriate fire-stopping materials such as mineral wool insulation, intumescent tape, fire sealants, or a wood plug.

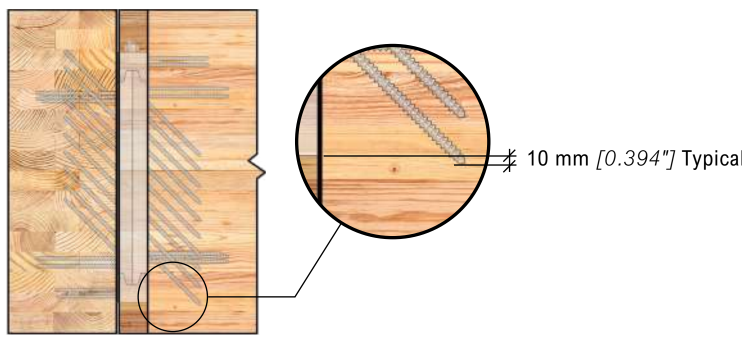
Wood Plug: In some installation configurations, the housing extends the full depth of the secondary member, leaving a void at the bottom. Thus, a wood plug is necessary to ensure the required FRR during the service life of the connection.

Additional Fire Design Considerations for MEGANT Connectors: The threaded rod assembly must be taken into account when determining the placement of the connector in the beam section and evaluating its FRR. The threaded rods extend 30 mm *[1-3/16 in.]* above the edge of the clamping jaw in all MEGANT connectors.

For MEGANT connectors, the inclined screw extends below the clamping jaw and may penetrate the wood cover. Despite this, the residual capacity of the fasteners exceeds the demand under fire conditions.



MEGANT 60 Series



MEGANT 100 and 150 Series

Figure A.6 - Distance Between Screw Tip and Connector for Megant

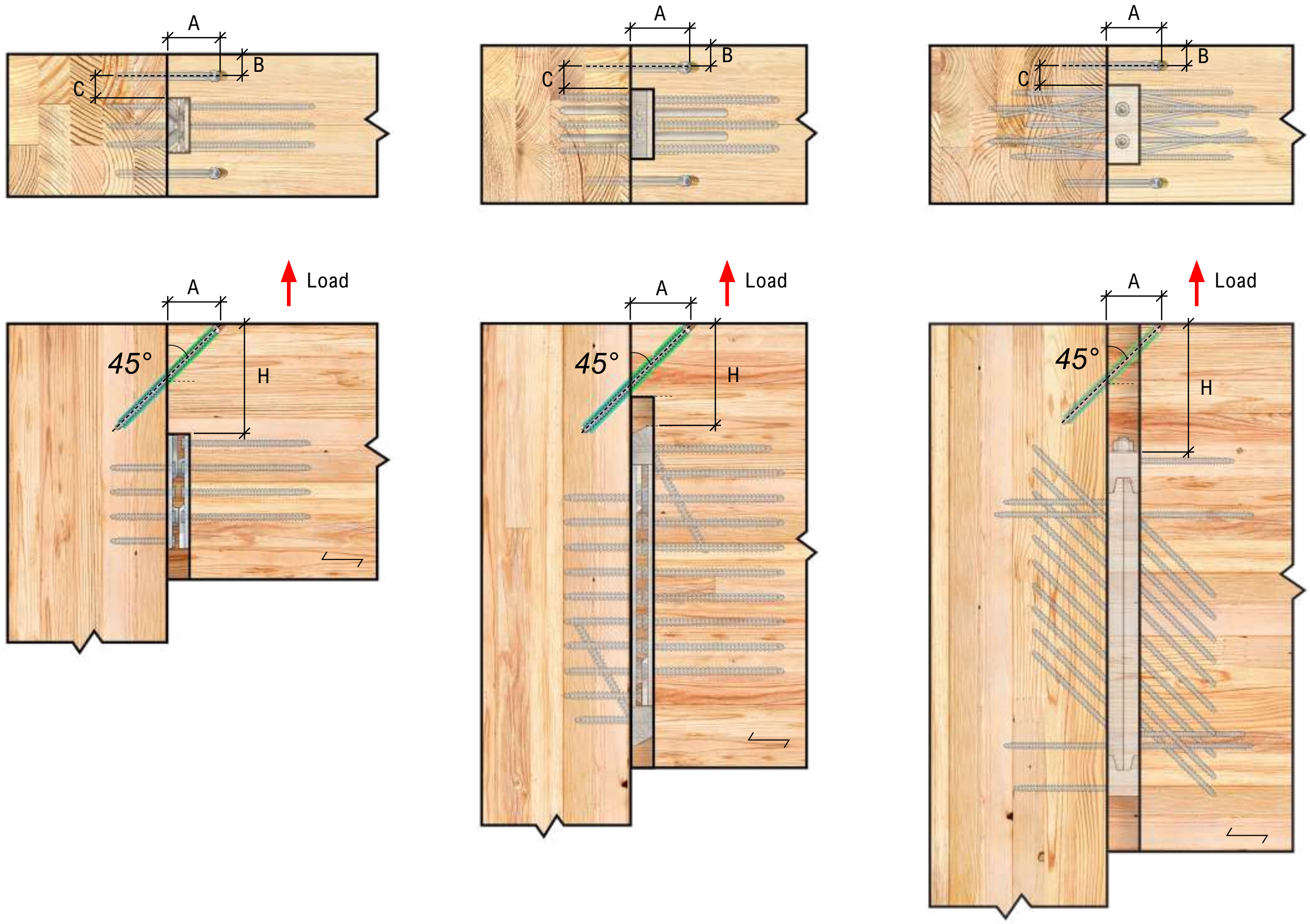
Appendix B: Uplift Resistance Design

Additional hardware is required to resist uplift forces with beam hanger systems. This can be achieved by installing fully threaded toe screws after the connectors are in place. The orientation of each screw relative to the joint assures that the screw primarily resists uplift through tension. Fully threaded screws are compatible with all beam hanger systems.

For RICON S VS hangers, uplift resistance can also be achieved using a Clip Lock system. More details on this option are presented in the RICON S VS chapter.

To ensure proper performance, installation of the beam hanger system and toe screw is essential. Minimum spacing requirements must be satisfied to prevent interference between fasteners and ensure the integrity and performance of the connection.

Example of Toe Screw Installation



RICON S VS | RICON S VS XL | MEGANT

Design Information for Toe Screw Connections

Table B.1. - Geometry Requirements

Toe Screw Diameter	Minimum Screw Length	Minimum Insertion Point End Distance	Minimum Distance to Edge of Beam	Minimum Distance to Edge of Hanger
D	**L**	**A**	**B**	**C**
mm				
—	20D	10D	3D	3D
8	160	80	24	24
10	200	100	30	30

Notes:

1. All connection design must meet all the relevant requirements of the Notes to the Designer section.
2. Geometry requirements are in accordance with CCMC 13677-R.
3. In wood species sensitive to splitting, minimum geometry requirements may be required to be increased.
4. If the insertion point end distance is greater than the distance from the top of the beam to the top of the hanger minus four times the diameter of the screw (i.e., A > H – 4D), then each inclined screw should be located at least a distance of C from the hanger.

Table B.2. - Allowable Factored Uplift Resistance Values for Single Toe Screws

Fasteners			Insertion Point End Distance [mm]	Factored Resistance [kN]		Cost
Type		Qty.	A	G = 0.42	G = 0.49	
MTC-FTCY	**8 x 220 mm**	2	85	7	9	Increasing Fastener Cost
	8 x 240 mm		95	7	9	
	8 x 260 mm		100	8	11	
	8 x 280 mm		110	9	N/A	
	8 x 300 mm		115	10	N/A	
	8 x 330 mm		125	11	N/A	
MTC-FTCY	**10 x 300 mm**	2	115	12	15	
	10 x 320 mm		125	12	16	
	10 x 340 mm		130	13	18	
	10 x 360 mm		135	15	N/A	
	10 x 380 mm		145	15	N/A	
	10 x 400 mm		150	16	N/A	
	10 x 430 mm		160	18	N/A	

Notes:

1. Tabulated allowable uplift loads are based on a short-term load duration, K_D, of 1.15.
2. Tabulated allowable uplift loads are for two fasteners installed at 45° in a beam-to-column configuration as shown on the previous page.
3. Tabulated allowable uplifts loads assume the fasteners are not installed in a void between lamelas of split-laminated glulam members.
4. Tabulated allowable uplift loads are based on both glulam members (i.e., column and beam) having the same specific gravity. Where specific gravities between the primary and secondary members differ, the lower value shall be used.
5. Tabulated allowable uplift loads are only valid for Limit States Design (LSD).
6. Highlighted allowable uplift cells indicate a value where the tensile strength of the fastener governs the design. No further increase in strength can be achieved with longer screws.
7. Tabulated values are based on at least two fasteners per connection.

Appendix C: Survey of Literature on Reinforcement for Tension Perpendicular to Grain

Connecting beams by side-loading or end-support in mass timber structures requires careful placement of fasteners and consideration of perpendicular-to-grain tensile stresses. When required, reinforcing screws can be used to prevent wood splitting by providing a load path for tension perpendicular to grain. This appendix provides a **literature review** of current best practices, focusing on advanced techniques such as self-tapping screws, based on the latest research and CSA O86:24. All engineering work must be completed by a licensed Professional Engineer of Record (EOR) to ensure safety and compliance with the applicable codes and standards.

Strength of Members for Brittle Failure in Tension Perpendicular to Grain

This appendix focuses exclusively on perpendicular-to-grain brittle failure modes in wood connections, emphasizing the importance of careful design. EORs should be particularly attentive to tension-induced splitting at points of load application and beam-end splitting at points of support. CSA O86:24 introduces design provisions addressing these failure modes, including splitting resistance for connections loaded perpendicular to grain. However, interpretation and application of these provisions—especially for beam-end and end-grain conditions—still requires engineering judgement. This literature review provides EORs with context, reference practices, and recommendations informed by testing and industry experience.

Splitting Resistance of Members in Side-Loaded Connections

Perpendicular-to-grain tension-induced splitting can occur if loads are applied without engaging enough of the member's depth, such as in a connection placed low on a member's side (see Figure C.1). In these scenarios, reinforcement may be required depending on fastener height and load magnitude.

Splitting is a concern when a connection applies load to a member, unless the connection includes fasteners that engage at least 70% of the beam's depth from the loaded edge, as indicated by CSA O86:24 and Eurocode 5 EN 1995-1-1:04.

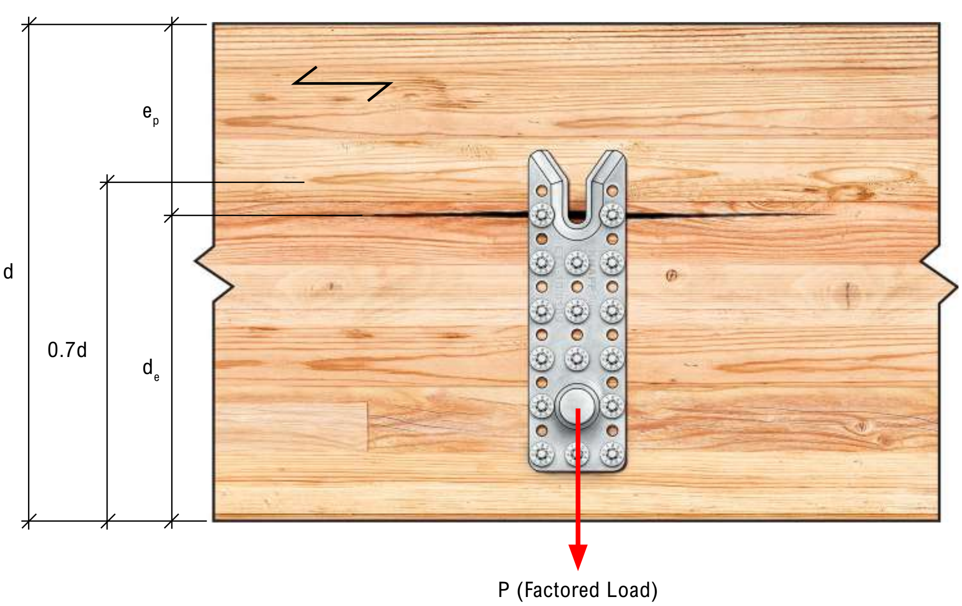


Figure C.1 - Splitting at Low Connection on Primary Member's Side

To evaluate the splitting strength of members in connections loaded perpendicular to grain, CSA O86:24 Clause 12.12.10.8 provides an equation for the factored splitting resistance, QS_{rT}, of a wood member and notes that splitting resistance need not be considered when the ratio of $d_e/d \geq 0.7$.

Note: CSA O86:24 defines d_e as the distance from the loaded edge of the member to the furthest fastener and e_p as the distance from the unloaded edge to the closest fastener. Throughout this guide, fastener placement is expressed from the unloaded edge, e_p. Therefore, a depth ratio of $d_e/d \geq 0.7$ corresponds to a fastener placement of $e_p/d \leq 0.3$.

CSA O86:24 does not explicitly distinguish between side-grain and end-grain applications within this provision. Testing has demonstrated that the equation for splitting perpendicular to grain provides good correlation in both conditions, but engineering judgement is required when interpreting the exception that omits a splitting check for fastener placement $e_p/d \leq 0.3$. This threshold originates from testing performed on side-grain applications and may be unconservative when applied to beam-end or end-grain conditions.

Splitting Resistance of Members at End Supports

Beam-end splitting in members can be induced by excessive cross-grain tension. Connections that provide support to beams may require reinforcement to prevent beam-end splitting if they do not support the bottom of the member, as illustrated in Figures C.2 through C.5.

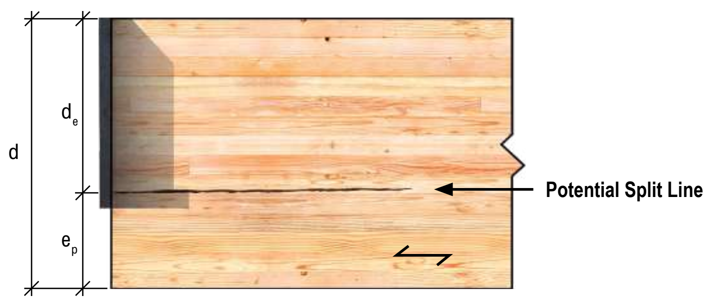


Figure C.2 - Concealed Bearing Plate Does Not Support Bottom of Member

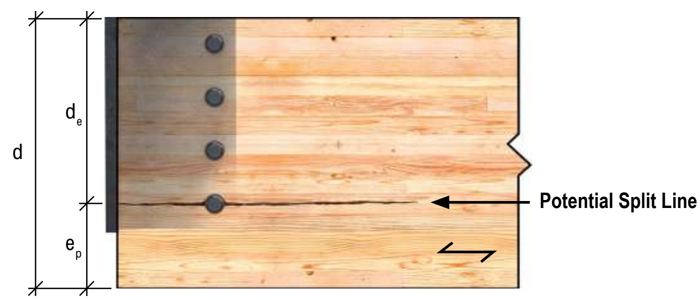


Figure C.3 - Lowest Dowel in Knife Plate Connection Does Not Support Bottom of Member

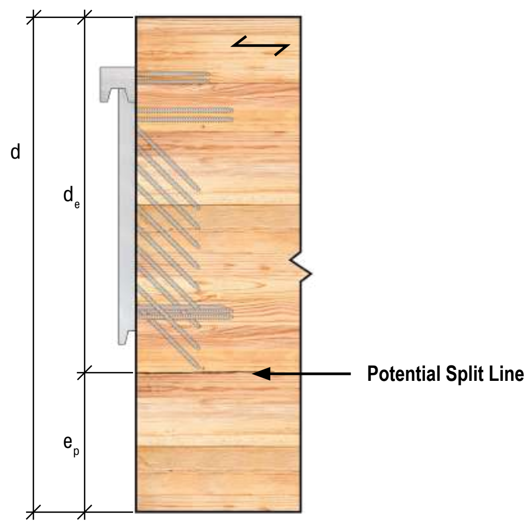


Figure C.4 - Lowest Inclined Fastener in Beam Hanger Does Not Support Bottom of Member

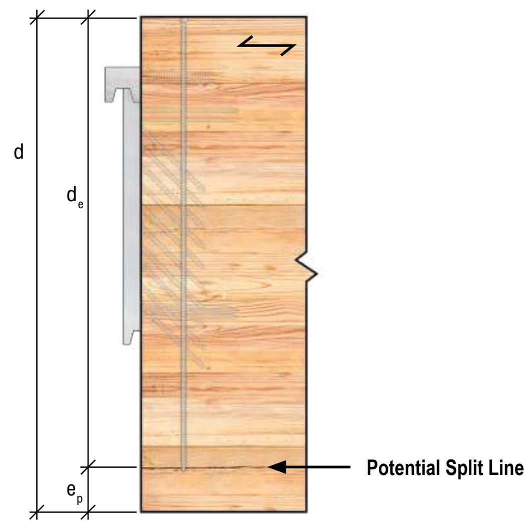


Figure C.5 - Effective Threads of Reinforcing Screw Does Not Extend to Bottom of Member

Appendix

Because beam-end splitting depends on support conditions and load levels, the EOR must ensure that end splitting does not occur. Testing has shown that beams are safe from end splitting when supported by MTC hangers at their factored resistances and positioned according to Table C.1.

Table C.1 - Relative Connector Positioning at Beam-End Locations

Product	Maximum e_p in Secondary Member
GIGANT	0.3 · d
RICON S VS	0.2 · d
MEGANT	0.3 · d
APEX 100 series	100 mm
APEX 150 series	107 mm

For end grain connections, the following verifications should be reviewed in addition to the general design requirements of CSA O86:24:

Splitting Resistance

If MTC Solutions' hangers will have fastener placement outside the recommended limits in Table C.1, the supported member should be checked for splitting perpendicular to grain using the factored splitting-resistance model in CSA O86:24 Clause 12.12.10.8.

Note: CSA O86:24 permits omission of this check when fastener placement is less than $e_p/d \leq 0.3$ ($d_e/d \geq 0.7$); however, this threshold is historically based on loads being applied to the side of a beam.. In beam-end or end-grain conditions, where confinement is reduced, this assumption may be unconservative, and the EOR should use judgment when applying this criterion.

Effective Shear Resistance

Regardless of fastener placement, the effective shear resistance of the supported member should be verified in accordance with CSA O86:24 Clause 12.2.1.6, using the appropriate effective shear depth. This verification checks if the shear resistance is adequate based on fastener position and reinforcement details.

Note: The notch provisions in Clauses 6.5.4.4 and 7.5.7.5.2 address geometric section reductions with re-entrant corners, such as traditional notched beams. Concealed beam hanger connections do not involve any loss of section, and as such, the full shear depth is maintained. Therefore, the effective shear depth method of Clause 12.2.1.6 is more appropriate here.

When verifying splitting resistance, only the portion of the member directly influenced by the connection should be considered effective. CSA O86:24 does not provide a method for defining the effective width to be used for splitting resistance in wide members; therefore, the following approach is provided as conservative engineering guidance. Research and test data indicate that perpendicular-to-grain tension disperses at approximately a 15° angle from the loaded region, meaning that the effective width, b_{eff}, may be taken as the smaller of the beam width or the fastener-group width plus twice the dispersion length as shown in Figure C.6. Engineering judgment is required where geometry, multiple connectors, or reinforcement may alter this distribution.

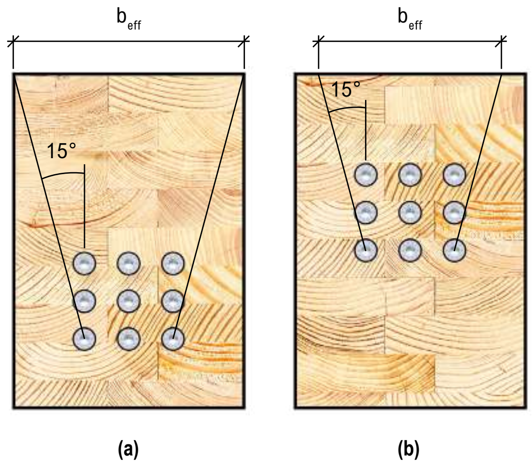


Figure C.6 - Effective Width of Secondary Member Where (a) Beam Width Governs (b) Dispersion Width Governs

Near-end beam connections behave similarly to end-grain conditions, where the risk of splitting perpendicular to grain increases due to reduced confinement. Therefore, when a member is supported close to its end as shown in Figure C.7, the EOR should verify the splitting resistance in accordance with CSA O86:24 Clause 12.12.10.8 when the fastener placement in the supporting member falls outside the limits in Table C.1.

As a point of reference, the National Design Specification (NDS) 2024 requires special consideration of connections that support the end of a member compared to connections located at least five times the member depth from the beam end. While CSA O86:24 does not provide an equivalent geometric limit, the same design rationale applies—connections located near a beam end should be evaluated for both splitting and shear resistance to ensure adequate performance.

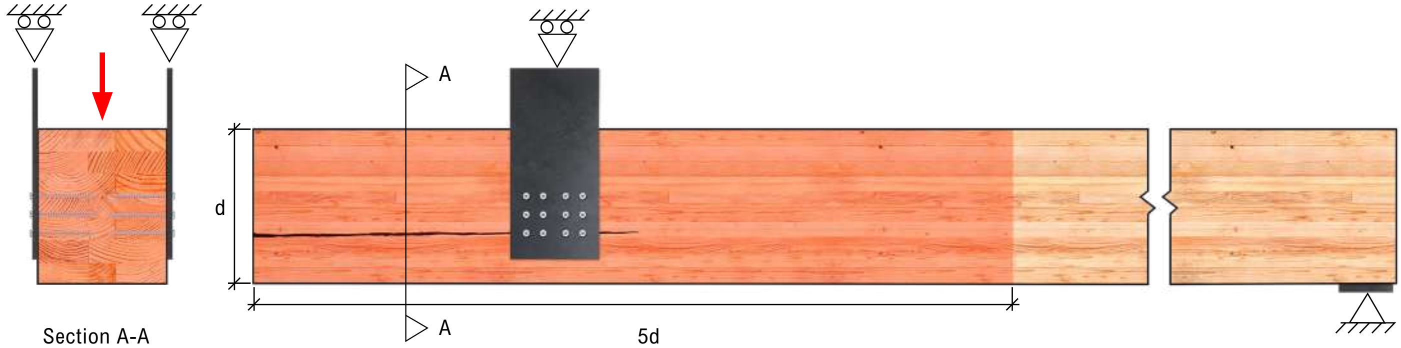


Figure C.7 - Splitting of Beam Supported Near its End

Best Practices for Designing Reinforcement

Reinforcement for Preventing Splitting at Points of Load Application

When a secondary member connects too low on the side of a primary member and engages less than 70% of its depth, it is necessary to calculate the factored splitting resistance, QS_{rT}, of the primary member. Should the factored load, P_f, exceed this value, reinforcing the member with self-tapping screws often proves more economical than increasing the member's size. This approach is especially critical for connections where prioritizing placement in the primary member can significantly minimize the forces associated with beam-end splitting perpendicular to the grain in the secondary member.

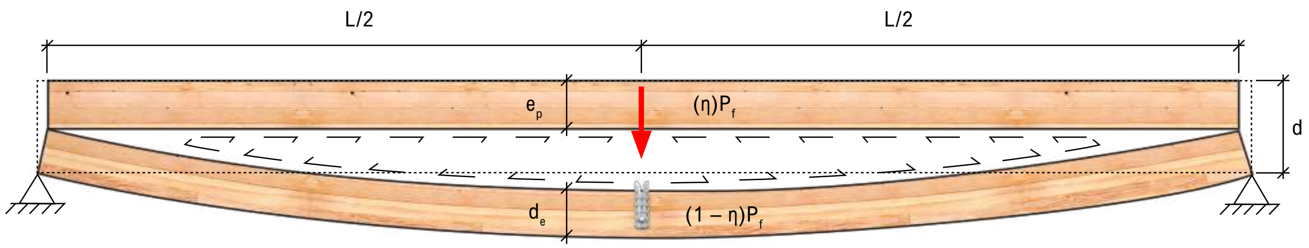


Figure C.8 - Primary Member Splitting with Hanger Installed at Mid-Span

Figure C.8 illustrates a split beam due to a load applied by a hanger installed at mid-span, where the top fasteners are located at a distance of d_e from the bottom edge. In this scenario, the lower beam section, with a depth of d_e, supports the entire load, P_f. If reinforcing screws connect the upper and lower beam sections at mid-span, they will distribute a portion of the load, ηP_f, to the upper section and its remaining portion, $(1 - \eta)P_f$, to the lower section. The formula below ensures deflection compatibility between the upper and lower portions of the split beam and is applicable to various loading configurations, not just at mid-span.

$$P_{Rf} = \eta \cdot P_f \qquad \textbf{(eq. C.1)}$$

Where:

$$\eta = 1 - 3\left(\frac{d_e}{d}\right)^2 + 2\left(\frac{d_e}{d}\right)^3 \qquad \textbf{(eq. C.2)}$$

With the factored load for the reinforcing screws, P_{Rf} , now able to be calculated, all information needed to design the reinforcing screws is available. Typical practice would be to provide a fully threaded self-tapping screw on each side of the hanger. Fasteners should be spaced 1.5D from the nearest beam hanger and 3D from the front edge of the primary beam, where D is the nominal diameter of the fastener. In such a case, each screw would be designed to support half of the calculated design load (i.e., P_{Rf} /2) given by the formula above.

Fully threaded reinforcing screws supplied by MTC should be designed following the requirements of the structural screw catalog and CSA O86:24. As outlined above, the location of the top row of fasteners in the hanger defines the location where splitting would occur in the member. The split can be considered to create an upper member and a lower member at its location. The upper member at this location equates to the “side” member that defines its thickness, $t_{s,w}$, as follows:

$$t_{s,w} = d - d_e \qquad \textbf{(eq. C.3)}$$

Assuming the head of the screw is set flush with the top surface of the beam, the effective thread lengths above, $L_{eff,s}$, and below, $L_{eff,m}$, the location of the split can then be calculated as:

$$L_{eff,s} = t_{s,w} - L_{un} \quad \textbf{(eq. C.4)}$$

$$L_{eff,m} = L - t_{s,w} - L_{tip} \quad \textbf{(eq. C.5)}$$

Where:

L_{un} length of the unthreaded portion of the screw, measured from screw head to the start of the threads

L_{tip} length of the screw tip, equivalent to the nominal fastener diameter, D

In addition, in scenarios where the hanger will be subjected to uplift loads greater than the factored splitting resistance for this condition, to prevent splitting at the screw tip, embed it at least 0.7d below the top of the member, as shown in Figure C.9.

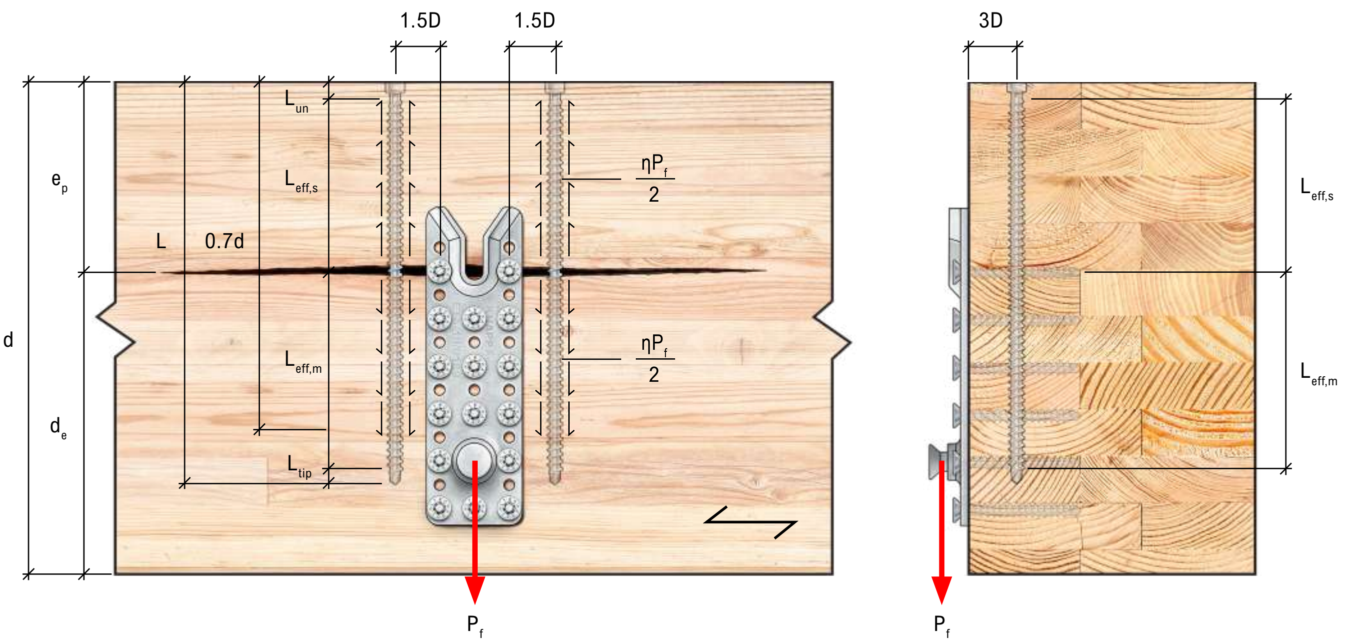


Figure C.9 - Force Distribution and Reinforcement Placement in Side of Member

Reinforcement for Preventing Beam-End Splitting at Points of Support

CSA O86:24 does not offer specific guidance for designing reinforcement for members susceptible to beam-end splitting; therefore, mechanics-based methods from literature are recommended herein. For beams determined to have insufficient splitting resistance at end supports, the EOR can reference Timber Engineering Principles for Design by H.J. Blaß and C. Sandhaas which offers the following equation for determining the factored load transferred by reinforcing screws, P_R, across the fracture plane at the end of a beam:

$$P_{Rf} = 1.3 \cdot \left[3\left(1-\frac{d_e}{d}\right)^2 - 2\left(1-\frac{d_e}{d}\right)^3\right] \cdot V_f \qquad \textbf{(eq. C.6)}$$

Where:

V factored shear load in the member being transferred to the support in kN

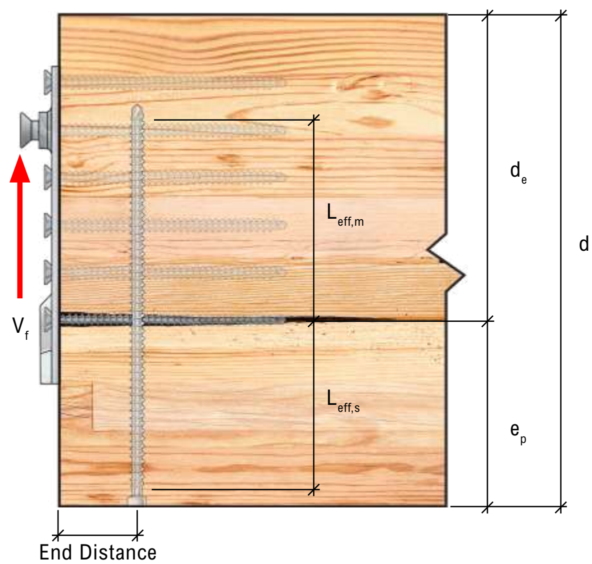


Figure C.10 - Reinforcement Placement in Beam-End

Only one row of reinforcing screws should be used to ensure even load distribution among all screws. Existing literature suggests that for typical gravity applications in beam-end connections, these fasteners should be installed from the bottom and penetrate as close to the top of the beam as possible. When designing reinforcement, it is best practice to position the row of reinforcing screws as close to the end of the beam as possible. The spacing, end distance, and edge distance requirements for MTC fully threaded self-tapping screws can be found in the MTC Solutions Structural Screw Catalog.

Detailing Reinforcing Screws

C.1 Placement of Reinforcing Screws for Equal Load Sharing

To ensure equal load sharing among reinforcing screws:

- In the primary member, reinforcing screws should be oriented in a single row on each side of the hanger, with all screws positioned the same distance, s, from the centerline of the hanger.
- In the secondary member, reinforcing screws should be oriented in a single row, with all screws positioned the same distance, a, from the end of the secondary member.

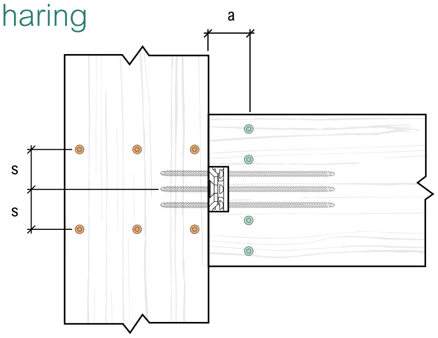


Figure C.11 - Reinforcing Screw Placement for Equal Load Sharing

C.2 Avoiding Screw Collisions

To avoid screw collisions, reinforcing screws should be installed beside the beam hanger rather than between its fasteners. If two beam hangers are placed side-by-side to support the end of a member, a reinforcing screw should be installed on each side of the dual-hanger assembly and ideally between the two hangers.

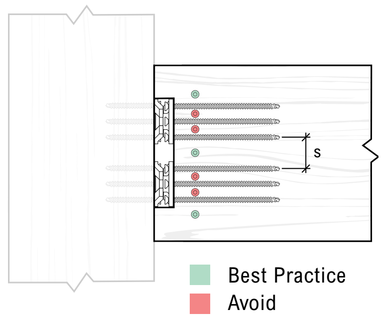


Figure C.12 - Reinforcing Screw Placement for Avoiding Screw Collisions

C.3 Installing Reinforcing Screws Near Edges

Screws installed near an edge of a member may be angled slightly inward (by approximately 5°) to mitigate the risk of deviating during installation and protruding from the side of the member

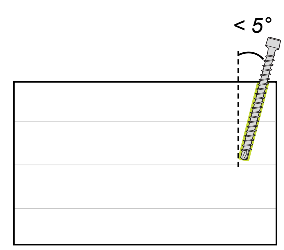


Figure C.13 - Reinforcing Screw Placement Near an Edge

C.4 Considering Tool Requirements Needed to Accommodate Installation

Typically, reinforcing screws should be installed before the member is placed in its final configuration. When this is not possible, the EOR must consider the space required for installation tools, the length of the reinforcing screws, and the installation sequence of adjacent components.

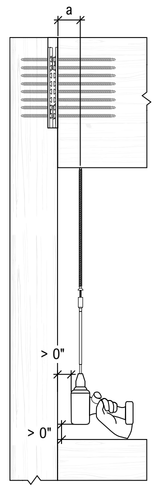


Figure C.14 - Accommodation of Tools During Installation

Summary of Recommendations

Recommendation	Reasoning
Only install a single row of reinforcing screws	Forces are not evenly distributed across multiple rows of fasteners
Prioritize placement of the secondary member to avoid reinforcement, helping isolate reinforcement only to the primary member	This results in more efficient design and more space for reinforcement in the primary member
Ensure screw spacing meets manufacturer's guidelines	This helps prevent screw collisions and wood splitting
Reinforcing screws near beam edges may be angled slightly inward (by approximately 5°) if geometry can be accommodated	This minimizes the risk of screw deviation from the side of the beam during installation
Pilot holes should be drilled as close to the full length of the screws as possible	This facilitates a proper penetration path for screws and reduces the risk of screw collisions

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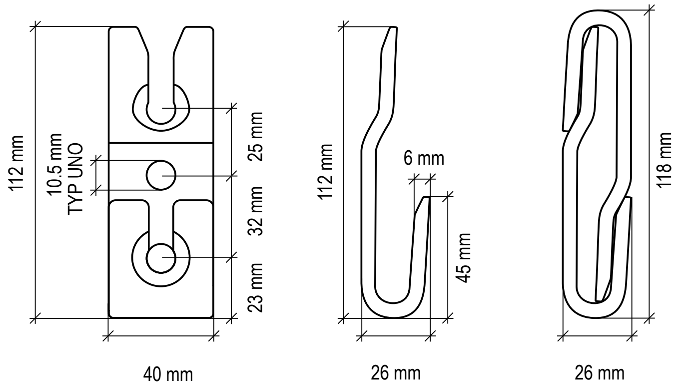
Appendix D: Product Specifications

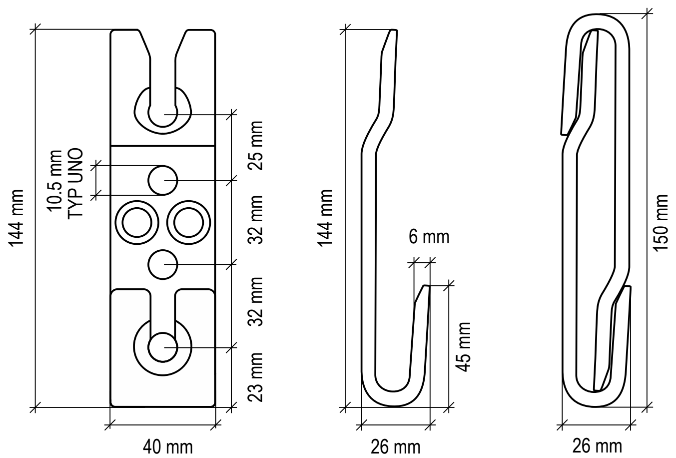
This appendix provides more precise dimensions for the different beam hanger components referenced in this design guide. Detailed 2D and 3D geometry files are available for download on the respective product pages.

GIGANT

GIGANT 120 x 40



GIGANT 150 x 40



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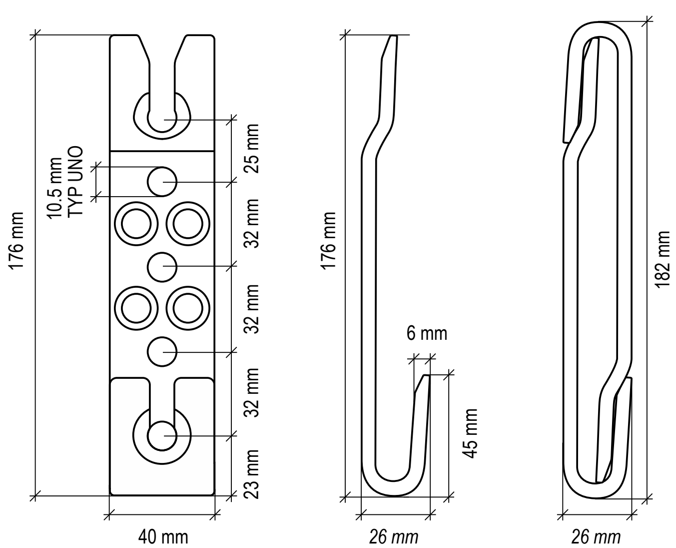
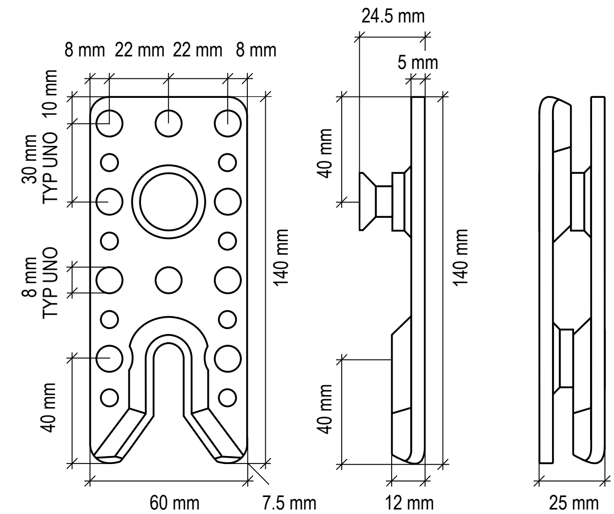


RICON S VS

RICON S VS 140 x 60



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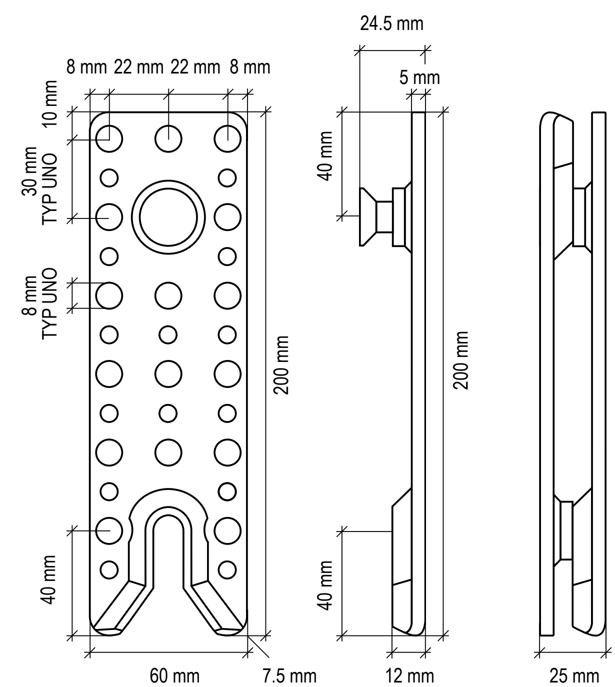

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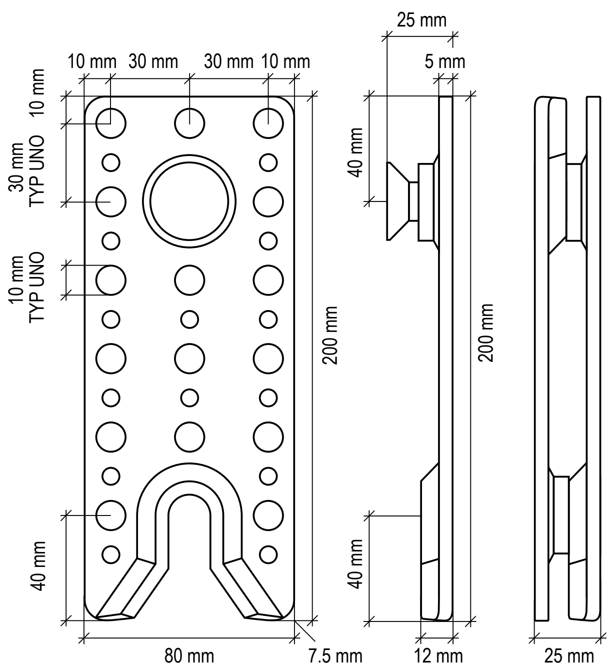
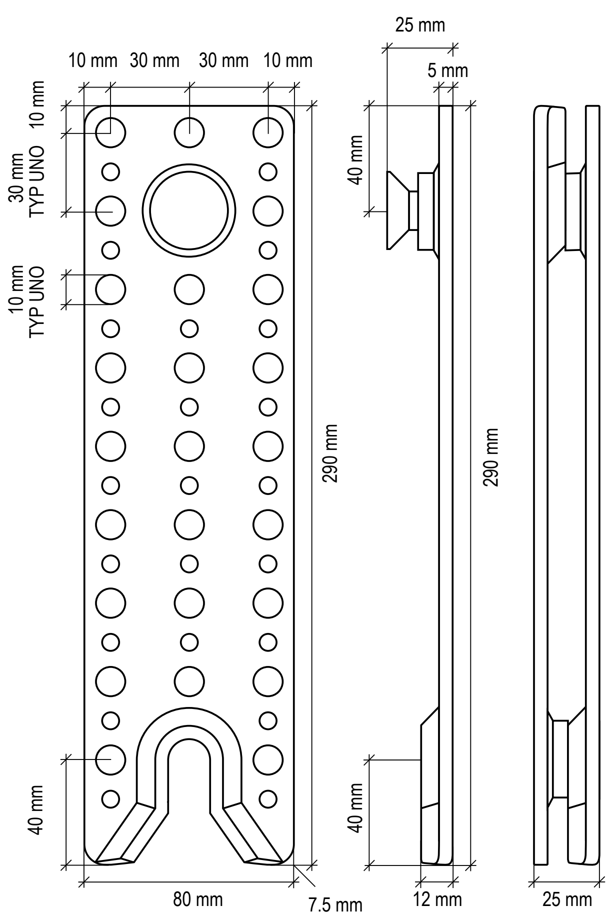
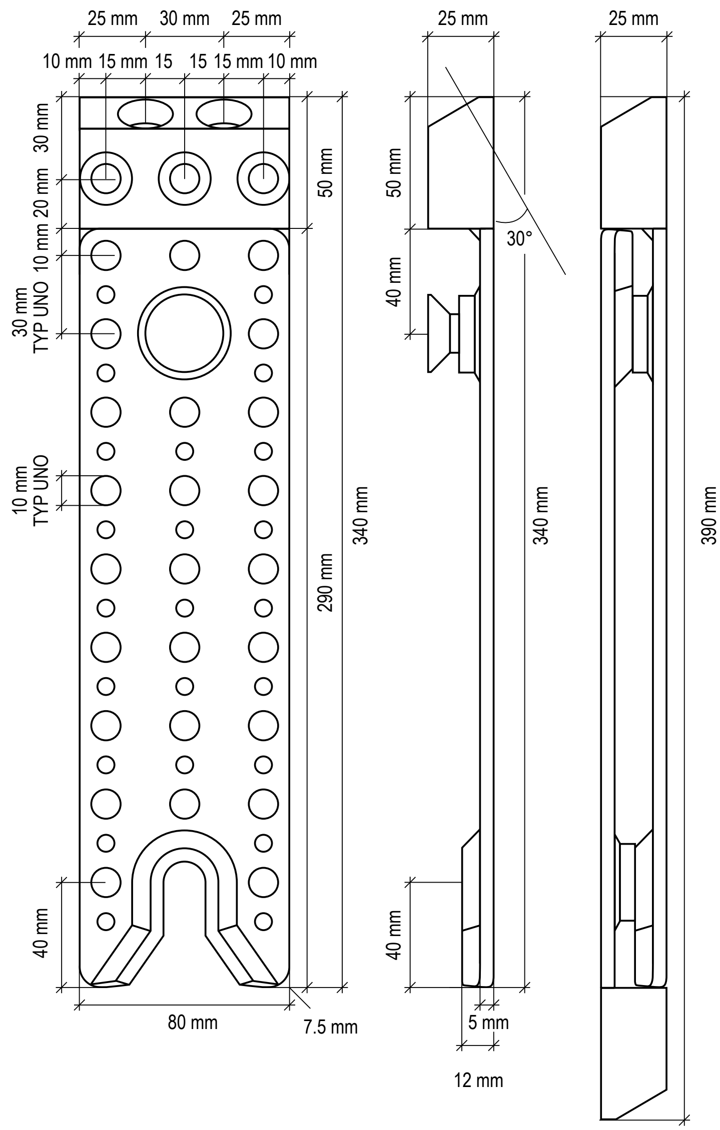


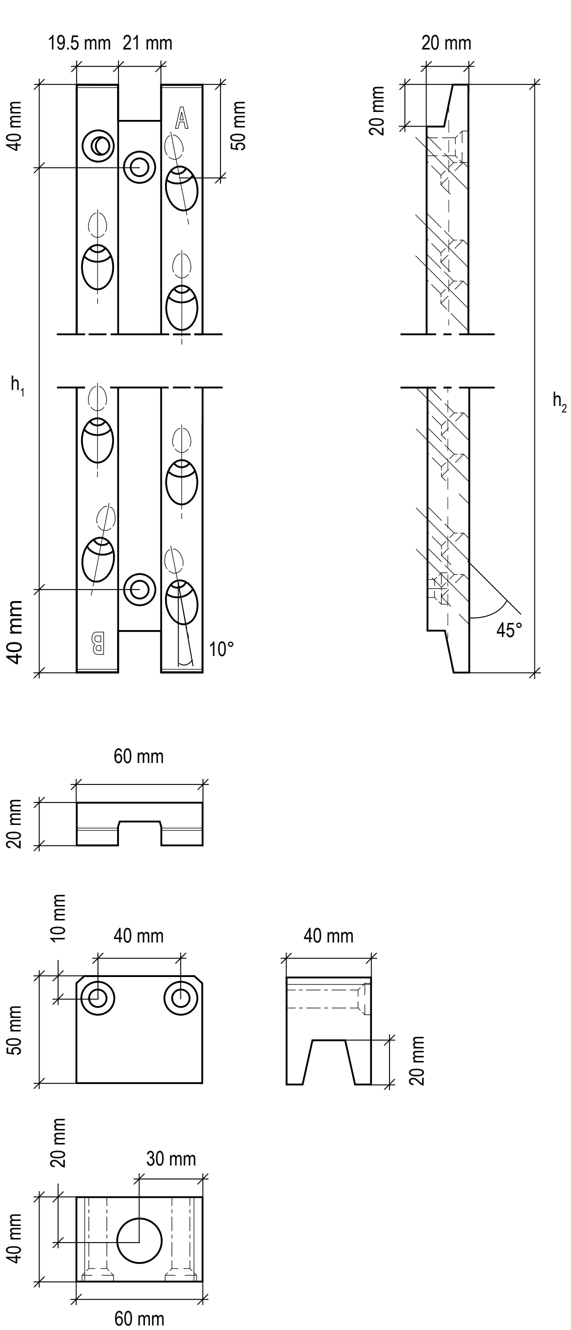
RICON S VS 290 x 80



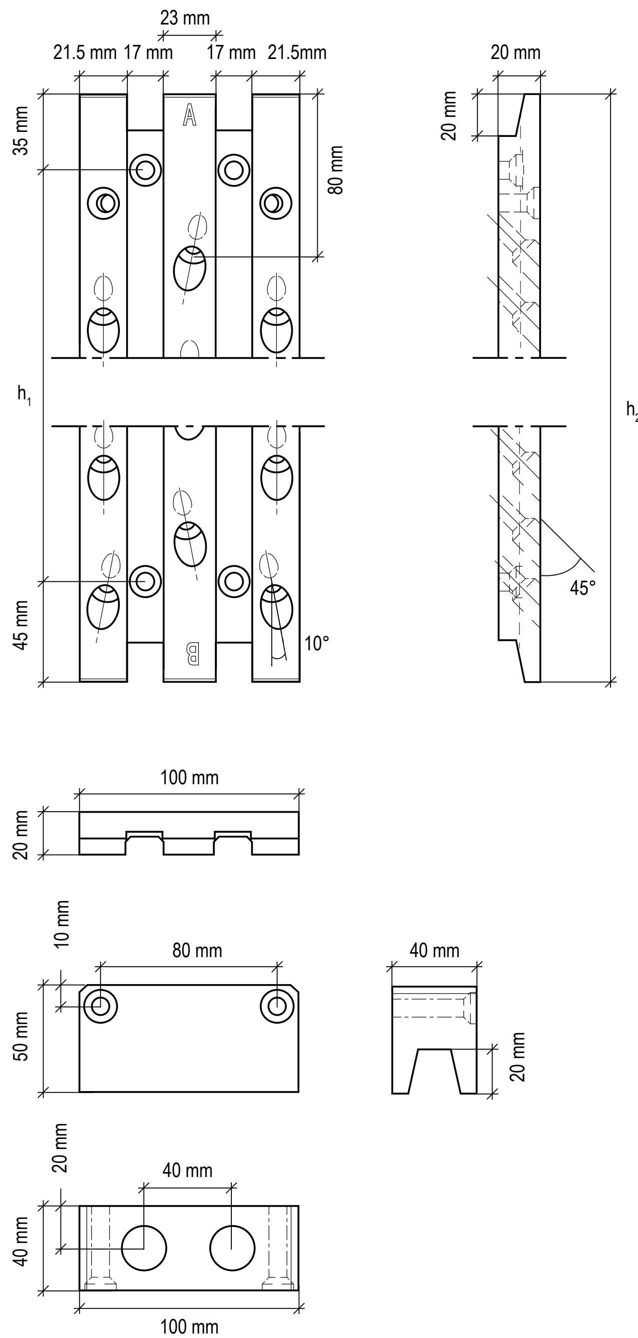
RICON S VS XL 390 x 80



MEGANT 60 SERIES



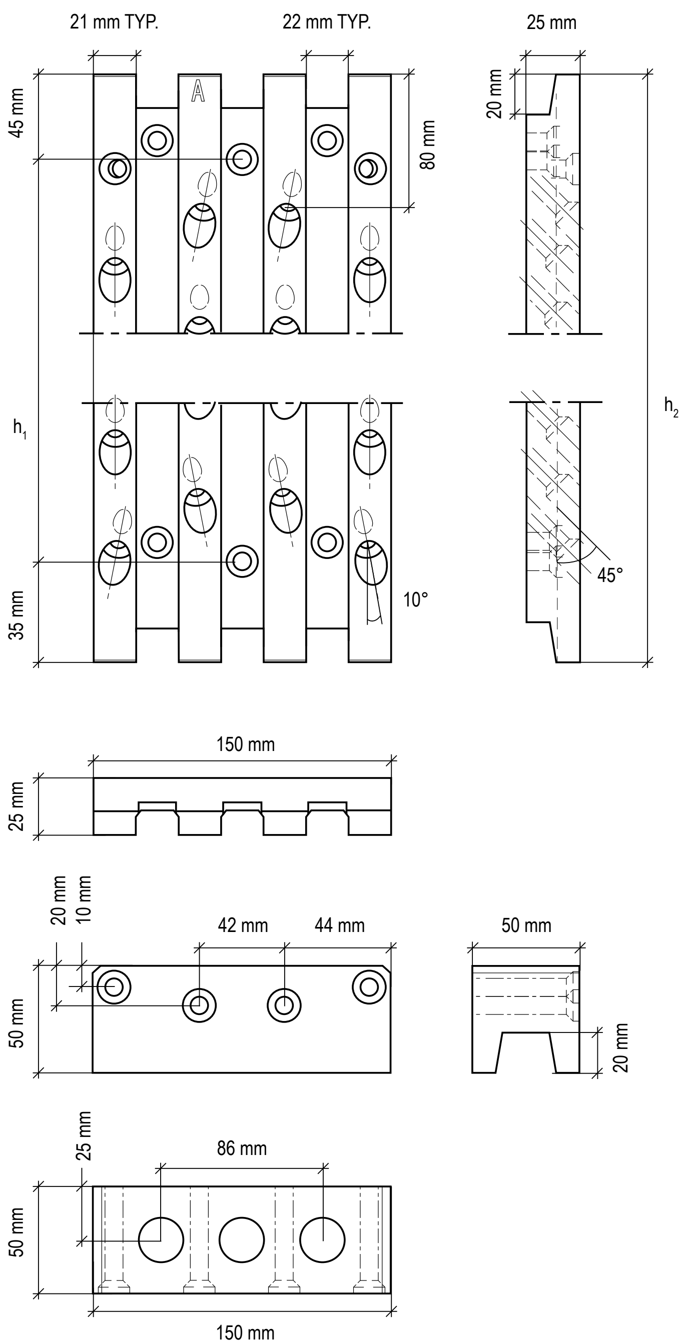
MEGANT 100 SERIES



Model	h_1	h_2
	mm	
MEGANT 430 x 60	290	370

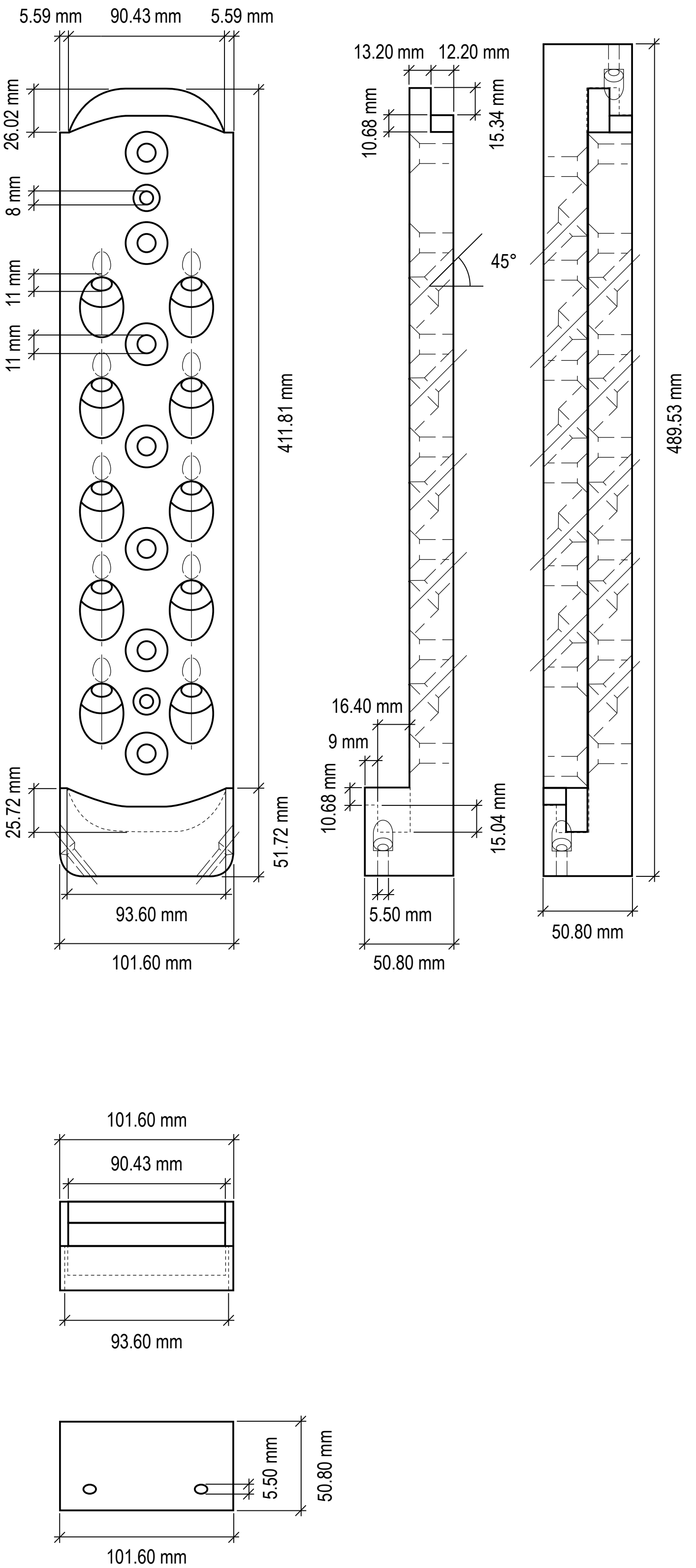
Model	h_1	h_2
	mm	
MEGANT 310 x 100	170	250
MEGANT 430 x 100	290	370

MEGANT 150 SERIES

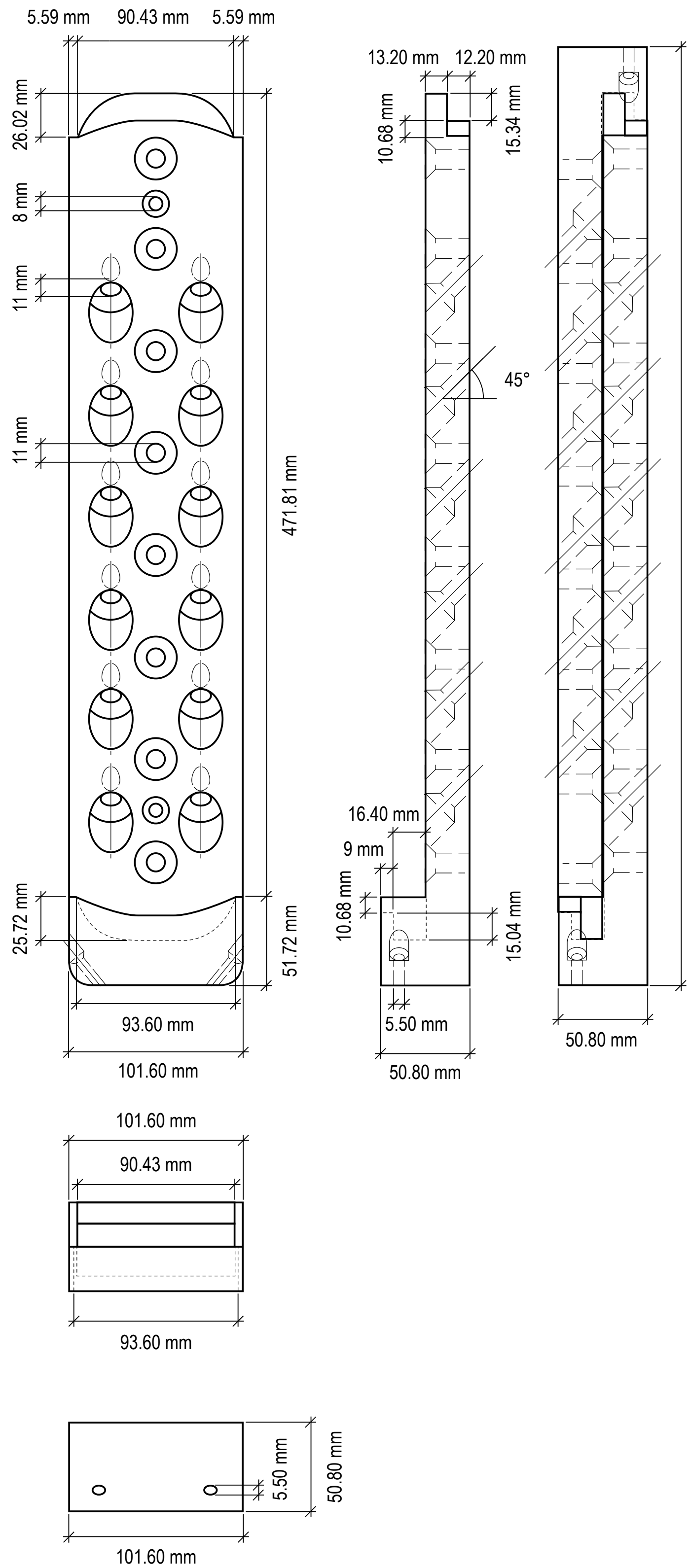


Model	h_1	h_2
	mm	
MEGANT 310 x 150	170	250
MEGANT 430 x 150	290	370

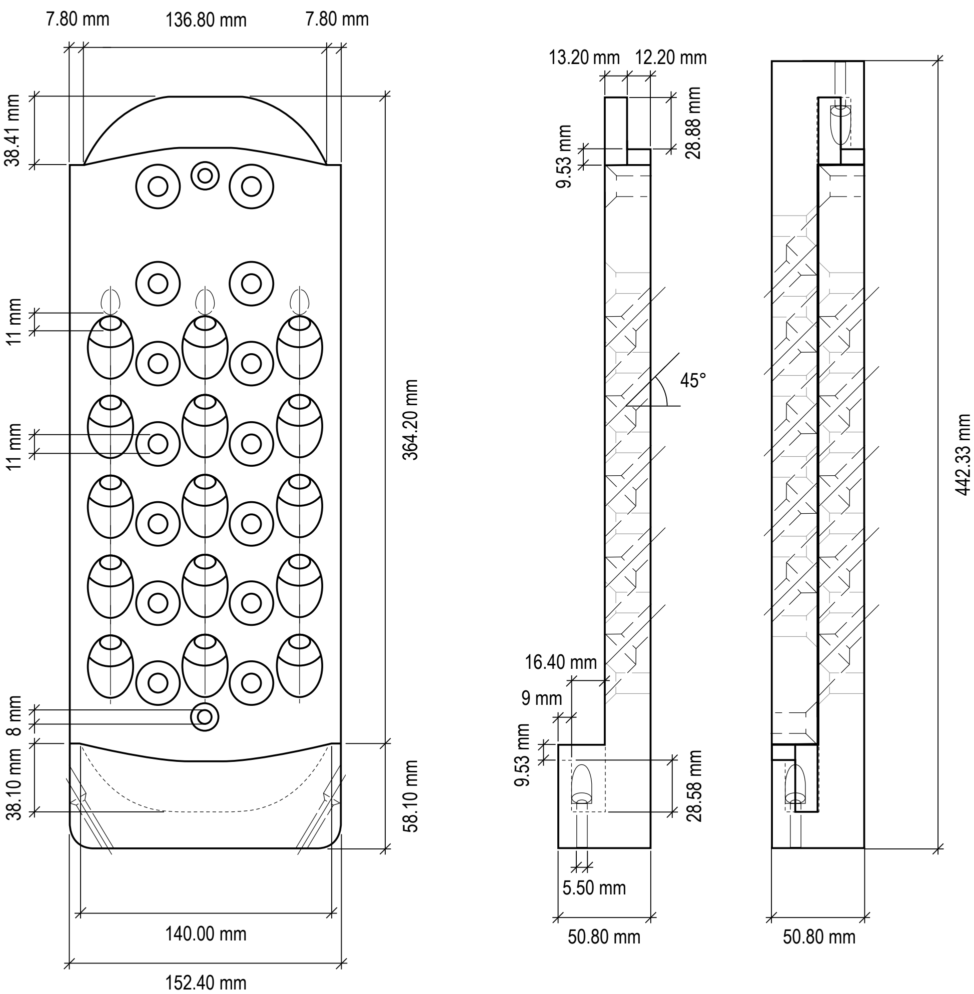
APEX S


5.59 mm
90.43 mm
5.59 mm
26.02 mm
8 mm
11 mm
11 mm
411.81 mm
25.72 mm
51.72 mm
93.60 mm
101.60 mm
13.20 mm
12.20 mm
10.68 mm
15.34 mm
45°
16.40 mm
9 mm
10.68 mm
15.04 mm
5.50 mm
50.80 mm
489.53 mm
50.80 mm
101.60 mm
90.43 mm
93.60 mm
5.50 mm
50.80 mm
101.60 mm

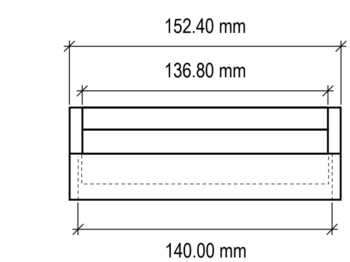
APEX M


5.59 mm
90.43 mm
5.59 mm
26.02 mm
8 mm
11 mm
11 mm
471.81 mm
25.72 mm
51.72 mm
93.60 mm
101.60 mm
13.20 mm
12.20 mm
10.68 mm
15.34 mm
45°
16.40 mm
9 mm
10.68 mm
15.04 mm
5.50 mm
50.80 mm
549.53 mm
50.80 mm
101.60 mm
90.43 mm
93.60 mm
5.50 mm
50.80 mm
101.60 mm

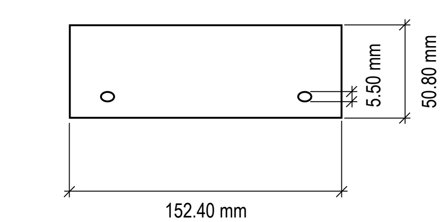
APEX L



7.80 mm
136.80 mm
7.80 mm
38.41 mm
11 mm
11 mm
8 mm
38.10 mm
364.20 mm
58.10 mm
140.00 mm
152.40 mm
13.20 mm
12.20 mm
9.53 mm
28.88 mm
45°
16.40 mm
9 mm
9.53 mm
28.58 mm
5.50 mm
50.80 mm
442.33 mm
50.80 mm



152.40 mm
136.80 mm
140.00 mm



5.50 mm
50.80 mm
152.40 mm

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