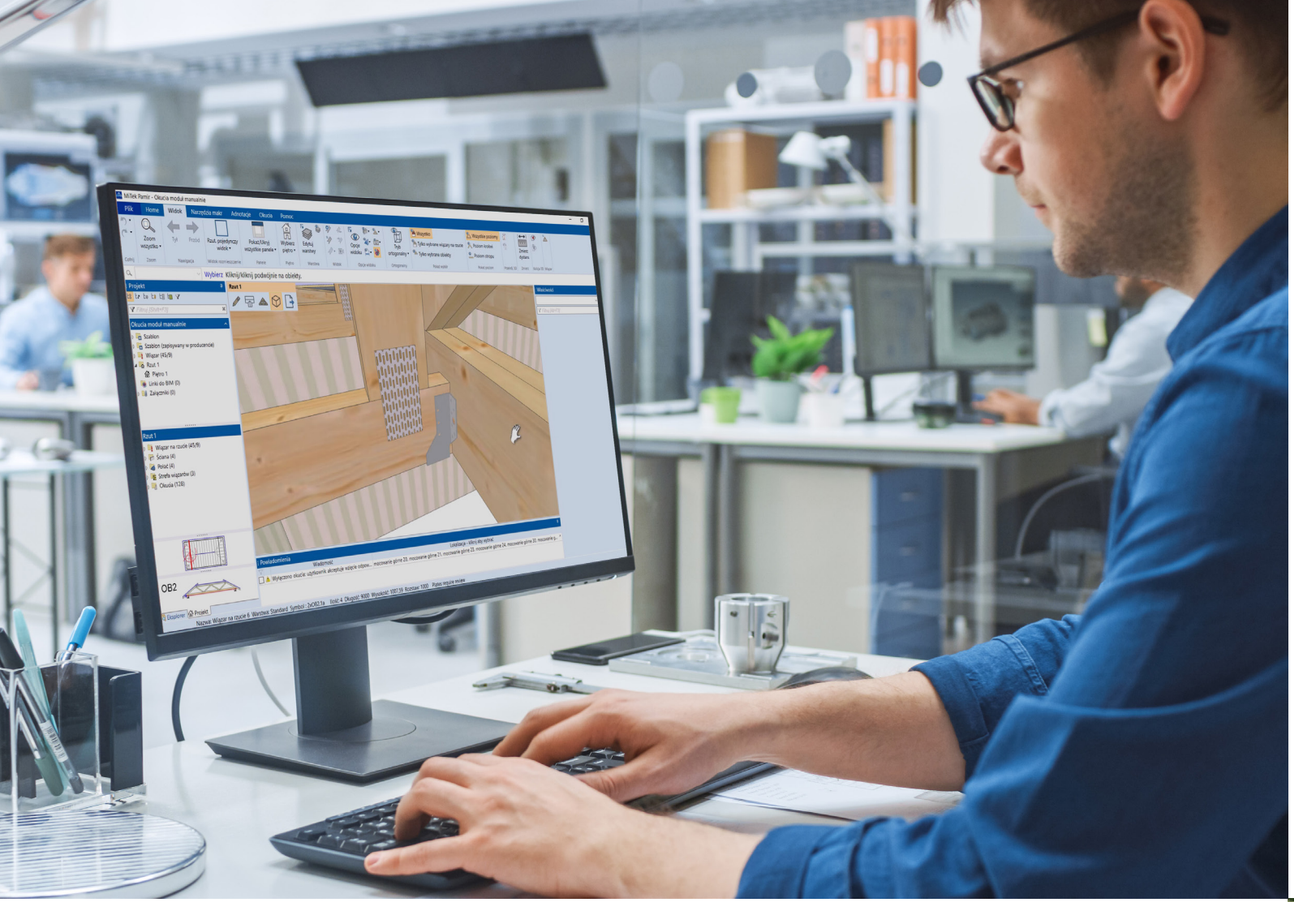
SIMPSON Strong-Tie®

TRUSSED ROOF SOLUTIONS

connection solutions for prefabricated roof trusses

Metal connectors for timber structures

www.strongtie.pl



Roof Trusses

Prefabricated roof trusses were seen as an alternative to steel or reinforced concrete roof structures and roofing for all kinds of halls just a few years ago. More and more often you see this technology not only in industrial or agricultural facilities, but also in multi- and single-family housing. As the experience of western countries shows, the popularity of trusses is growing and will continue to grow, so it is worth knowing what connectors we can use when installing them.

Roof trusses consist of timber outer elements - top chords and bottom chords, inner elements - webs and posts. The timber is designed and cut with millimeter precision at the truss prefabrication plant. After the truss shape is laid out at the nodes, the timber is joined with tooth-plates on both sides. The plates are pressed into the timber using various types of assembly presses. A prefabricated truss roof can consist of multiple trusses with the same profile (such as a rectangular gabled building) or a complex configuration of trusses of different sizes, shapes and webbing (such as multi-pitch hip-end roofs). Among the main advantages of prefabricated truss roofs are, the safety of the structure, the speed of installation, the precision of construction and the quality of the wood used. Connections in this type of construction play a very important role. The most common types of connections are connections to supports (walls) and connection between two trusses. An extremely important element of truss structures is to ensure the rigidity of the whole structure. This role is performed by correctly designed and installed wind bracing.

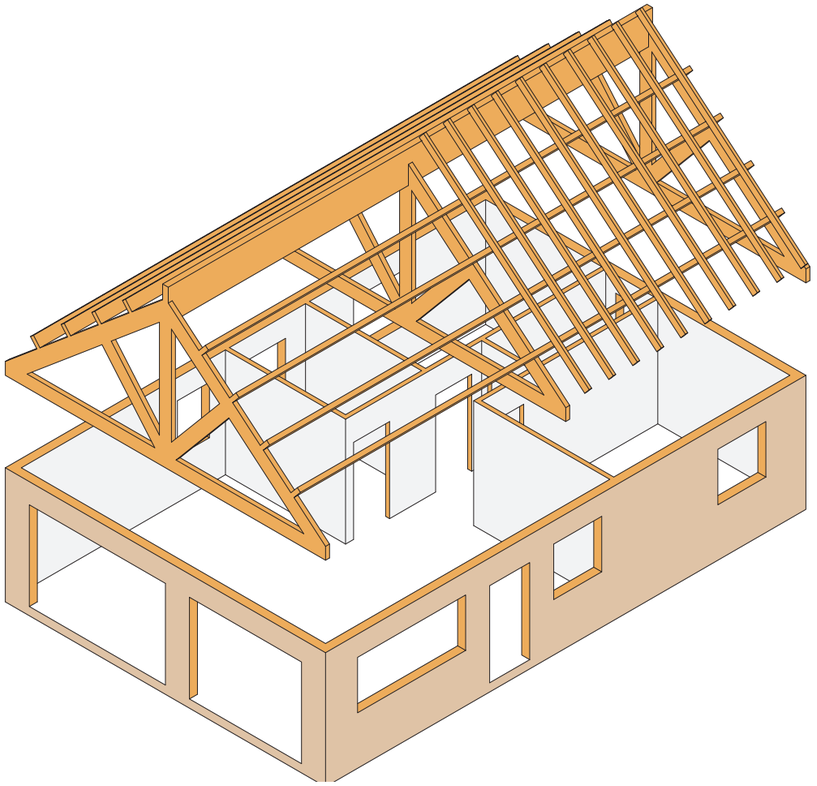
Connectors are widely used in all kinds of timber structures. This is no different for truss roofs. Selecting the right truss-support connection or the connection between two trusses is one of the responsibilities of the structural designer. Thanks to the established cooperation between Simpson Strong-Tie and MiTek Industries, as of 2024, truss roof designers are gaining an effective new tool - an automatic connector selection module.

Simpson Strong-Tie has been supporting the, rapidly growing, roof truss market for years. Thanks to our tailored product offering - connectors, screws and anchors - we can solve any technical connection problem in typical prefabricated roof structures. In addition to the offer of dedicated products, an important element of cooperation is cyclic technical training of constructors and access to expert technical support from our engineers.

With a view to continuously improving technical services, another element to facilitate design with our connectors appeared in January 2024. Simpson Strong-Tie has entered into a partnership with MiTek Industries - the world's leading provider of solutions that enable the erection of truss roofs using tooth-plates.

The first very important result of the cooperation is the availability of a completely free module for automatic selection of connectors in MiTek's Pamir software. Thanks to this new functionality, users of the program can select connectors for the designed roof in literally seconds. Pamir, based on the results of load calculations in individual connections and the load capacity of the connectors, will decide which connector to specify in a particular connection. The designer at each stage has the option to manually select a connector or change its installation method.

All connectors presented in this brochure are available in the metal connectors module of MiTek Industries' Pamir software.



Specifics of truss structures and connectors designed for their installation

Roof trusses used in northern and eastern Europe are made of timber 45 mm wide (less often 60 mm).
In some western countries, 35 mm width is the standard. This determines, in many cases, the size of connectors (for example, beam hangers). Remember that the connectors we are describing can also be used in many cases in the construction of traditional trusses.

When working with trusses, special attention should be paid to the stability of these structures, both during assembly, as well as the finished structure. A classic triangle truss with a height and a span of several meters, with a width of 45 mm, can behave unstably during installation.It is essential to temporarily support the trusses as more prefabricated elements are added.

Quite a separate issue is the correct structural bracing of roof structure. The issue of bracing takes on of additional importance here due to the size of individual trusses and large roof slope areas. Pay attention to the designer's guidelines for the selection and correct installation (connection details, steel strap tension) of the wind bracing system.

Many of the roof truss connectors available in our offer give you a choice of nailing pattern or type of nails used in the connection. This allows you to choose a solution with a higher load-bearing capacity or a faster installation method. Among the implemented connectors, there are more than 100 different solutions carefully selected and dedicated to truss roofs.

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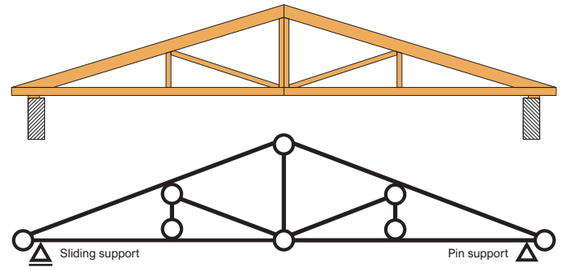
Simpson Strong-Tie metal connectors & anchorage system to roof trusses

Types of roof truss connections

Truss support

Typically, classic trusses are supported like traditional rafters members on wall plates. Many manufacturers often abandon the use of wall plates, anchoring the truss directly to the concrete top of the wall. The most common solution in to fix truss to bearings are reinforced angle brackets connecting the truss to the wall plate / concrete on both sides. This is a very good and universal solution, which is why it is so widely used.



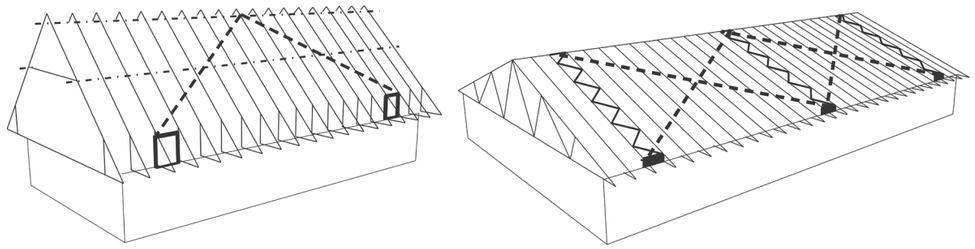
When designing a roof truss, the designer chooses the method of support - as a rule, it is a pin support at one end and a sliding support at the other. When the truss deflects under load, and one of the supports is designed and realized as sliding, the truss has the possibility of a gentle shift at the support. If the truss was designed with an two pin support in mind, but such a support was not realized, there are additional tensile forces on the bottom chord of the truss that the engineer did not anticipate at the design stage.

Connections between trusses

In almost every truss roof there is a need to connect the trusses with each other. Typically, these are perpendicular connections of the bottom chords of the trusses. In such a situation, the secondary (supported) truss is connected using a hanger type connector to the main (supporting) truss.
A more complex problem is to make a truss connection at an angle other than a right angle. Typically a 45-degree angle and such a connection is found in the case of hip end roofs

Truss bracing

Quite a separate issue is the correct structural bracing of roof structure. The issue of bracing takes on added importance here due to the size of individual trusses and the large area of roof slopes. Often the simplest gable roof is particularly prone to the domino effect. Pay attention to the designer's guidelines for the selection and correct installation (connection details, steel strap tension) of the wind bracing system.



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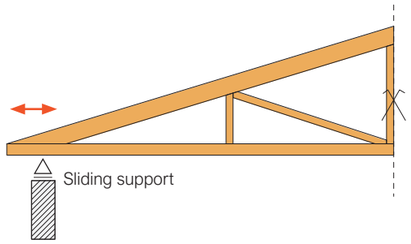
ACRL - Reinforced Angle Bracket

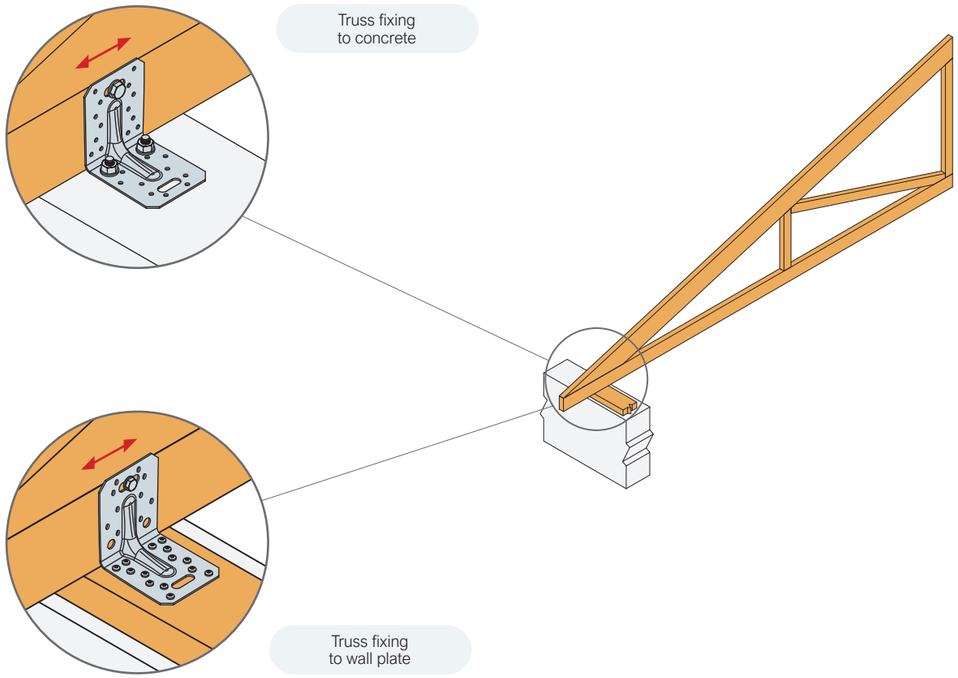
Trusses fixing to wall plate or concrete - sliding connection

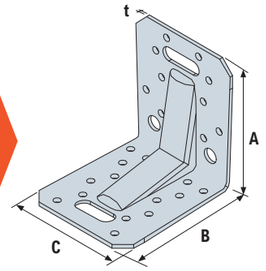
- Sliding support
  The product is dedicated to prefabricated roof trusses with the static scheme of a simply supported beam.

Application:

The ACRL10520 angle bracket is designed to be a universal solution for connecting the truss to the wall plate or concrete. The arrangement of the holes in this angle bracket makes it possible to realize both sliding and pin support regardless, whether the truss is nailed to the wall plate or anchored to the concrete while maintaining adequate load-bearing capacity in each case.
Using CNA nails driven into the truss, creating a pin support. Using a through bolt M10 creating a sliding support.





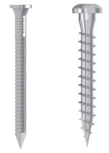


ACRL10520
Reinforced Angle Bracket

Dimensions:
A - 105
B - 105
C - 90
t - 2,0

ETA CE

Fixing to timber
Nails CNA4.0
Screws CSA5.0



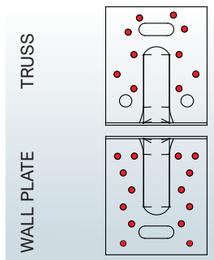
Fixing to concrete
Anchor FM 753 evo
Chemical anchor AT-HP

ACRL - Reinforced Angle Bracket

Truss to Wall plate (full nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24) pair of angle brackets per connection		
	Flange A	Flange B	$R_{1,k}$	$R_{2/3,k}$	$R_{4/5,k}$
ACRL10520	10xCNA4,0x40	14xCNA4,0x40	10,8	14,5	$\max\left\{\frac{12{,}7b}{k_{mod}^{0{,}7}}+565/k_{mod};\ \frac{e-10{,}7}{14{,}1/k_{mod}^{0{,}25}}\right.$
	10xCNA4,0x60	14xCNA4,0x60	17,9	20,3	$\max\left\{\frac{15{,}6b}{k_{mod}^{0{,}6}}+565/k_{mod};\ \frac{e-10{,}7}{21{,}2/k_{mod}^{0{,}15}}\right.$

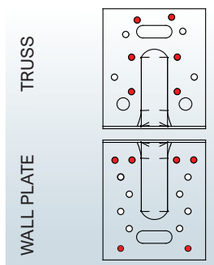
Fastening
full pattern



Truss to Wall plate (partial nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24) pair of angle brackets per connection		
	Flange A	Flange B	$R_{1,k}$	$R_{2/3,k}$*	$R_{4/5,k}$*
ACRL10520	6xCNA4,0x40	6xCNA4,0x40	5,9	7,7	$\max\left\{\frac{6{,}5b}{k_{mod}^{0{,}55}}\text{ x b}+202/k_{mod};\ \frac{e-10{,}7}{7{,}0/k_{mod}^{0{,}25}}\right.$
	6xCNA4,0x60	6xCNA4,0x60	9,8	11,3	$\max\left\{\frac{8{,}4b}{k_{mod}^{0{,}5}}\text{ x b}+199/k_{mod};\ \frac{e-10{,}7}{10{,}6/k_{mod}^{0{,}25}}\right.$

Fastening
partial pattern

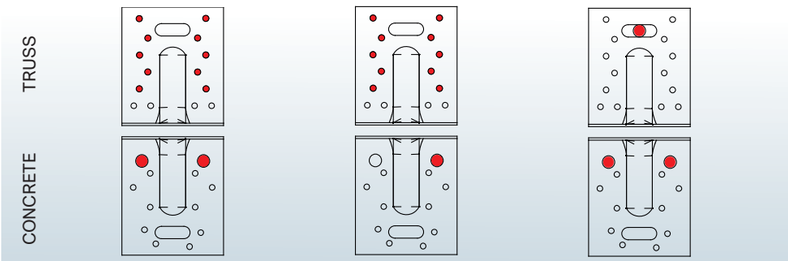


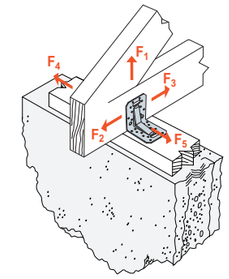
Truss to Concrete

Product Reference	Fixing		Scheme	Characteristic value [kN] (timber C24) pair of angle brackets per connection	
	Flange A	Flange B		$R_{1,k}$	$R_{2/3,k}$
ACRL10520	10xCNA4,0x40	2xFM 753 evo	1	27,6	11,7
	10xCNA4,0x40	1xFM 753 evo	2	11,7	7,0
	1x śruba M10*	2xFM 753 evo	3	7,5*	przesuw

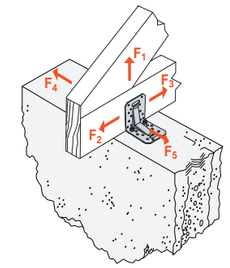
* The key condition for the failure of the connection is the bolt load capacity. The resistance of the bolt should be calculated in accordance with According to Eurocode 5 para. 8.2.3 considering only the failure mechanisms (j) and (k).

Fastening
truss - concrete





LOAD SCHEME
truss - wall plate
two connectors per connection



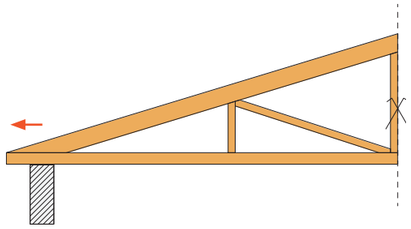
LOAD SCHEME
truss - concrete
two connectors per connection

E20 - Reinforced Angle Bracket

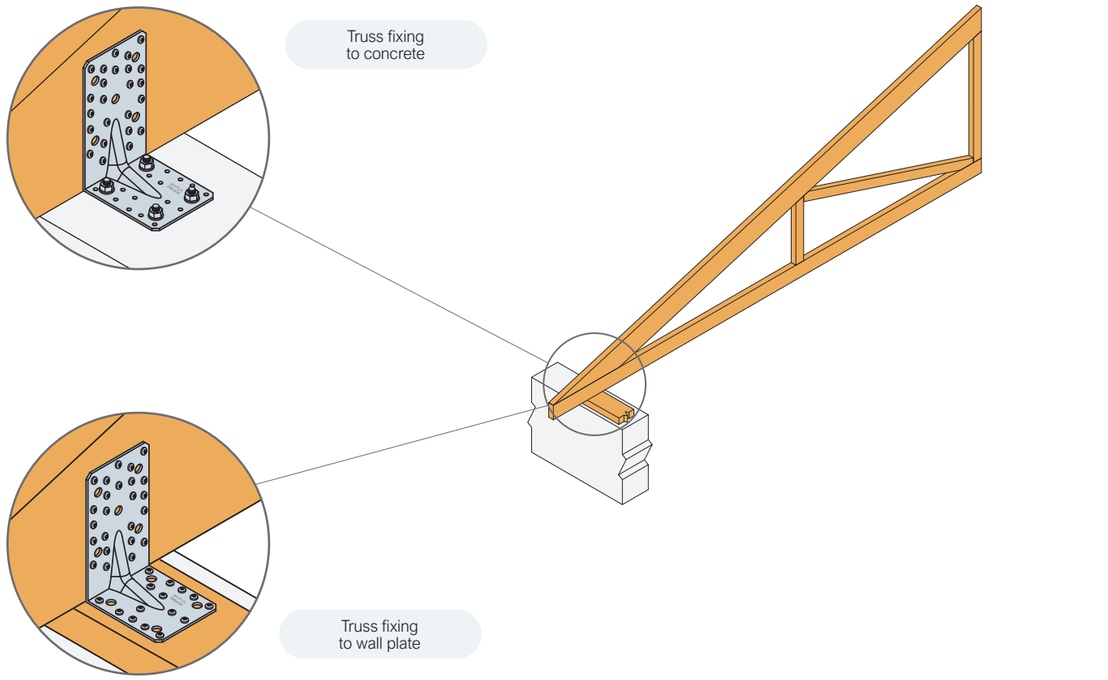
Trusses fixing to wall plate or concrete - pin connection

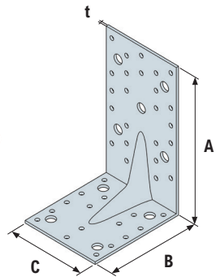
▶ Pin support
The product is dedicated to prefabricated roof trusses with the static scheme of a simply supported beam.

Application:
The E20 angle bracket is an extension of the range of reinforced angle brackets. It is an excellent complement to the offer of angle brackets ACRL10520. Thanks to the large dimensions, different perforations (also holes for bolts and anchors), the application of these angle brackets is very wide. Angle bracket E20/3 carries very high load capacities, which allow to carry most load combinations in typical timber structures. For truss-support connections, its advantage is the high top flange of the angle bracket.



Fixing:
- Fixing connector to timber:
  CNA4.0 system nails or alternatively CSA5.0 screws.
- Fixing connector to concrete:
  Mechanical anchor (FM753 evo) or chemical (AT-HP) Simpson Strong-Tie





E20/3
Reinforced Angle Bracket

Dimensions:
A - 170
B - 113
C - 95
t - 3,0

ETA CE

Fixing to timber
Nails CNA4.0
Screws CSA5.0

Fixing to concrete
Anchor FM 753 evo
Chemical anchor AT-HP

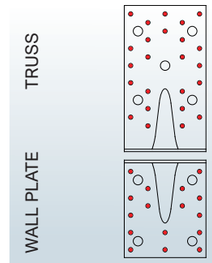
Simpson Strong-Tie metal connectors & anchorage system to roof trusses

E20 - Reinforced Angle Bracket

Truss to Wall plate (full nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24) pair of angle brackets per connection	
	Flange A	Flange B	$R_{1,k}$	$R_{2/3,k}$
E20/3	24xCNA4,0x40	16xCNA4,0x40	8,95	21,8
	24xCNA4,0x60	16xCNA4,0x60	14,71	28,3

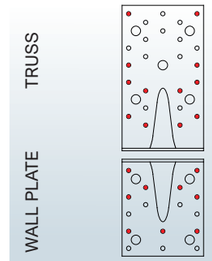
Fastening
full pattern



Truss to Wall plate (partial nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24) pair of angle brackets per connection	
	Flange A	Flange B	$R_{1,k}$	$R_{2/3,k}$
E20/3	12xCNA4,0x40	9xCNA4,0x40	6,78	16,4
	12xCNA4,0x60	9xCNA4,0x60	10,97	21,5

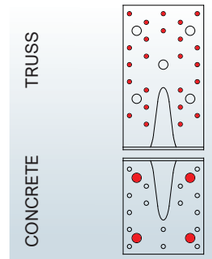
Fastening
partial pattern

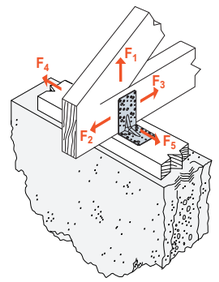


Truss to Concrete

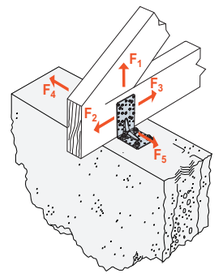
Product Reference	Fixing		Characteristic value [kN] (timber C24) pair of angle brackets per connection	
	Flange A	Flange B	$R_{1,k}$	$R_{2/3,k}$
E20/3	24xCNA4,0x40	4xFM 753 evo	65,5	42,9
	24xCNA4,0x60	4xFM 753 evo	88,8	47,5

Fastening
truss - concrete





LOAD SCHEME
truss - wall plate
two connectors per connection



LOAD SCHEME
truss - concrete
two connectors per connection

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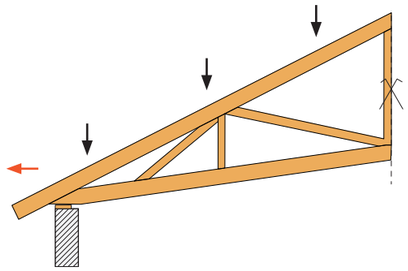
SFH/SFHM - Rafter Connectors

Trusses fixing to wall plate - pin connection

- For scissor trusses and raised chord trusses, SFH or SFHM joints are used to transfer significant horizontal forces from the truss to the support. It is worth noting that when designing a raised tie truss a sliding support scheme should generally not be used.

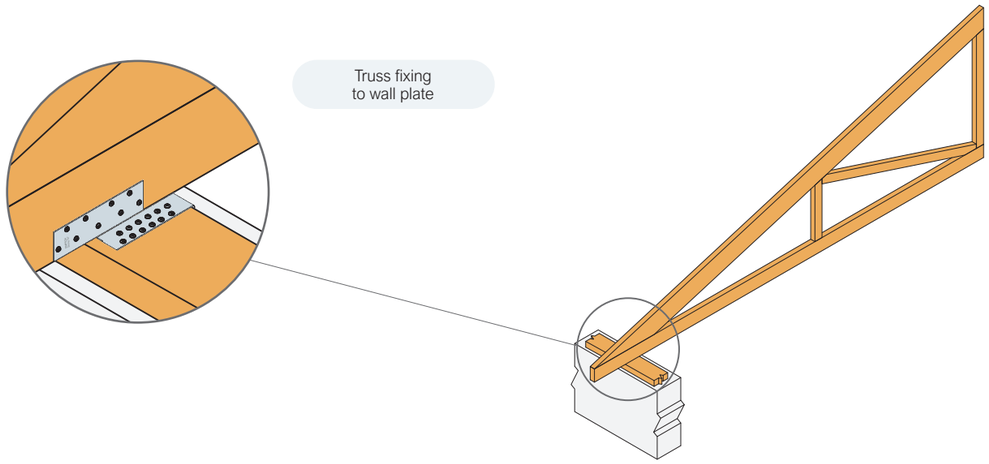
Application:

SFH and SFHM connectors carry large horizontal forces. The connection is made using a pair of connectors (available in sets of right + left connectors). A large number of nails installed to the wall plate as well as to the truss allows for very high horizontal force capacities. In addition to selecting the right connector, it is necessary to ensure that the wall plate is properly connected to the concrete.



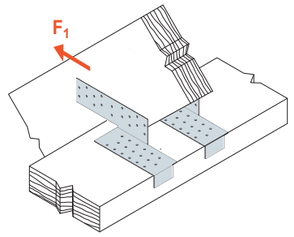
Fixing:

- Fixing connector to timber:
  CNA4.0 system nails or alternatively CSA5.0 screws.

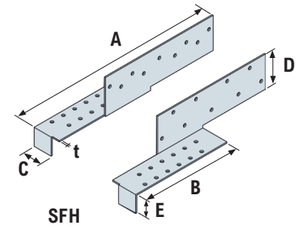


Truss to Wall plate (full nailing)

Product Reference	Fixing			Characteristic value [kN] pair of connectors per connection
	Wall plate	Truss	Fasteners	$R_{1,k}$
SFH	12	9	CNA4.0x40	27,7
			CNA4.0x60	35,7
SFHM	18	18	CNA4.0x40	51,6
			CNA4.0x60	64,8
SFHS	7+30	25	CNA4.0x40	79,9
			CNA4.0x60	102,9



LOAD SCHEME
truss - wall plate
two connectors per connection



SFH

SFH
Rafter Connectors

Dimensions:
A - 270
B - 159
C - 45
D - 60
E - 27
t - 2,0

ETA CE

Fixing to timber
Nails CNA4.0
Screws CSA5.0

CNA CSA

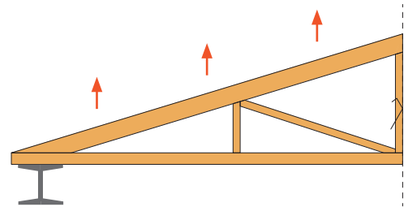
HE - Steel Beam Anchor

Trusses fixing to the steel I-beam

- Installation to a steel support is quite a problematic issue if you decide to use welding, or bolted connections. An alternative solution is simple HE joint connections. They are eagerly used if we are dealing with fink trusses. The connectors are used in pairs, in a diagonal arrangement. It is a very simple and quick solution, moreover, it does not require specialized equipment or cumbersome drilling into the steel I-beam."

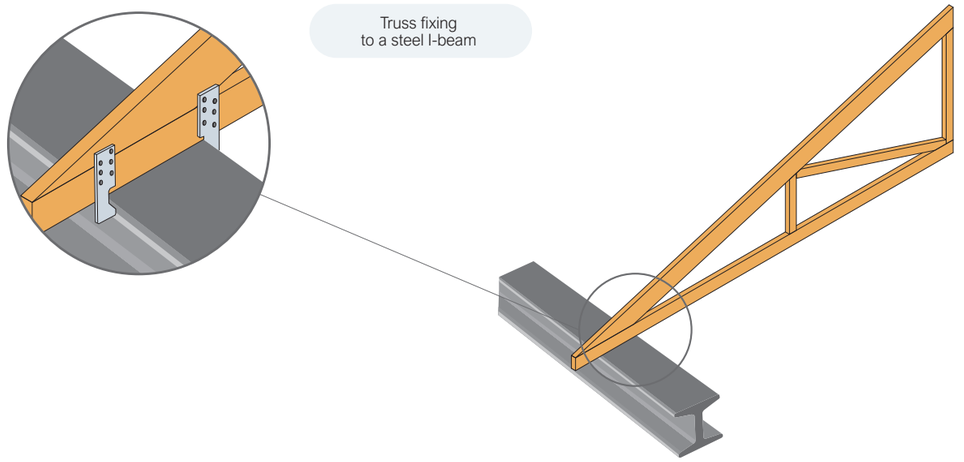
Application:

HE clips are designed to suspend steel I-beams to a timber structure or, conversely, to fasten timber beams on top of a steel I-beam. The biggest advantage of these connectors is that their use eliminates cumbersome drilling in steel members, Note that 2 or 4 HE connectors are used in the connection, depending on the required load capacity. If 2 HE anchors are used, they should be installed in a diagonal arrangement. HE anchors are a popular solution for installing prefabricated roof trusses to steel I-beams.



Fixing:

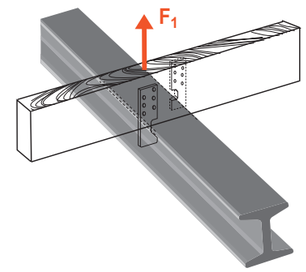
- Fixing connector to timber:
  CNA4.0 system nails or alternatively CSA5.0 screws



Truss to Steel I-beam

Product Reference	Truss fixing	Characteristic value [kN] (2clips per connection)
		$R_{1,k}$
HE135 HE175	3 x CNA4.0x40	min. {10,7; 17,0/k_{mod}}
	4 x CNA4.0x40	min. {13,6; 17,0/k_{mod}}
	5x CNA4.0x40	min. {15,7; 17,0/k_{mod}}
	6x CNA4.0x40	min. {16,8; 17,0/k_{mod}}
HE175	7x CNA4.0x40	min. {21,8; 17,0/k_{mod}}
	8x CNA4.0x40	min. {23,6; 17,0/k_{mod}}
	9x CNA4.0x40	min. {28,6; 17,0/k_{mod}}
	10x CNA4.0x40	min. {30,7; 17,0/k_{mod}}

If four HE anchors are fixed, it is possible to double the values from the table.

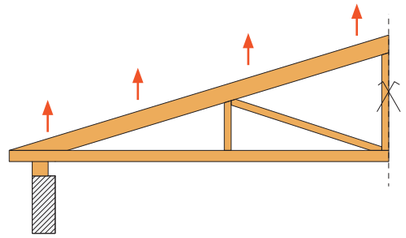


LOAD SCHEME
truss - steel I-beam
two connectors per connection

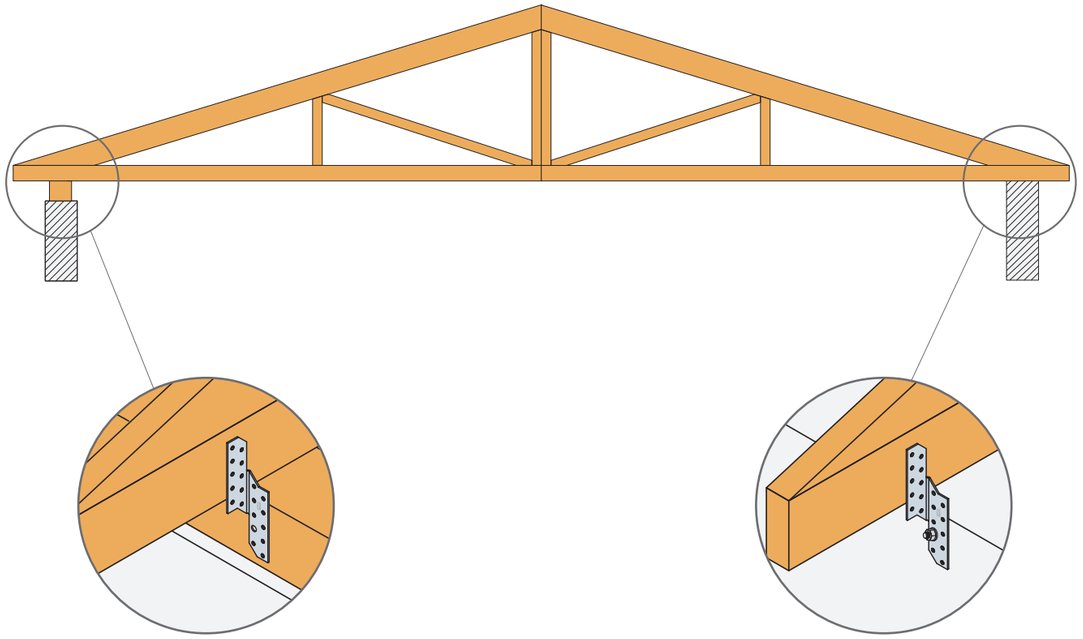
SPF - Purlin Anchors

Trusses fixing to wall plate - pin connection

Application:
SPF purlin anchors connectors are used for the support connection of the truss to the wall plate or concrete. Depending on the load, 2 or 4 connectors are used. The main role is to ensure that the truss has a high resistance to being up lifted from the support. It allows high load capacities if the geometry of the joint allows a large number of nails to be installed. A mechanical anchor hole in one of the flanges allows direct fixing to concrete.

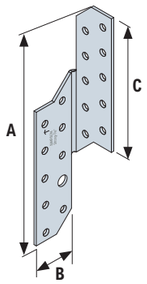


Fixing:
- Fixing connector to timber:
  CNA4.0 system nails or alternatively CSA5.0 screws.
- Fixing connector to concrete:
  Mechanical anchor (FM753 evo) or chemical (AT-HP) Simpson Strong-Tie



Truss fixing to wall plate

Truss fixing to concrete



SPF210
Purlin Anchors

Dimensions:
A - 170 ÷ 370
B - 34,5
C - 100 ÷ 300
t - 2,0

ETA CE

Fixing to timber
Nails CNA4.0
Screws CSA5.0

Fixing to concrete
Anchor FM 753 evo
Chemical anchor AT-HP

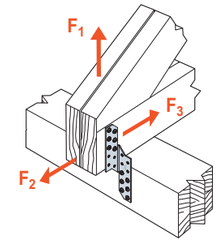
Simpson Strong-Tie metal connectors & anchorage system to roof trusses

SPF - Purlin Anchors

Truss to Wall plate

Product Reference	Fixing		Characteristic value [kN] (timber C24) single connector per connection		
	Wall plate	Truss	$R_{1,k}$	$R_{2,k}$	$R_{3,k}$
SPF170R	5 - CNA4,0x50	5 - CNA4,0x50	min.(6,9; 6,0 /k_{mod})	2,6	2,0
SPF170L	5 - CNA4,0x50	5 - CNA4,0x50	min.(6,9; 6,0 /k_{mod})	2,6	
SPF210R	7 - CNA4,0x50	7 - CNA4,0x50	min.(11,7; 8,4 /k_{mod})	4,1	
SPF210L	7 - CNA4,0x50	7 - CNA4,0x50	min.(11,7; 8,4 /k_{mod})	4,1	
SPF250R	9 - CNA4,0x50	9 - CNA4,0x50	min.(16,5; 10,8 /k_{mod})	min.(5,6; 4,6 /$k_{mod}^{0,5}$)	
SPF250L	9 - CNA4,0x50	9 - CNA4,0x50	min.(16,5; 10,8 /k_{mod})	min.(5,6; 4,6 /$k_{mod}^{0,5}$)	
SPF290R	11 - CNA4,0x50	11 - CNA4,0x50	min.(21,4; 13,2 /k_{mod})	min.(6,1; 4,6 /$k_{mod}^{0,5}$)	
SPF290L	11 - CNA4,0x50	11 - CNA4,0x50	min.(21,4; 13,2 /k_{mod})		
SPF330R	13 - CNA4,0x50	13 - CNA4,0x50	min.(26,2; 13,4 /k_{mod})		
SPF330L	13 - CNA4,0x50	13 - CNA4,0x50	min.(26,2; 13,4 /k_{mod})		
SPF370R	15 - CNA4,0x50	15 - CNA4,0x50	min.(30,9; 13,4 /k_{mod})		
SPF370L	15 - CNA4,0x50	15 - CNA4,0x50	min.(30,9; 13,4 /k_{mod})		

The load capacity of two connectors in connection is the sum of the single load capacities.
The characteristic load capacities shown are based on the second class of use and load class short-term loads according to EC5. For other load cases please refer to the ETA-notes for a more accurate result.

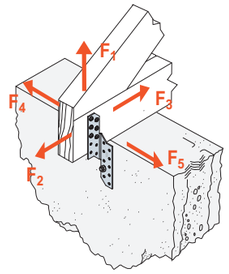


LOAD SCHEME
truss - wall plate
single connector per connection

Truss to Concrete

Product Reference	Fixing		Characteristic value [kN] (timber C24) single connector per connection				
	Concrete	Truss	$R_{1,k}$	$R_{2,k}$	$R_{3,k}$	$R_{4/k}$	$R_{5,k}$
SPF170R	1 FM 753 evo	5 - CNA4,0x50	6,7	2,9	1,0	2,0	-
SPF170L		5 - CNA4,0x50				2,0	-
SPF210R		7 - CNA4,0x50				1,7	0,7
SPF210L		7 - CNA4,0x50				1,7	0,7
SPF250R		9 - CNA4,0x50				1,4	1,1
SPF250L		9 - CNA4,0x50				1,4	1,1
SPF290R		11 - CNA4,0x50				1,2	1,3
SPF290L		11 - CNA4,0x50				1,2	1,3
SPF330R		13 - CNA4,0x50				1,1	1,6
SPF330L		13 - CNA4,0x50				1,1	1,6
SPF370R		15 - CNA4,0x50				1,0	1,7
SPF370L		15 - CNA4,0x50				1,0	1,7

The loadcapacity are for a single SPF connector, where the primary and secondary beams can rotate.
The capacity for load direction $F_{2/3}$ and $F_{4/5}$ are the sum of the individual capacities.
The anchorage should be checked separately. The centre of the SPF connector should be on the line between the wall plate and the concrete.
The characteristic load capacities shown are based on the second class of use and load class short-term loads according to EC5. For other load cases please refer to the ETA-notes for a a more accurate result.



LOAD SCHEME
truss - concrete
single connector per connection

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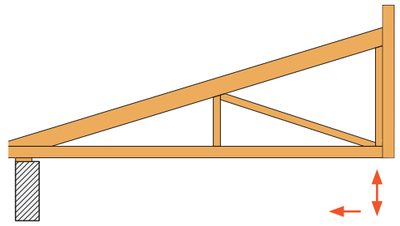
BSNN - Face Fix Hangers

Connections between trusses - face fixing

▶ The typical perpendicular connection of two trusses is a popular connection in truss roofs, and a standard BSNN beam hanger can be used here. These hangers allow installation using a full nailing pattern for full load-bearing capacity or partial nailing pattern if speed of installation is a priority. In cases of concrete support, the hanger is anchored using large holes in the side plates.

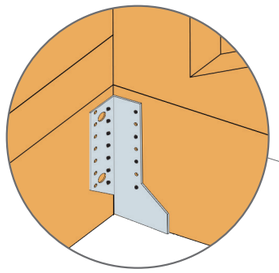
Application:

BSNN beam hangers are designed to connect timber elements with a standard cross section. The standard product allows installation in timber -to- timber and timber -to-concrete connections using CNA nails or CSA screws.

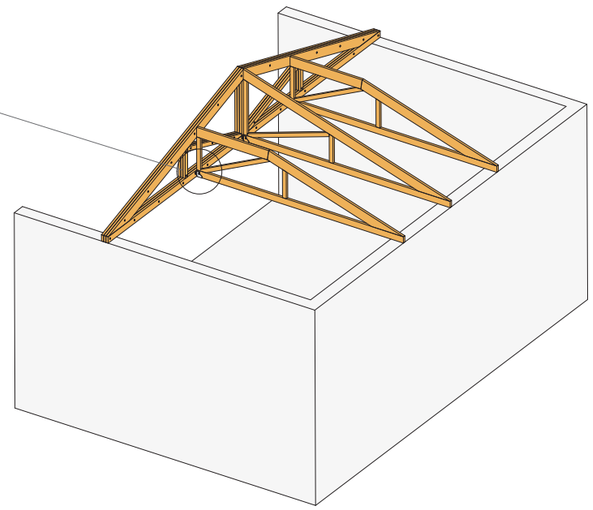


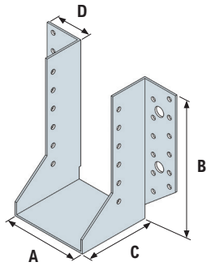
Fixing:

- Fixing connector to timber:
  CNA4.0 system nails or alternatively CSA5.0 screws
- Fixing connector to concrete:
  Mechanical anchor (FM753 evo) or chemical (AT-HP) Simpson Strong-Tie



Truss to truss
face fixing





BSNN
Joist Hangers

Dimensions:
A - 45 ÷ 120
B - 93 ÷ 205
C - 63
t - 2,0

ETA CE

Fixing to timber
Nails CNA4.0
Screws CSA5.0

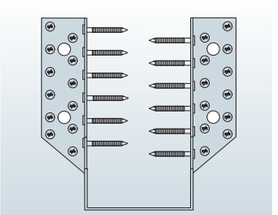
Fixing to concrete
Anchor FM 753 evo
Chemical anchor AT-HP

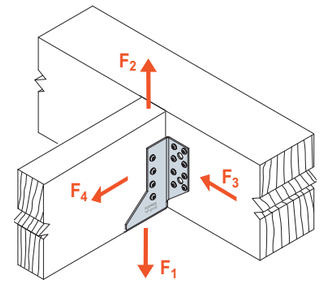
BSNN - Face Fix Hangers

Truss to Truss (full nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24)			
	Truss	Truss	$R_{1,k}$	$R_{2,k}$	$R_{3,k}$	$R_{4,k}$
BSNN45/93	8 - CNA4,0x40	6 - CNA4,0x40	8,4	4,7	3,9	4,4
BSNN45/108	12 - CNA4,0x40	6 - CNA4,0x40	13,4	5,7	5,5	5,9
BSNN45/138	16 - CNA4,0x40	10 - CNA4,0x40	19,9	6,6	7,7	7,4
BSNN45/168	18 - CNA4,0x40	12 - CNA4,0x40	25,4	7,4	9,0	8,9
BSNN45/198	22 - CNA4,0x40	14 - CNA4,0x40	29,3	8,2	10,6	10,4
BSNN60/100	12 - CNA4,0x50	6 - CNA4,0x50	15,6	7,2	6,9	7,8
BSNN60/130	16 - CNA4,0x50	10 - CNA4,0x50	23,8	8,5	9,7	9,8
BSNN60/160	18 - CNA4,0x50	12 - CNA4,0x50	30,8	9,7	11,4	11,8
BSNN60/190	22 - CNA4,0x50	14 - CNA4,0x50	35,5	10,7	13,5	13,7
BSNN90/145	18 - CNA4,0x50	12 - CNA4,0x50	28,2	13,7	11,4	11,8
BSNN90/205	26 - CNA4,0x50	16 - CNA4,0x50	40,0	16,7	15,4	15,7
BSNN120/160	22 - CNA4,0x50	14 - CNA4,0x50	34,4	19,3	13,5	13,7
BSNN120/190	26 - CNA4,0x50	16 - CNA4,0x50	40,0	21,4	15,4	15,7

Fastening
full pattern



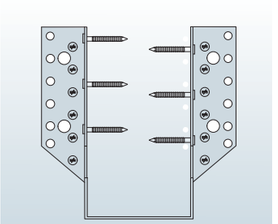


LOAD SCHEME
truss - truss
one connector per connection

Truss to Truss (partial nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24)			
	Truss	Truss	$R_{1,k}$	$R_{2,k}$	$R_{3,k}$	$R_{4,k}$
BSNN45/93	6 - CNA4,0x40	3 - CNA4,0x40	7,4	4,5	1,4	3,1
BSNN45/108	8 - CNA4,0x40	4 - CNA4,0x40	9,7	5,7	2,2	5,9
BSNN45/138	10 - CNA4,0x40	6 - CNA4,0x40	13,3	6,6	2,7	7,4
BSNN45/168	12 - CNA4,0x40	6 - CNA4,0x40	14,6	7,4	3,2	8,9
BSNN45/198	14 - CNA4,0x40	8 - CNA4,0x40	18,3	8,2	3,6	10,4
BSNN60/100	8 - CNA4,0x50	4 - CNA4,0x50	11,4	7,2	2,7	7,5
BSNN60/130	10 - CNA4,0x50	6 - CNA4,0x50	16,0	8,5	3,3	9,8
BSNN60/160	12 - CNA4,0x50	6 - CNA4,0x50	17,8	9,7	3,8	11,3
BSNN60/190	14 - CNA4,0x50	8 - CNA4,0x50	22,2	10,7	4,4	13,7
BSNN60/220	16 - CNA4,0x50	8 - CNA4,0x50	22,2	11,6	4,9	15,1
BSNN90/145	12 - CNA4,0x50	6 - CNA4,0x50	17,8	13,3	3,8	11,3
BSNN90/205	16 - CNA4,0x50	8 - CNA4,0x50	22,2	16,7	4,9	15,1
BSNN120/160	14 - CNA4,0x50	8 - CNA4,0x50	22,2	17,8	4,4	13,7
BSNN120/190	16 - CNA4,0x50	8 - CNA4,0x50	22,2	17,8	4,9	15,1

Fastening
partial pattern



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ET - Skewed 45° Hanger

Connections between trusses - skewed fixing

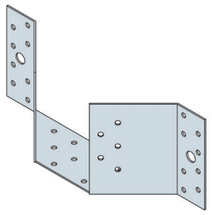
▶ Connection between trusses can occur at an angle other than a right angle. Connections at a 45° angle, generally found in hip end roofs. The ideal solution for this connection is the ET260 or ET301 truss hanger, which allows trusses to be mounted at a 45° angle both to the left and to the right. The hanger also allows connections to concrete.

Application:

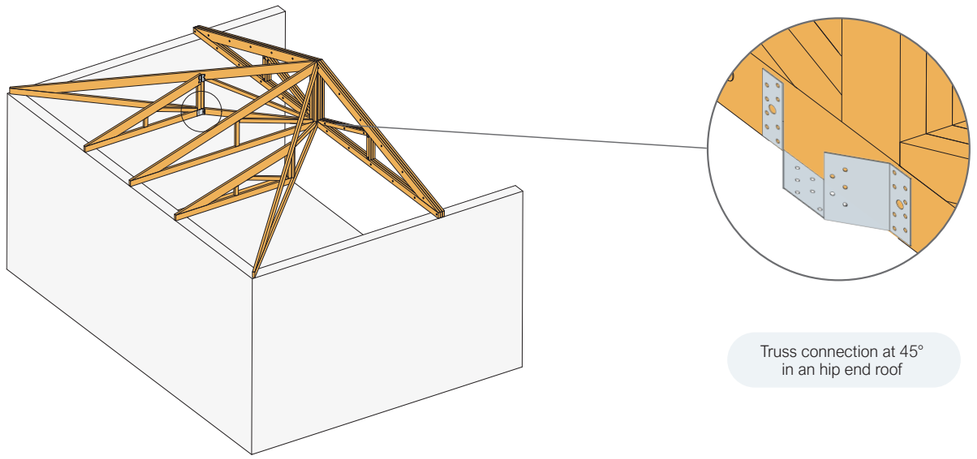
The ET beam hanger allows the installation of a secondary beam that connects to the main beam at a 45° angle. The hanger is designed to be used in connections rotated both left and right. It is very often used by roof truss manufacturers in hp end roofs in the combination of corner truss and hip end girder. Thanks to its small height, it allows installation even in trusses with small cross--sections of truss bottom chords.

Fixing:

- Fixing connector to timber:
  CNA4.0 system nails or alternatively CSA5.0 screws
- Fixing connector to concrete:
  Mechanical anchor (FM753 evo) or chemical (AT-HP) Simpson Strong-Tie



ET260



Truss connection at 45°
in an hip end roof

Truss to Truss (full nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24)	
	Truss	Truss	$R_{1.k}$*	$R_{2.k}$
ET260	16 - CNA4.0x35	10 - CNA4.0x35	10.5	5.4
ET301	16 - CNA4.0x35	16 - CNA4.0x35	11.2	6.3

* Characteristic value R_1 for truss to truss and truss to concrete connection are the same.

Truss to Concrete

Product Reference	Fixing		Characteristic value [kN] (timber C24)	
	Truss	Truss	$R_{1.k}$*	$R_{2.k}$
ET260	2-FM753 Evo x M10	10 - CNA4.0x35	10.5	5.4
ET301	2-FM753 Evo x M10	16 - CNA4.0x35	11.2	6.3

* Characteristic value R_1 for truss to truss and truss to concrete connection are the same.

Fixing to timber
Nails CNA4.0
Screws CSA5.0

CNA **CSA**

ETC - Truss Hangers

Connections between trusses - skewed fixing

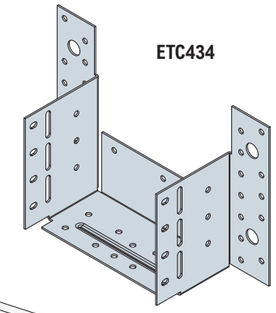
▶ In hip end roofs, a connection may occur where two or three trusses - one perpendicular and one or two trusses at a 45° angle - come together at one point to the main truss. The ETC hanger is designed for such complex connections and can support two or three trusses simultaneously.

Application:

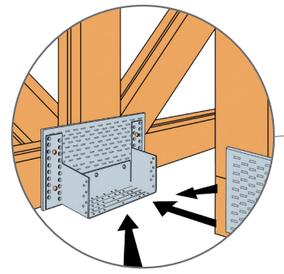
The ETC beam hanger is used to connect 2-3 elements that converge at a single node.
It is mostly used to connect prefabricated trusses in hip end roofs. The wide bottom plate elimi-nates the need to cut the supported element to the desired angle.

Fixing:

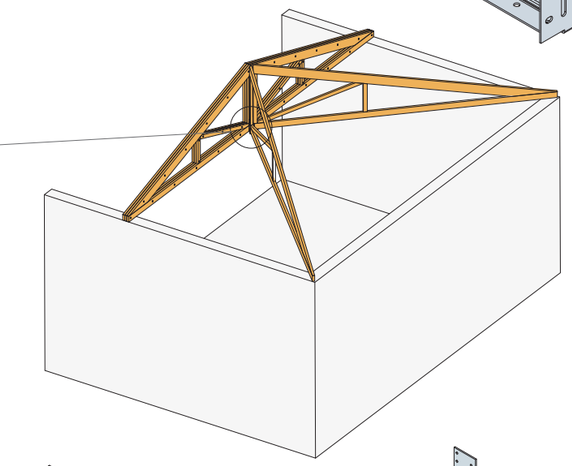
- Fixing connector to timber:
  CNA4.0 system nails or alternatively CSA5.0 screws

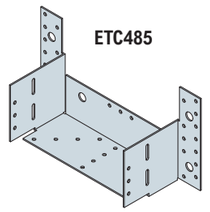


ETC434

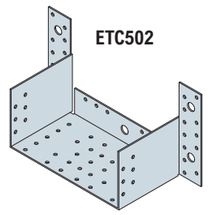


Multiple truss fixing

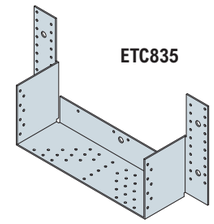




ETC485



ETC502



ETC835

Truss to Truss

Product Reference	Fixing			Characteristic value [kN] Header ≥197mm					
	Header	Rafter	Corner truss	$R_{1.k}$			$R_{2.k}$		
				Rafter	Truss	Max.	Rafter	Truss	Max.
	qty	qty	qty	CNA4.0x35					
ETC434	27	6	6	3.0	9.0	12.0	5.3	4.7	3.3
ETC485R	24	11	10	5.6	16.8	22.4	5.9	5.7	3.8
ETC502	27	4	6	4.6	9.3	23.2	1.2	5.6	4.4
ETC835	41	5	28	5.8	11.7	29.2	1.8	5.8	7.7

Fixing to timber
Nails CNA4.0
Screws CSA5.0

CNA **CSA**

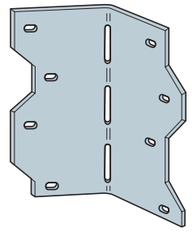
LS - Skewable Angle

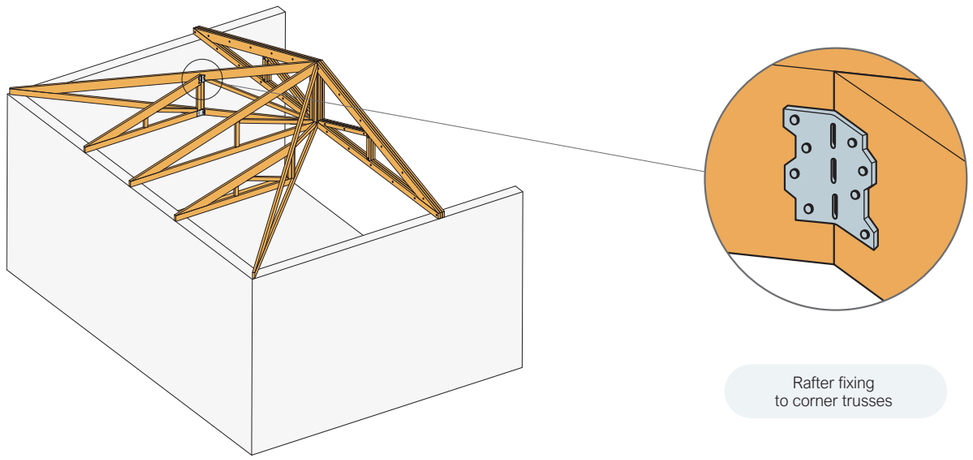
Connections between trusses - skewed fixing

▶ In hip end roofs, it is impossible to ignore a simple connector, however, which is great for skewed applications. LS angle brackets have the ability to be bent to the desired angle, as well as the holes in the connector have an oblong shape. This allows it to be installed at an acute angle, when driving nails perpendicular to the plate is physically impossible.

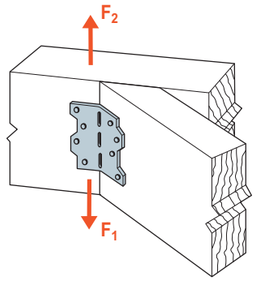
Application:
LS adjustable angle bracket is used in all butt joints with unusual connection angles (from 0 to 135 degrees). The use of oblong holes allows the joint to be installed even at very acute angles. Driving nails perpendicular to the sheet metal in such connections is impossible, hence the use of oblong holes, which allow diagonal nailing.

Fixing:
- Fixing connector to timber:
  Nails CNA3,7x50





Rafter fixing
to corner trusses

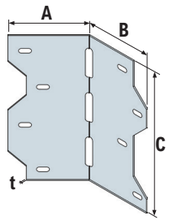


LOAD SCHEME
truss - truss
single connector per connection

Truss to Truss (full nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24) single connector per connection
	Flange A	Flange B	$R_{1/2,k}$
LS30	3xCNA3,7x50	3xCNA3,7x50	2,8
LS50	4xCNA3,7x50	4xCNA3,7x50	4,3
LS70	5xCNA3,7x50	5xCNA3,7x50	4,4

ETA CE



LS
Skewable Angle

Dimensions:
A - 57
B - 57
C - 86 / 124 / 162
t - 1,2

Fixing to timber
Nails CNA3.7

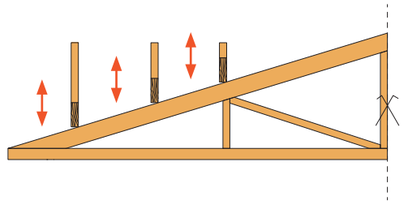
CNA

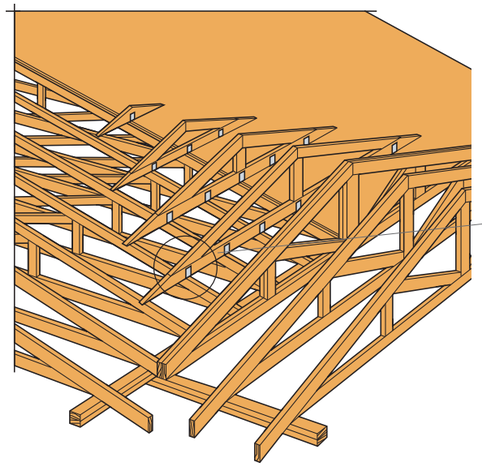
VTCR - Valley Truss Clip

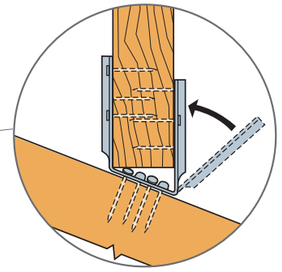
Connections between trusses - valley trusses

Application:
VTCR truss clips are used to mount valley trusses to the main slope trusses. The joint is bent which allows the clip to be adjusted to the slope of the roof. The dome holes force the nails into the main truss at a 45° angle. As a result, VTCR clips can be used with trusses 45mm wide. Angle adjustment from 10° to 40°.

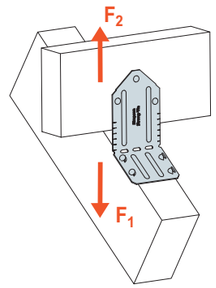
Fixing:
- Fixing connector to timber:
  Nails N3,75x30 and CNA3.1x60







Truss connection
to top chord of truss

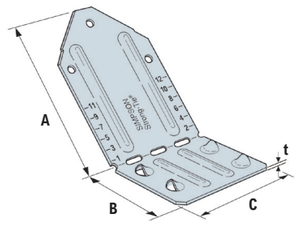


LOAD SCHEME
truss - truss
single connector per connection

Truss to Truss (full nailing)

Product Reference	Fixing		Characteristic value [kN] (timber C24)	
	Top chord of truss	Valley truss	$R_{1,k}$	$R_{2,k}$
VTCR	4 x N3.1x60	3 x N3.75x30	8,0	1,0

ETA CE



LS
Valley Truss Clip

Dimensions:
A - 90
B - 50
C - 63
t - 1,2

Fixing to timber
Nails CNA3,1
Nails N3,75

CNA **N3.75**

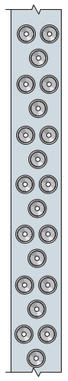
BAN09 - Wind Bracing Straps

Roof truss bracing

- Bracing elements of a truss should be an integral part of any roof structure. The role that bracing plays in the structure can be summed up in one sentence. Without proper bracing, the roof truss will fold up like domino blocks. Correctly installed bracing guarantees proper and trouble-free operation of the structure.

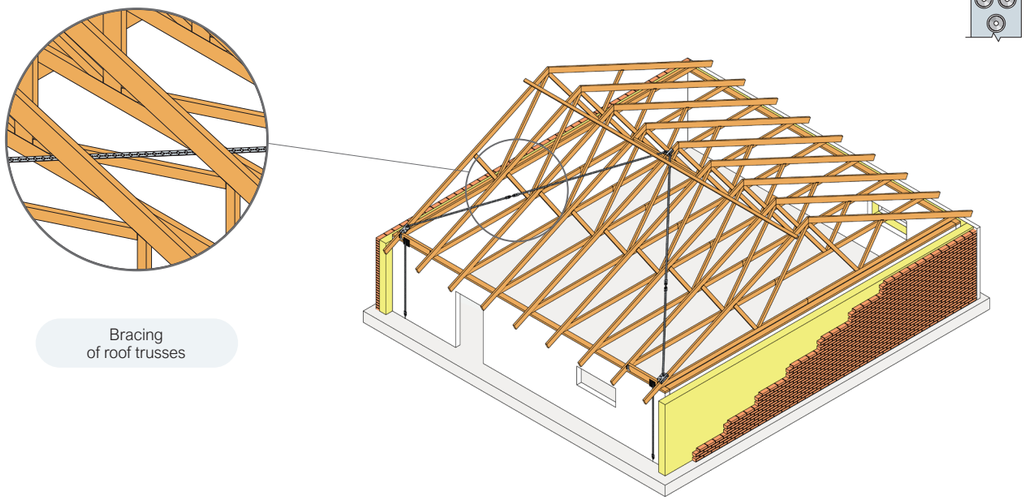
Application:

BAN09 perforated tape is a patented specially reinforced tape and is used in wind bracing systems. Reinforcement in the perforation areas prevents ovalization of holes under load at the points of contact between the strap and the fastener. A great advantage of the tape is its thickness of 0.9 mm, which is beneficial for the smoothness of the layer or in situations where short lengths are needed.



Fixing:

- Fixing connector to timber:
  CNA4.0 system nails or alternatively CSA5.0 screws

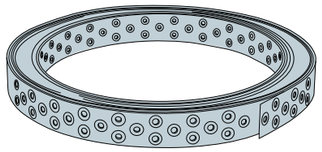


Connection of the strap to timber element

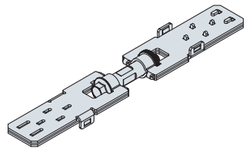
Product Reference	Characteristic value [kN] (timber C24) $R_{1,k}$*			
	CNA4.0x35	CNA4.0x40	CNA4.0x50	CNA4.0x60
BAN094025	min { 17,8/k_{mod} ; n x 1,68 }	min { 17,8/k_{mod} ; n x 1,83 }	min { 17,8/k_{mod} ; n x 2,22 }	min { 17,8/k_{mod} ; n x 2,36 }
BAN094050				

* n = - Number of nails in row according to Eurocodu 5 - 8.3.1.1 (8)

BAN094050
Wind Bracing Straps



BPST
Tension Device

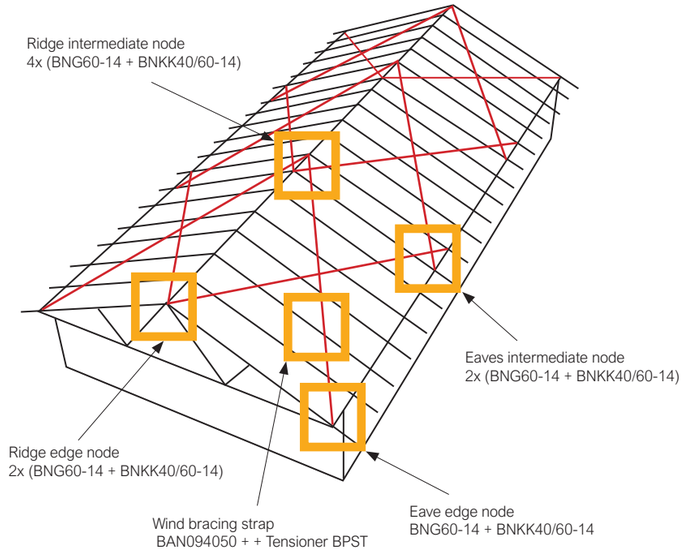


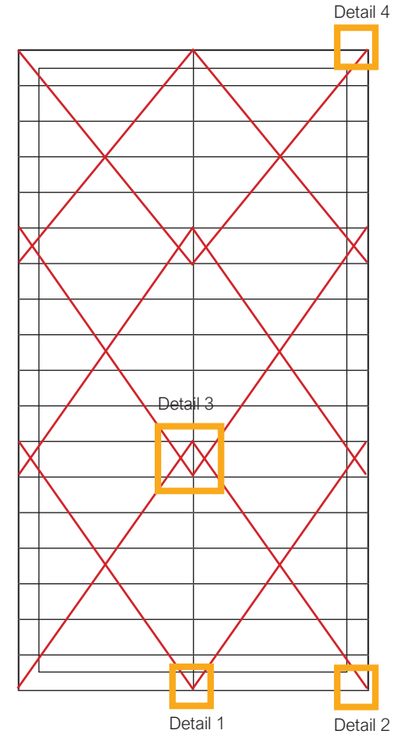
Fixing to timber
Nails CNA4.0
Screws CSA5.0

Simpson Strong-Tie metal connectors & anchorage system to roof trusses

BAN09 - Wind Bracing Straps

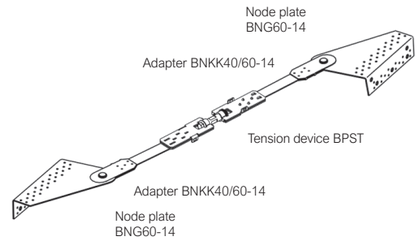
Exaple of application the wind system on a gable roof



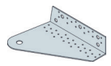


For each section of perforated strap the following system elements are used:

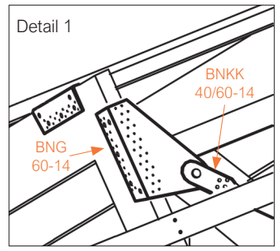
- 1 node plate set BNG60-14 (sold in sets of 1 left + 1 right)
- 2 BNKK40 / 60-14 adapters that connect the node
- 1 piece of BPST tension device



BNG60-14



BNKK4060-14

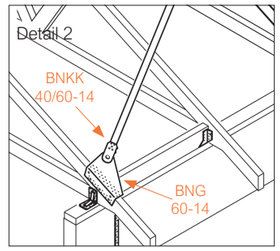


Essential components list of roof bracing system

- BAN094050 ((quantity based on roof geometry).
- Node plate BNG60-14 - 12 sets (left and right connector included)
- Adapters BNKK40/60-14 - 24 pieces.
- Tension device BPST - 12 pieces.

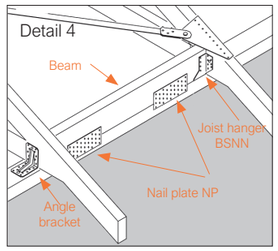
Check:
Number of strap sections = number of node plate sets = number of tensioners BPST
Number of strap sections x2 = number of adapters BNKK40 / 60-14

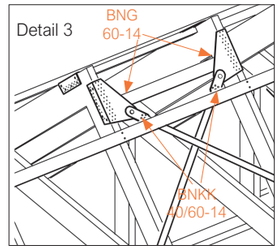
BPST



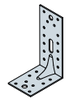
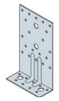
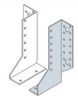
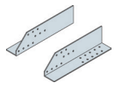
The above example is only an overview of the Simpson Strong-Tie roof wind bracing system components. Each roof should be treated individually. The designer of the structure is responsible for the correct design of both the roof and bracing of it.

The example does not show the loads and the selection of components in terms of load bearing capacity. The Simpson Strong-Tie wind bracing system does not eliminate the need for other components of bracing including temporary bracing, buckling bracing, etc.. The final decision is made by a designer of the roof structure.



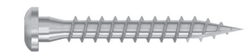
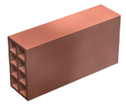


Additional connectors used in truss connections

Product	Index	Product description and application
	**ABRL98**	ABRL angles are used to create an articulated-sliding support and maximize the reflection of the static model in the real structure. The product is dedicated to prefabricated roof trusses with a freely supported beam static scheme. ABRL98 expands the line of sliding angle brackets (ACRL10520, E5/2).
	**ABR9020**	ABR Strong angle bracket with reinforcement achieve high rigidity and strength thanks to embossed ribs along the entire length of the arm. They are particularly suitable for connections that must carry high forces. ABR9020 and ABR10525 reinforced angles have a wide range of applications in truss roofs. Supports, wind trestles, bracing ladders are just a few examples of connections where ABR angles can be used.
	**ABR10525**	
	**E19/2**	Angles E19 and E9/2.5 are an extension range of reinforced angles. Thanks to their large dimensions, various perforations (including holes for bolts and anchors), the use of these angles is very wide. In the case of truss constructions, their special advantage is high vertical arms connected with trusses.
	**E9/2.5**	
	**AG922**	Reinforced angle bracket, designed to carry very heavy loads. It can be used in timber to timber and timber to concrete connections. Thanks to its size and load-bearing capacity, it is used in connections subject to the highest loads. It can be connected to a wall plate or directly to a concrete.
	**AE116**	AE series angle bracket is used to realize timber to timber as well as timber to concrete connections. Special attention should be paid to the use of AE angles in connection with concrete. The load bearing capacities obtained are very high, also thanks to the use of thick US40/40/10G washers.
	**E170**	ABR 170 and 220 angles are an extension range of reinforced angles. Thanks to the large dimensions, different perforations (also holes for screws and anchors), the application of these angles is very wide.
	**BSD**	BSD joist hangers are designed for elements with a larger cross-section, They allow the connection of elements with a width of 100 to 200mm. In connections subjected to the highest loads. Can be connected to wall plate or directly to the concrete rim.
	**SDE**	SDE adjustable face fix hanger is used to connect beams with unusual beam cross-section. The advantage of the split beam hanger is the indefinite width of the secondary beam. Wherever we have to deal with untypical timber cross-sections and cannot use a standard hanger, we can use the split beam hanger.
	**SVI**	A connector designed to carry heavy loads in a rafter-wall plate connection. The SVI set consists of two connectors (left + right) forming one connection, transferring a very high expansion force. Thanks to this, it is usually used in the case of trusses with a raised truss strip or scissor trusses. They complement the SFH line.
	**AH + US**	The simplest solution that allows you to obtain a very high load-bearing capacity when lifting the truss from the support. The high vertical arm allows you to drive a large number of nails into the truss and obtain appropriate anchoring load-bearing capacity. An essential element of the connection is a thick washer US40/50/10, which protects the short arm against bending. It can be installed directly to the concrete or through the wall plate.
	**NP**	Perforated plate have many applications for making simple overlay connection. Due to the avoidance of eccentricity, it is recommended to use plates in pairs, connected to timber elements on both sides. In the case of trusses, used to divide prefabricated elements into smaller shipping elements.

Simpson Strong-Tie metal connectors & anchorage system to roof trusses

Fasteners for roof trusses

Application	Fasteners	
	**CNA** CNA ring nails are a system fastener designed for fastening connectors to timber.	
	CSA CSA screws are the second (after CNA nails) type of system fasteners for Simpson Strong-Tie connectors.	
	SSF / SSH SSF Solid-Drive ™ are used together with connectors wherever reduced assembly time is needed and the connection does not require maximum loads.	
		
	SWW Structural wood screws used for trusse connection into multilayer systems. Fastened without pre-drilling.	
	SWW Galvanized steel screws with partial thread and countersunk head. Used for trusses connection into multilayer systems.	
	TTUFS Galvanized steel screws with partial thread and countersunk head. Used for trusses connection into multilayer systems.	
	**FM 753 evo** FM 753 evo band anchor is a fast installation and high load capacity with small anchor spacing and small edge distances.	
	AT-HP Styrene-free methacrylate resin for high-performance fastening for threaded rods and reinforcement in cracked and uncracked concrete.	
	**POLY-GP** A general-purpose resin suitable for all uses in materials with voids and for light to medium loads in substrates made of solid masonry units and concrete.	

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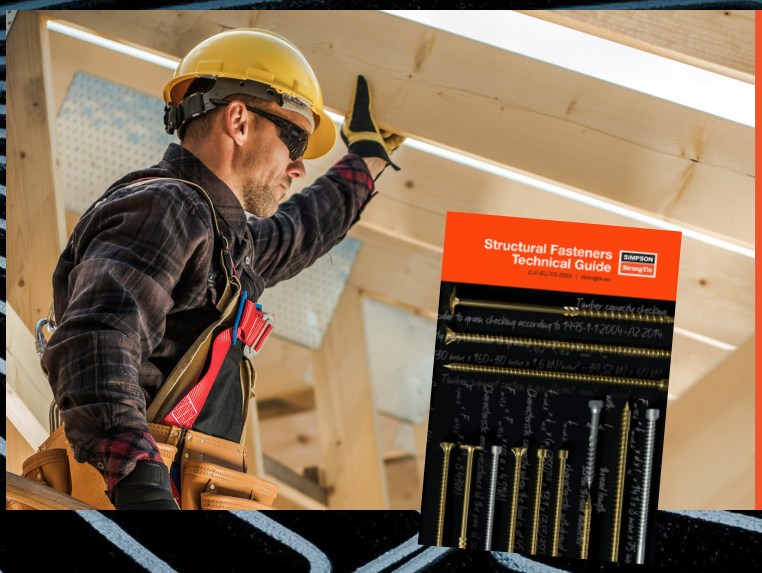

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Designed specifically to meet the needs of professionals. The new catalog, is a kind of guide to the use of Simpson Strong-Tie® fasteners in timber structures. The guide is full of technical information and installation tips for solid wood C24, glulam and CLT.

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