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European Technical Assessment ETA-17/0554 of 2023/05/31

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:

Simpson Strong-Tie Joist Connectors
See type numbers in section II.1 of the ETA

Product family to which the above construction product belongs:

Three-dimensional nailing plate (timber-to-timber joist connector)

Manufacturer:

SIMPSON STRONG-TIE Int. Ltd
For local branch refer to www.strongtie.eu

Manufacturing plant:

SIMPSON STRONG-TIE Manufacturing facilities

This European Technical Assessment contains:

56 pages including 4 annexes which form an integral part of the document

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:

EAD 130186-00-0603 for Three-Dimensional Nailing Plates

This version replaces:

The ETA with the same number issued on 2017-06-07

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product

This ETA covers the following joist connector types: HB, ITSE, IUSE, ITB, HITB, ITBS, HIUB, IUBS, HIUQ, IUC, THM, ZS, EWH

Simpson Strong-Tie, HB, ITSE and EWH Top Flange Connectors are one-piece non-welded three-dimensional nailing plates, top-flange supported timber-to-timber connectors. Additionally, the connectors can be welded to a steel header. The EWH connector can also be installed on to a Timber Nailer header.

Simpson Strong-Tie IUSE, IUC & EWH Face Fix Connectors are one-piece, non-welded three-dimensional nailing plates, face-fix timber-to-timber connectors.

Simpson Strong-Tie ITB, ITBS, HITB, HIUB, IUBS and EWH Connectors are non-welded three-dimensional nailing plates for timber-to-timber connectors, including I-joists, metal web floor trusses and solid timber joists. The ITB, HITB, IUB, HIUB and EWH Connectors are one-piece, and the ITBS and IUBS Connectors are two-piece adjustable angle joist connectors.

Simpson Strong-Tie HIUQ and EWH Face Fix Connectors are non-welded three-dimensional nailing plates, face-fix timber-to-timber joist to SIP panel connectors.

Simpson Strong-Tie ZS Clips are non-welded three-dimensional nailing plates for use with I-joists or solid sawn timbers used as noggins between joists to support floor decks or partitions.

The timber elements are fixed together with a range of fasteners. Typical examples are shown in Annexes and typical installations shown in Annex B.

The connectors are made from zinc-coated steel in accordance with EN 10346:2009 (named "Steel ref 1" in the rest of the document) or ASTM A653 (named "Steel ref 2") and stainless steel in accordance with EN 10088-2:2005 (named "Steel ref 3"), grade 1.4401 or 1.4404 with a minimum characteristic 0.2% yield stress of 240 MPa, a minimum 1.0% yield stress of 270 MPa and a minimum ultimate strength of 530 MPa, and are available in a range of sizes. Material, dimensions and nails positions are detailed in Annex D and typical installations are detailed in Annex B. By default all the products are made out of this material except when specified.

Some connectors may be produced from pre-galvanized steel grade S250GD + Z800 or ZM310 or similar coatings according to EN 10346 (named "Steel ref 4" in the rest of the document) , that has been tested to ISO 11997-1 Cyclic

Corrosion Testing in artificial atmosphere." (similar as in Joist hangers ETA)

All joist connectors can also be produced from stainless steel number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088-2 or a stainless steel with a minimum characteristic 0.2% yield stress of 240 MPa, a minimum 1.0% yield stress of 270 MPa and a minimum ultimate tensile strength of 530 MPa. If no name is clearly specified, product variant made with stainless steel have generally the same name with a S (as Stainless) at the end.

A coloured top paint can be applied to all connectors.

2 Specification of the intended use in accordance with the applicable EAD

The joist connectors are intended for use in making structural end grain to side-grain joints in timber structures, as a connection between a wood-based joist and a solid-timber or wood-based header, (type HB and ITSE can also be used with a steel header), where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Works Requirements 1 and 4 of Regulation (EU) 305/2011 shall be fulfilled.

The joist connectors can be installed as connections between wood based members such as:

- Structural solid timber classified to C16-C40 according to EN 338 / EN 14081
- Glulam classified to GL24-GL36 according to EN 1194 / EN 14080
- LVL according to EN 14374
- I-beams with backer blocks in the web of the header and web stiffeners in the joist.
- Plywood according to EN 636

The connectors are for use in timber structures subject to the dry, internal conditions defined by service classes 1 and 2 of EN 1995-1-1:2004 + A1:2008 (Eurocode 5) and for joints subject to static or quasi-static loading.

Annex C defines the directions of forces and also states the formulas for the characteristic load-carrying capacities of the joist connector connections. The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code.

The joist hangers are intended for use for connections subject to static or quasi static loading.

The scope of the hangers regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions and in conjunction with the admissible service conditions according to EN 1995-1-1 and the admissible corrosivity category as described and defined in EN ISO 12944-2.

The provisions made in this European Technical Assessment are based on an assumed intended working life for the three-dimensional nailing plate 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for selecting the appropriate product in relation to the expected economically reasonable working life of the works.

3 Characteristics of product and assessment

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Joint Strength - Characteristic load-carrying capacity	See Annex D
Joint Stiffness	See Annex B
Joint ductility	No performance assessed
Resistance to seismic actions	No performance assessed
Resistance to corrosion and deterioration	See section 3.6
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The connectors are made from steel classified as Euroclass A1 in accordance with Commission Delegated Regulation 2016/364, EN 13501-1 and EC decision 96/603/EC, amended by EC Decision 2000/605/EC
3.3 General aspects related to the performance of the product	
	The connectors have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species (including timbers preserved with organic solvent, boron diffusion and related preservatives) described in Eurocode 5 and subject to the dry, internal conditions defined by service classes 1 and 2.
Identification	Each connector bears the manufacturer's identification mark and the product type. The CE Marking appears on the packaging. See Annex D

*) See additional information in section 3.4 – 3.7.

3.4 Methods of verification

Safety principles and partial factors

The characteristic load-carrying capacities are based on the characteristic values of the nail connections and the joist connectors. To obtain design values the capacities have to be divided by different partial factors for the material properties, the nail connection in addition multiplied with the coefficient k_{mod} .

According to EN 1990 (Eurocode – Basis of design) paragraph 6.3.5 the design value of load-carrying capacity may be determined by reducing the characteristic values of the load-carrying capacity with different partial factors.

3.5 Mechanical resistance and stability

See [Annex C](#) for characteristic load-carrying capacities of the joist connectors.

The characteristic capacities of the joist connectors are determined by calculation assisted by testing or only testing as described in EAD 130186-00-0603. They should be used for designs in accordance with Eurocode 5 or a similar national Timber Code.

The design models allow the use of fasteners described in the table in [Annex C3](#):

The characteristic load-carrying capacities of the products shall be calculated in accordance with the manufacturer's design code, extracts of which are given in [Annex C4](#). The design code has been derived in accordance with EAD 130186-00-0603 and Eurocode 5.

The calculated values should be used for designs in accordance with Eurocode 5 or a similar national Timber Code. These values are based on the assumption that there is a maximum gap of 3 mm between the timber members, the members are laterally restrained and wane is not present in the timber at the joint.

The hangers shall be used with the fasteners specified in [Annex C3](#).

No performance has been determined in relation to the joint's stiffness properties - to be used for the analysis of the serviceability limit state.

No performance has been determined in relation to ductility of a joint under cyclic testing. The contribution to the performance of structures in seismic zones, therefore, has not been assessed.

3.6 Aspects related to the performance of the product

3.6.1 Corrosion protection in service class 1 and 2.

In accordance with EAD 130186-00-0603 the joist hanger have a zinc coating weight of min Z275. The steel employed is S250 GD with min Z275 according to EN 10346:2009.

3.6.2 Corrosion protection in service class 3.

In accordance with Eurocode 5 the joist connectors are made from stainless steel number 1.4401, 1.4404, 1.4521, 1.4301 or 1.4509 according to EN 10088-2 or a stainless steel with a minimum characteristic 0.2% yield stress of 240 MPa, a minimum 1.0% yield stress of 270 MPa and a minimum ultimate tensile strength of 530 MPa. The nails or screws shall be produced from stainless steel. Connectors coated with hot dip galvanisation, or made of S250GD steel with zinc coating ZM310 according to EN 10346:2009, can also be used in service class 3 according to Eurocode 5

3.7 General aspects related to the use of the product

Simpson Strong-Tie joist hanger types HB, ITSE, IUSE, ITB, HITB, ITBS, HIUB, IUBS, HIUQ, IUC, THM, ZS and EWH are manufactured in accordance with the provisions of this European Technical Assessment using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation.

A connector (three-dimensional nailing plate) is deemed fit for its intended use provided:

- the connector capacity is calculated in accordance with the manufacturer's literature
- joints are designed in accordance with Eurocode 5 or an appropriate national code, under the responsibility of an engineer experienced in timber structures
- verifiable calculation, notes and drawings are prepared taking account of the loads to be resisted
- the requirements detailed in part II, section 1, of this ETA, relating to the timber members being joined are taken into account, for example, lateral restraint and wane
- joints are designed for the specified fasteners and grade or type of joist and header
- the actual end bearing capacity of the joist (end grain member) to be used with the connector is checked by the designer of the joist to ensure it is not less than the connector capacity and, if necessary, a connector with a larger end bearing capacity substituted to suit. The end bearing capacity of I-joists with solid sawn timber flanges shall be based on the full connector seat bearing area and the appropriate characteristic stress perpendicular to grain for the particular grade of timber. For I-joists with LVL flanges, the joist bearing area shall be taken as 80% of the full connector seat bearing area.

The assessment of the joint has been made under the following assumptions:

- installation is in accordance with the manufacturer's specifications and drawings prepared for that purpose, and the appropriate tools are used
- the specified fasteners and grade or type of joist and header are used
- the requirements relating to the timber members being joined are taken into account, e.g.: lateral restraint and wane
- the maximum gap of 3 mm (see Annex B Figure 2) between the joist and the header assumed in the assessment is not exceeded.

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 97/638/EC of the European Commission¹, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 2+.

5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking

Issued in Copenhagen on 2023-05-31 by



Thomas Bruun
Manager, ETA-Danmark

ANNEX A
REVISION HISTORY

<i>Modifications and additions to the previous versions of ETA-17/0554</i>	
Issue No.	Update
1.0	First release
2.0	Additional manufacturing plant has been added
	Addition of MIT hanger without additional face nail capability
3.0	Additional manufacturing plant has been added
	Update of end bearing capacity of joints
	Addition of footnotes to Annex 2, Tables 1 to 5
4.0	Addition of LBV, B, BI and HB hangers
	Update of end bearing capacity of joints
	Addition of footnotes to Annex 2, Tables 1 to 5
5.0	Addition of ITSE hanger
	Revision of figures in Tables accounting for amended Eurocode 5
	Addition of Annex 3
	Extension of validity
6.0	ETA-04/0042 has been amended to incorporate details of ETA-06/0034 Simpson Strong-Tie IU, IUT, IUS, MIU, HU, U, LUS, HUS, IUSE Face-Fix Hangers and ETA-08/0084 Simpson Strong-Tie ITB, HITB, ITBS, IUB, HIUB, IUBS Hangers for Joists
	Addition of ZS, IUQ, HIUQ, IUC, and MUS products
7.0	ETA-04/0042 transferred to ETA-17/0554
	Addition of LIB and LITB hangers
	IT – Correction of characteristic uplift load capacity
	ITSE – Correction of fastener specification
	ITSE – Modification of characteristic uplift load capacity
	MIT – Correction of characteristic uplift load capacity
	IUSE – Correction of fastener specification
	HB - Correction of material thickness
	HIUB – Modification of characteristic load capacity
	ZS – Modification of connector height and width range
	ZS – Modification of capacity of connector
	IUQ – Modification of capacity connector
	IUC – Correction of nail specification
	All products – Update of the structure of connector dimensions tables
	All products – Update of the structure of connector capacity tables

8.0	Removal of IT, ITT, MIT, B, BI, IU, IUT, IUS, MIU, HU, U, LUS, HUS, IUB, IUQ, LIB, and LITB hangers
	Addition of EWH hangers
	Typical installation images updated
	CSA-S and SSH fasteners added
	References to connectors removed from ETA deleted from all sections
	ZM310 material added
	Reference to "a coloured top paint can be applied to the connectors" added
	All product dimensions drawings updated
	HB - Product dimensions table updated, performance table column headings corrected
	HITB – Product dims table updated
	HIUB – Product dims table updated, R_{2k} value corrected
	HIUQ – Product dims table updated, SDS screw changed to SSH, performance values updated
	ITBS – Skew angle reference table added, product dims table updated
	IUBS - Skew angle reference table added, product dims table updated
	THM – SDS screw changed to SSH

**ANNEX B
TYPICAL INSTALLATIONS**

B1 Typical installations

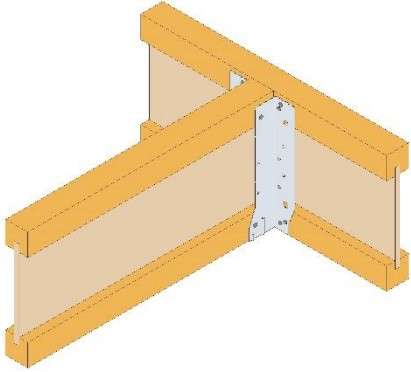


Figure B1: Standard Face Fix I-Joist Header

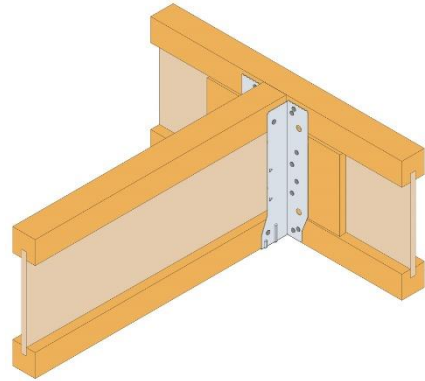


Figure B2: Standard / Enhanced Face Fix I-Joist Header

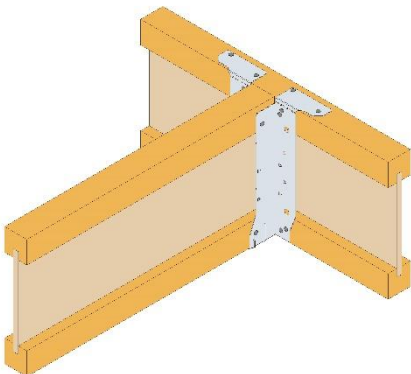


Figure B3: Standard top fix I-joist Header

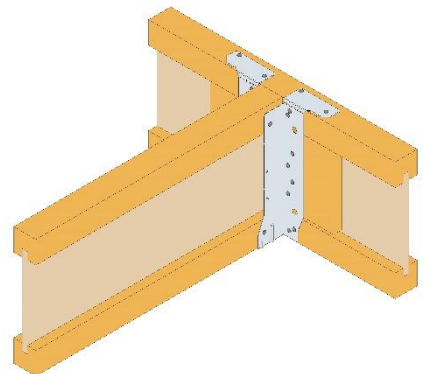


Figure B4: Standard / Enhanced top fix I-joist header

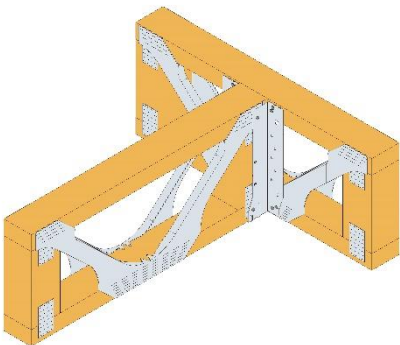


Figure B5 : Standard Face fix metal web header

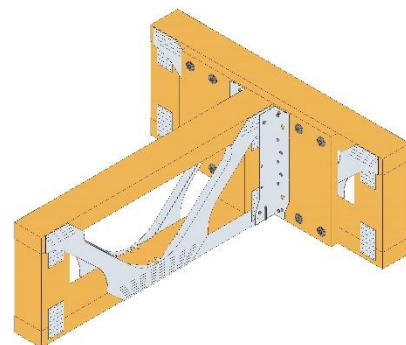


Figure B6: Enhanced face fix enhanced metal web header

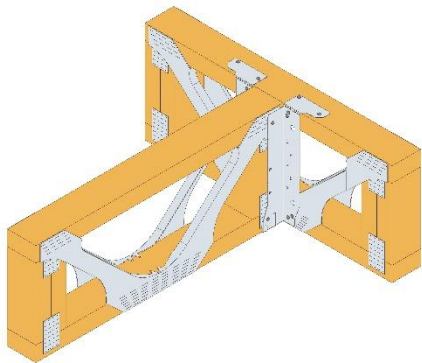


Figure B7: Standard top fix metal web header.

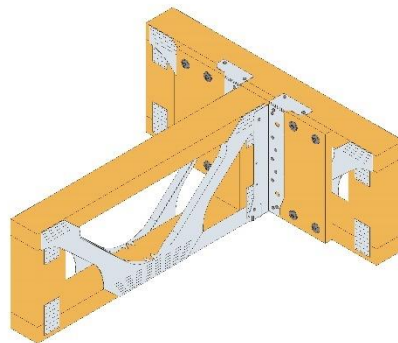


Figure B8: Enhanced top fix metal web header

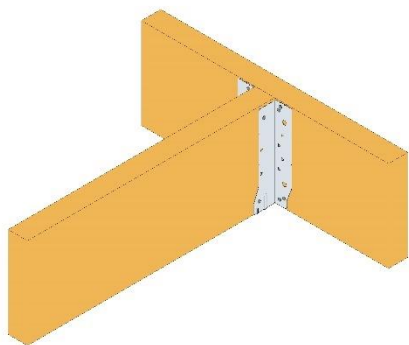


Figure B9: Standard/enhanced face fix solid header

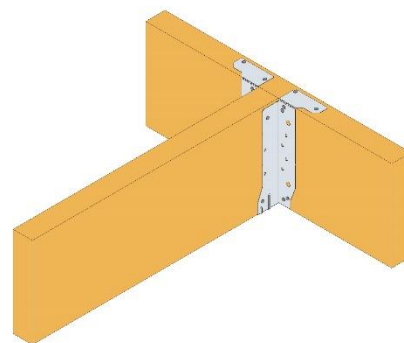


Figure B10: Standard / Enhanced top fix solid header.

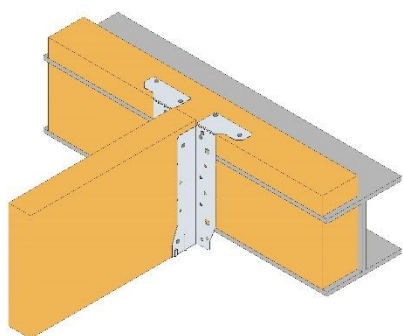


Figure B11: Standard top fix timber nailer header

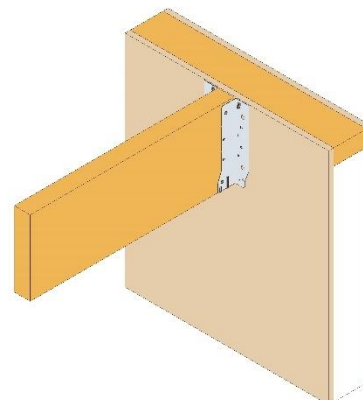


Figure B12: Standard face fix SIP's header

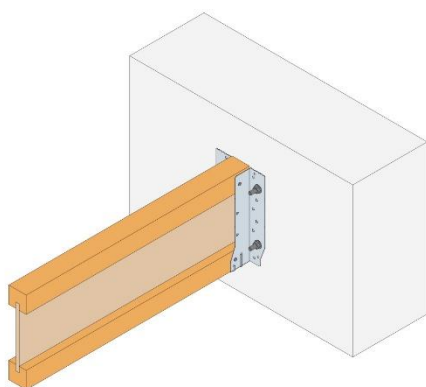


Figure B13: Standard face fix rigid support

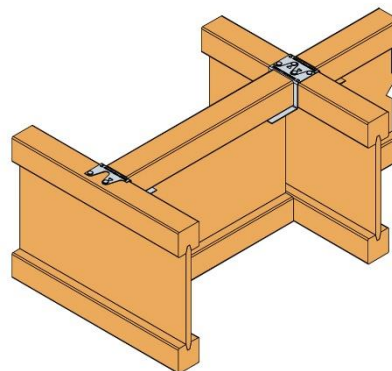


Figure B14: Standard ZS Clip

Above are shown all the typical installations. Any other installation is described in the [Annex D](#) for the specific product.

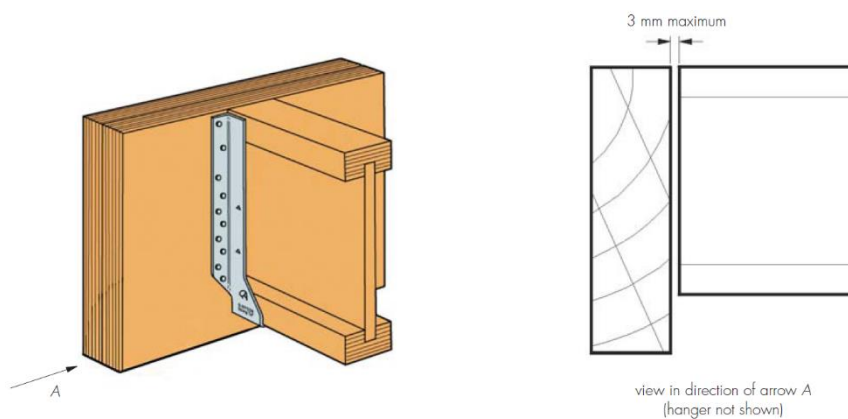


Figure B.10 – Maximum gap of 3mm between the joist and the header.

**ANNEX C
BASIS OF DESIGN**

C0 Symbols used in the ETA

For the purpose of this ETA, the following symbols apply.

a	Lever arm between centre of compression zone and centre of the header nails effective in tension
e	Eccentricity of loads, equals distance from centre of seat to face of header.
$F_{v,Rk,j}$	Lateral load-carrying capacity of the side/joist nails (N)
$F_{v,Rk,h}$	Lateral load-carrying capacity of the header nails (N)
$F_{ax,Rk,h}$	Axial load-carrying capacity of the header nails (N)
f_u	Tensile strength of hanger steel (N/mm ²)
n	Factor dependent on nail type: <ul style="list-style-type: none"> ▪ $n = 2$ for ring shank nails (CNA) ▪ $n = 100$ for smooth (plain or square twisted nails)
n_j	Number of effective joist nails
n_h	Number of effective header nails
ρ_k	Characteristic density of header or joist material (kg/m ³)
t	Thickness of side flanges (mm)
S	Minimum width of connector side flanges (mm)

C1 Definition of Force Directions

To determine the characteristic capacities for the timber-to-timber connectors, the load has been applied in F_1 and F_2 directions as shown in Figure C.1.

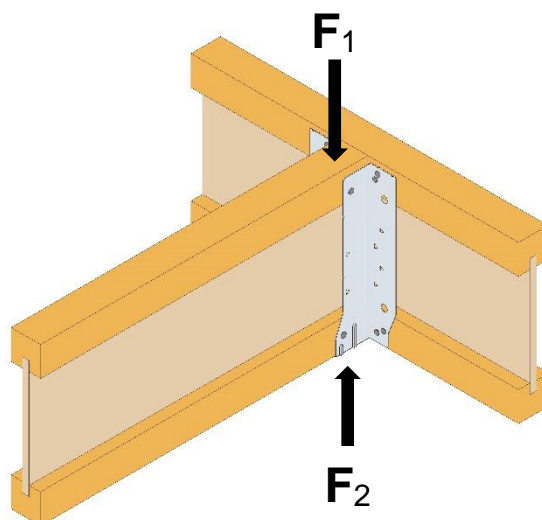


Figure C.1 – Definition of force directions.

C2 Fastener Specification**Fastener types and sizes**

CNA connector nails and CSA connector screws according to ETA-04/0013.

Nail type	Fastener size (mm)		Finish / Material
	Diameter	Length	
According to ETA-04/0013			
CNA Connector nail	3.7	50	Electroplated zinc
CNA Connector nail	4.0	35 - 50	Electroplated zinc
CNA Connector nail	4.2	35 - 50	Electroplated zinc
CNA-S Connector nail	4.0	40 - 60	Stainless steel
CSA Connector screw	4.0	30	Electroplated zinc
CSA Connector screw	5.0	30 - 80	Electroplated zinc
CSA-S Connector screw	5.0	35 - 40	Stainless steel

SSH screws according to ETA-21/0670

Nail type	Fastener size (mm)		Finish / Material
	Diameter	Length	
According to ETA-21/0670			
SSH	6.0	40 - 120	Zinc/Nickel Flake
SSH	8.0	40 - 300	Zinc/Nickel Flake

Other fasteners according to EN 14592.

Fasteners according to EN 14592	Fastener size (mm)		Finish / Material
	Diameter	Length	
Annular ring shank nail	3.7	40	Electroplated zinc
Square Twist nail	3.75	30	Hot-dip galvanized/ Sherardised/ Electroplated
Smooth shank nail	3.8	38	Hot-dip galvanized
Round Wire nail	3.75 - 4.0	75 - 100	Hot-dip galvanized
SDS coach screw	6.2	63	Electroplated

C3 Nail Capacity Tables

For fasteners according to referenced ETA's, either ETA-04/0013 or ETA-21/02670, refer to those ETA's for capacities

Capacities of 3.75 x 30 mm Square Twist Nails

Nail Reference	Nail Shape	Side Length or Diameter (mm)	Nail Length (mm)	Wire Tensile Strength (mm)	Plate Thickness (mm)	Timber Grade	Timber Char. Density (kg/m ³)	F _{ax,Rk} (N)	F _{v,Rk} (N)
3.75 x 30 ST	Square	3.40	30	600	1.2	C16	310	188	899
						C18	320	201	925
						C20	330	213	951
						C22	340	226	978
						C24	350	240	1004
						C27	370	268	1057
						C30	380	283	1083
						SCL	480	451	1353
3.75 x 30 ST	Square	3.40	30	600	1.5	C16	310	186	893
						C18	320	198	919
						C20	330	211	945
						C22	340	224	970
						C24	350	237	996
						C27	370	265	1049
						C30	380	280	1075
						SCL	480	447	1342
3.75 x 30 ST	Square	3.40	30	600	2.0	C16	310	183	882
						C18	320	195	908
						C20	330	207	933
						C22	340	220	959
						C24	350	233	984
						C27	370	261	1035
						C30	380	275	1061
						SCL	480	439	1324

Capacities of Round Wire Nails

Nail Reference	Nail Shape	Side Length or Diameter (mm)	Nail Length (mm)	Wire Tensile Strength (mm)	Plate Thickness (mm)	Timber Grade	Timber Char. Density (kg/m ³)	F _{ax,Rk} (N)	F _{v,Rk} (N)
3.8 x 38 SR	Round	3.80	38	600	1.2	C16	310	269	1145
						C18	320	286	1180
						C20	330	305	1216
						C22	340	323	1251
						C24	350	343	1280
						C27	370	383	1337
						C30	380	404	1365
SCL	480	644	1653						
3.75 x 75 SR	Round	3.75	75	600	1.2	C16	310	532	1309
						C18	320	567	1336
						C20	330	603	1364
						C22	340	640	1391
						C24	350	678	1419
						C27	370	758	1474
						C30	380	799	1502
SCL	480	1275	1782						
4.0 x 100 SR	Round	4.00	100	600	1.2	C16	310	760	1498
						C18	320	809	1531
						C20	330	861	1565
						C22	340	914	1598
						C24	350	968	1632
						C27	370	1082	1699
						C30	380	1141	1733
SCL	480	1821	2083						
3.8 x 38 SR	Round	3.80	38	600	1.5	C16	310	267	1137
						C18	320	284	1172
						C20	330	302	1208
						C22	340	321	1244
						C24	350	340	1275
						C27	370	380	1332
						C30	380	401	1360
SCL	480	639	1647						
3.75 x 75 SR	Round	3.75	75	600	1.5	C16	310	530	1308
						C18	320	564	1336
						C20	330	600	1363
						C22	340	637	1391
						C24	350	675	1418
						C27	370	755	1473
						C30	380	796	1501
SCL	480	1270	1781						

Capacities of Round Wire Nails (continued)

Nail Reference	Nail Shape	Side Length or Diameter (mm)	Nail Length (mm)	Wire Tensile Strength (mm)	Plate Thickness (mm)	Timber Grade	Timber Char. Density (kg/m ³)	F _{ax,Rk} (N)	F _{v,Rk} (N)
4.0 x 100 SR	Round	4.00	100	600	1.5	C16	310	757	1497
						C18	320	807	1531
						C20	330	858	1564
						C22	340	911	1597
						C24	350	965	1631
						C27	370	1079	1699
						C30	380	1138	1733
						SCL	480	1816	2081
3.8 x 38 SR	Round	3.80	38	600	2.0	C16	310	263	1124
						C18	320	280	1159
						C20	330	298	1194
						C22	340	316	1230
						C24	350	335	1265
						C27	370	375	1324
						C30	380	395	1352
						SCL	480	630	1635
3.75 x 75 SR	Round	3.75	75	600	2.0	C16	310	526	1307
						C18	320	561	1335
						C20	330	596	1362
						C22	340	633	1390
						C24	350	671	1417
						C27	370	750	1472
						C30	380	791	1499
						SCL	480	1261	1778
4.0 x 100 SR	Round	4.00	100	600	2.0	C16	310	753	1496
						C18	320	803	1530
						C20	330	854	1563
						C22	340	906	1596
						C24	350	960	1630
						C27	370	1073	1697
						C30	380	1132	1731
						SCL	480	1806	2079

C4 Typical Connector and Fastener Type Combinations

Connector type	Type	Fastener diameter [mm]	Length Min – Max [mm]	Finish	Nailing
ITSE	ST ⁽¹⁾	3.75	30	Hot-dip galvanized- sherardised – Electroplated zinc	Standard and enhanced
	SR ⁽²⁾	3.75	75	Hot-dip galvanized	
	ARS ⁽³⁾	3.7	50	Hot-dip galvanized	
	ARS ⁽³⁾	4.0	40-50	Electroplated zinc	
HB	ST ⁽¹⁾	3.75	30	Hot-dip galvanized- sherardised – Electroplated zinc	Standard
	SR ⁽²⁾	3.8	38	Hot-dip galvanized	
	SR ⁽²⁾	3.75	75	Hot-dip galvanized	
	SR ⁽²⁾	4.0	100	Hot-dip galvanized	
	ARS ⁽³⁾	3.7	50	Electroplated zinc	
	ARS ⁽³⁾	4.0	50	Electroplated zinc	
IUSE	SR ⁽²⁾	3.8	38	Hot-dip galvanized	Standard and enhanced
	SR ⁽²⁾	3.7	50	Hot-dip galvanized	
	SR ⁽²⁾	3.75	75	Hot-dip galvanized	
	SR ⁽²⁾	4.0	100	Hot-dip galvanized	
	ARS ⁽³⁾	3.7	40-50	Electroplated zinc	
	ARS ⁽³⁾	4.0	35-50	Electroplated zinc	
	ARS ⁽³⁾	4.0	40-60	Stainless steel	
	ARS ⁽³⁾	4.2	35-50	Electroplated zinc	
IUSE ITB, ITBS	ST ⁽¹⁾	3.75	30	Hot-dip galvanized- sherardised – Electroplated zinc	Standard and enhanced
	SR ⁽²⁾	3.75	75	Hot-dip galvanized	
	ARS ⁽³⁾	3.7	50	Electroplated zinc	
	ARS ⁽³⁾	4.0	40-50	Electroplated zinc - Stainless steel	
	CSA ⁽⁴⁾	4.0	30	Electroplated zinc	
HITB, HIUB, ZS, IUC	ST ⁽¹⁾	3.75	30	Hot-dip galvanized- sherardised – Electroplated zinc	Standard
IUBS,	ST ⁽¹⁾	3.75	30	Hot-dip galvanized- sherardised – Electroplated zinc	Standard and enhanced
IUBS, HIUQ	SSH ⁽⁵⁾	6.0	60	Zinc/Nickel Flake	Standard and enhanced
	ST ⁽¹⁾	3.75	30	Hot-dip galvanized- sherardised – Electroplated zinc	
HIUQ	SSH ⁽⁵⁾	6.0	60	Electroplated	Standard and Enhanced
	SS ⁽⁶⁾	3.75	75	Hot-dip galvanized	
EWH	ST ⁽¹⁾	3.75	30	Hot-dip galvanized- sherardised – Electroplated zinc	Standard and enhanced
	RW ⁽²⁾	3.75	75	Hot-dip galvanized	
	ARS ⁽³⁾	4.0	40-50	Electroplated	
	CSA ⁽⁴⁾	5.0	40-50	Electroplated zinc	
	SSH ⁽⁵⁾	8.0	40	Zinc/Nickel Flake	

(1) Square Twist nail

(2) Round Wire nail

(3) Annular Ring Shank nail

(4) Connector screw

(5) Coach screw

(6) Smooth Shank nail

C5 Design Formula where appropriate

Nail capacities

The nail capacities are calculated as follows, and have been validated against connector test data:

- smooth nails (plain or square twisted) — as specified in relevant tables given in [Annex C3](#). These may have an efficiency factor applied as part of the design method validation and are only for use in conjunction with the connectors described in this ETA.
- CNA ring-shank nails — calculated as described in ETA-04/0013
- other ring-shank nails — calculated as described in Eurocode 5.

Top fix connectors (Design Model and performance tables)

The characteristic load-carrying capacities for the HB and ITSE connectors are given in the tables in [Annex D](#) which have been derived in accordance with EAD 130186-00-0603. They should be used for designs in accordance with Eurocode 5.

These values are based on the assumption that there is a maximum gap of 3 mm between the timber members, the members are laterally restrained and wane is not present in the timber at the joint. Capacities for intermediate widths can be interpolated. Connector capacity is independent of the connector height.

The connectors shall only be used with the fasteners specified in the relevant table in [Annex C](#). The performance of the fasteners have been determined in accordance with either ETA04/0013, ETA-21/0670 or Eurocode 5 (see also [Annex D](#)), using an ultimate tensile strength for the wire used for the production of the nails of 600 MPa.

Face fix connector (Design model and listed variables)

The design method used to determine the characteristic load-carrying capacities for the IUSE connectors has been validated by the 'calculation assisted by testing' method as defined in EAD 130186-00-0603 and is detailed in the technical report entitled 'Approval for IU, IUT, IUS, MIU, HU, U, LUS, HUS and IUSE', which has been substantiated by ETA Danmark as part of the ETA approval process.

Summary of design model, to be used in conjunction with the values listed in [Annex D](#):

Design — Vertical down load capacity (F_1)

The load is transferred from the supported member to the supporting member by:

1. Tension in the lower part of the connector.
2. Load transfer from the connector to the supporting member.

The capacity of the system is the minimum of the above two mechanisms.

Capacity = Min. (F_t , F_h)

Tension in the lower part of the connector (F_t):

$$F_t = 2 \cdot S \cdot t \cdot f_u$$

Load transfer from the connector to the supporting member (F_h):

$$F_h = \left[1 / \left[\left(\frac{1}{n_h \cdot F_{v,Rk,h}} \right)^n + \left(\frac{e}{a \cdot n_h \cdot F_{ax,Rk,h}} \right)^n \right] \right]^{1/n}$$

Design — Vertical up load capacity (F_2)

$$F_{uplift} = \min \{ n_j \cdot F_{v,Rk,j}; n_h \cdot F_{v,Rk,h} \}$$

The connectors shall only be used with the fasteners specified in the relevant table in [Annex D](#). The performance of the fasteners have been determined in accordance with either ETA04/0013, ETA-21/0670 or Eurocode 5 (see also Annex C), using an ultimate tensile strength for the wire used for the production of the nails of 600 MPa.

Other hangers determined by test method (performance tables)

The characteristic load-carrying capacities for the connectors EWH, HITB, HIUB HIUQ, ITB, ITBS, IUBS IUC, THM and ZS are given in the tables in [Annex D](#) which have been derived in accordance with 'Test Only' method in accordance with EAD 130186-00-0603 . They should be used for designs in accordance with Eurocode 5.

These values are based on the assumption that there is a maximum gap of 3 mm between the timber members, the members are laterally restrained and wane is not present in the timber at the joint. Capacities for intermediate widths can be interpolated. Connector capacity is independent of the connector height.

The connectors shall only be used with the fasteners specified in the relevant tables in [Annex C3 and Annex D](#). The performance of the fasteners have been determined in accordance with either ETA04/0013, ETA-21/0670 or Eurocode 5, using an ultimate tensile strength for the wire used for the production of the nails of 600 MPa.

ANNEX D
PRODUCT DEFINITION AND CAPACITIES

D1 Connector Type EWH

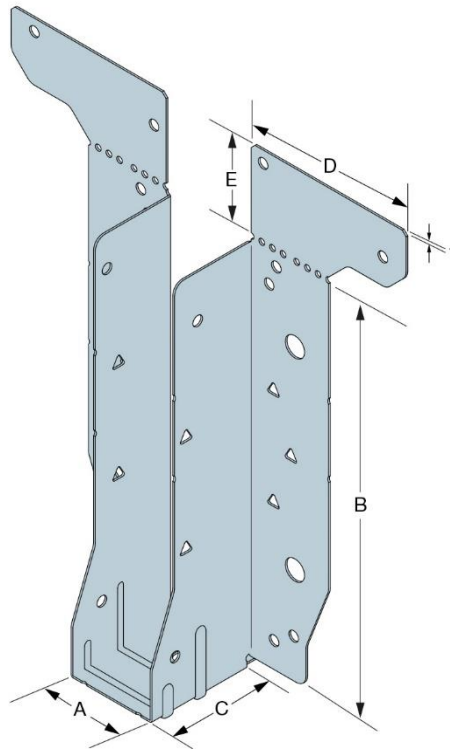
Product Name	Material reference acc. to clause II-1	Alternative Names
EWH	Steel ref 1	-

Product dimensions

Item	Product dimensions [mm]							Holes						
	A		B		C	D	E	t	Flange B			Flange C		Flange E
	Min	Max	Min	Max					Ø5	Ø10	Tri	Ø5	Tri	Ø5
EWH (B ≤ 200)	40	296	195	417	49	80	40	(¹)	8	4	6	4	4	4
EWH (B = 219)	40	296	195	417	49	80	40	(¹)	8	4	8	4	4	4
EWH (B ≥ 235)	40	296	195	417	49	80	40	(¹)	8	4	10	4	4	4

Notes:

(¹) 0.9mm or 1.0mm material when $A \leq 99\text{mm}$ and/or $B \leq 300\text{mm}$, otherwise 1.2mm material



Product capacities: Standard installation, I-Joist Headers

Item	Type	Fasteners					Characteristic Capacities [kN]						
							R _{1,k}			R _{2,k}			
		Face (Flange B)		Top (Flange E)	Joist (Flange C)		Support Type			Joist Type			
		ø5	Tri	ø5	ø5	Tri	LVL I-Joist 36mm	LVL I-Joist 39mm	SS I-Joist 45mm	LVL I-Joist 36mm	LVL I-Joist 39mm	SS I-Joist 45mm	LVL, Glulam, Solid Sawn Timber
					N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	
EWH	Top Fix	8	-	4	4	-	11.0	13.0	12.1	2.3	2.5	3.5	3.5
	Face Fix	8	-	-	4	-	6.0	9.2	8.0	2.3	2.5	3.5	3.5

Product capacities: Enhanced installation, I-Joist Headers

Item	Type	Fasteners					Characteristic Capacities [kN]					
							R _{1,k}			R _{2,k}		
		Face (Flange B)		Top (Flange E)	Joist (Flange C)		Support Type			Joist Type		
		ø5	Tri	ø5	ø5	Tri	LVL I-Joist Enhanced	SS I-Joist Enhanced	LVL I-Joist 36mm	LVL I-Joist 39mm	SS I-Joist 45mm	LVL, Glulam, Sawn Timber
					N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	N3.75x30 CNA4.0x35 CNA4.0x40	
EWH	Top Fix	8	6	4	4	-	18.3	18.2	2.3	2.5	3.5	3.5
		8	8	4	4	-	19.9	19.6	2.3	2.5	3.5	3.5
		8	10	4	4	-	20.3	20.6	2.3	2.5	3.5	3.5
	Face Fix	8	6	-	4	-	15.5	16.3	2.3	2.5	3.5	3.5
		8	8	-	4	-	16.9	16.6	2.3	2.5	3.5	3.5
		8	10	-	4	-	17.6	17.7	2.3	2.5	3.5	3.5

Notes:

- 36mm, 39mm and 45mm refers to the I-joist flange depth.
- For EWH > 300mm deep, a backer block installed onto the front face of the supporting I-joist is required for the standard performance values to apply. The installation of the backer block is to be in accordance with the I-Joist manufacturers specification.
- The enhanced installation requires a backer block to be installed onto the front face of the supporting I-joist, and the specified number of triangular holes to be filled. The installation of the backer block is to be in accordance with the I-Joist manufacturers specification.
- Solid Sawn Timbers to be minimum C24 graded timber.

Product capacities: Standard and Enhanced installation, Metal Web Floor Joist Headers

Item	Type	Fasteners					Characteristic Capacities [kN]					
							R _{1,k}				R _{2,k}	
		Face (Flange B)		Top (Flange E)	Joist (Flange C)		Support Type				Joist Type	
		ø5	Tri	ø5	ø5	Tri	Metal Web		Metal Web Enhanced		Metal web	LVL, Glulam, Solid Timber
						N3.75x30 CNA4.0x35 CNA4.0x40	CSA5.0x50	N3.75x30 CNA4.0x35 CNA4.0x40	CSA5.0x50	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x50	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x50	
EWH	Top Fix	8		4	4	-	13.0	16.4	-	-	3.5	3.5
		8	6	4	4	-	-	-	17.1	17.4	3.5	3.5
		8	8	4	4	-	-	-	18.0	18.3	3.5	3.5
		8	10	4	4	-	-	-	18.6	18.9	3.5	3.5
	Face Fix	8			4	-	9.9	13.7	-	-	3.5	3.5
		8	6	-	4	-	-	-	15.5	16.6	3.5	3.5
		8	8	-	4		-	-	17.3	18.4	3.5	3.5
		8	10	-	4		-	-	19.1	20.2	3.5	3.5

Notes:

- Enhanced installation requires an 18mm plywood gusset to be fixed to the face of the metal web joist.
- The plywood gusset is to be at least 400mm long and full depth of the metal web joist.
- The plywood gusset is to be installed with 8 No ESCR8.0x80mm screws.
- Solid Sawn Timbers to be minimum C24 graded timber.

Product capacities: Standard and Enhanced installation, Solid Joist Headers

Item	Type	Fasteners					Characteristic Capacities [kN]							
							$R_{1,k}$				$R_{2,k}$			
		Face (Flange B)		Top (Flange E)	Joist (Flange C)		Support Type			Joist Type				
		$\phi 5$	Tri	$\phi 5$	$\phi 5$	Tri	LVL	Glulam	Solid Sawn Timber	LVL I-Joist 36mm	LVL I-Joist 39mm	SS I-Joist 45mm	Metal web LVL Glulam Solid Sawn Timber	
						N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40		
EWH	Top Fix	8	-	4	4	-	15.5	12.9	12.8	2.3	2.5	3.5	3.5	
		8	6	4	4	-	18.8	18.5	17.6	2.3	2.5	3.5	3.5	
		8	8	4	4	-	19.0	19.0	18.5	2.3	2.5	3.5	3.5	
		8	10	4	4	-	20.4	19.4	19.1	2.3	2.5	3.5	3.5	
	Face Fix	8	-	-	4	-	11.1	9.0	6.6	2.3	2.5	3.5	3.5	
		8	6	-	4	-	18.7	16.3	13.4	2.3	2.5	3.5	3.5	
		8	8	-	4	-	20.4	17.9	15.2	2.3	2.5	3.5	3.5	
		8	10	-	4	-	21.3	18.6	17.1	2.3	2.5	3.5	3.5	
Item	Type	$\phi 8$	Tri	$\phi 5$	$\phi 5$	Tri	LVL	Glulam	Solid Sawn Timber	LVL I-Joist 36mm	LVL I-Joist 39mm	SS I-Joist 45mm	Metal web LVL Glulam Solid Sawn Timber	
							SSH8.0x40	SSH8.0x40	SSH8.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	
EWH	Face Fix	4	-	-	4	-	12.9	11.2	10.0	2.3	2.5	3.5	3.5	

Notes:

- Glulam to be minimum GL24
- Characteristic timber density for Metal web floor joists flanges to be a minimum of 370 kg/m³
- Solid Sawn Timbers to be minimum C24 graded timber.
- Where EWH installed with SSH screws, Nails in the joist are as specified under the $R_{2,k}$ column

Product capacities: Standard installation, Timber Nailers

Item	Nailer Depth [mm]	Fasteners					Characteristic Capacities [kN]							
		Face (Flange B)		Top (Flange E)	Joist (Flange C)		$R_{1,k}$			$R_{2,k}$				
		Support Type		Joist Type										
		Solid Timber		LVL I-Joist 36mm	LVL I-Joist 39mm	SS I-Joist 45mm	Metal web, LVL, Glulam, Solid Sawn Timber							
$\phi 5$	Tri	$\phi 5$	$\phi 5$	Tri				N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x75	CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40
EWH	38-74	4	-	4	4	-	9.8	-	13.9	2.3	2.5	3.5	3.5	
	75-100	4	-	4	4	-	9.8	13.5	13.9	2.3	2.5	3.5	3.5	

Notes:

- Timber nailers can be either Solid Sawn Timber (C24 minimum grade), LVL or Glulam
- (38 - 74mm) refers to depth range of timber nailer.
- The minimum width of the timber nailer shall be 89mm.

Product capacities: Standard installation, Standard Insulated Panels (SIP)

Item	OSB Sheathing Thickness [mm]	Fasteners					Characteristic Capacities [kN]							
		Face (Flange B)		Top (Flange E)	Joist (Flange C)		$R_{1,k}$			$R_{2,k}$				
		Support Type		Joist Type										
		SIP		LVL I-Joist 36mm	LVL I-Joist 39mm	SS I-Joist 45mm	Metal Web, LVL, Glulam, Solid Sawn Timber							
$\phi 5$	Tri	$\phi 5$	$\phi 5$	Tri				CSA5.0x50	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40		
EWH	11	4	-	4	4	-	9.7			2.3	2.5	3.5	3.5	
	15	4	-	4	4	-	10.2			2.3	2.5	3.5	3.5	

Notes:

- SIP panel requires a minimum of 45mm deep timber top rail.
- Top rail timbers to be a minimum C24 graded timber.

Product capacities: Concrete Support

Item	Fasteners					Characteristic Capacities [kN]				
						$R_{1,k}$		$R_{2,k}$		
	Face (Flange B)		Top (Flange E)	Joist (Flange C)		Support Type	Joist Type			
	$\varnothing 8$	Tri	$\varnothing 5$	$\varnothing 5$	Tri		Concrete C20/25	LVL I-Joist 36mm	LVL I-Joist 39mm	SS I-Joist 45mm
						LMAS + Adhesive, WA, BOAX	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40
EWH	4	-	-	4	-	21.3 (*)	2.3	2.5	3.5	3.5

Notes:

- (*) This is the maximum characteristic value for the hanger.
- The anchor capacity is to be verified separately.
- Solid Sawn Timbers to be minimum C24 graded timber.

Anchor Bolts verification

For anchor verification, the maximum withdrawal force in the anchor can be calculated as follows:

$$F_{ax,bolt} = \frac{F_1 \cdot e}{2 \cdot z_{max}}$$

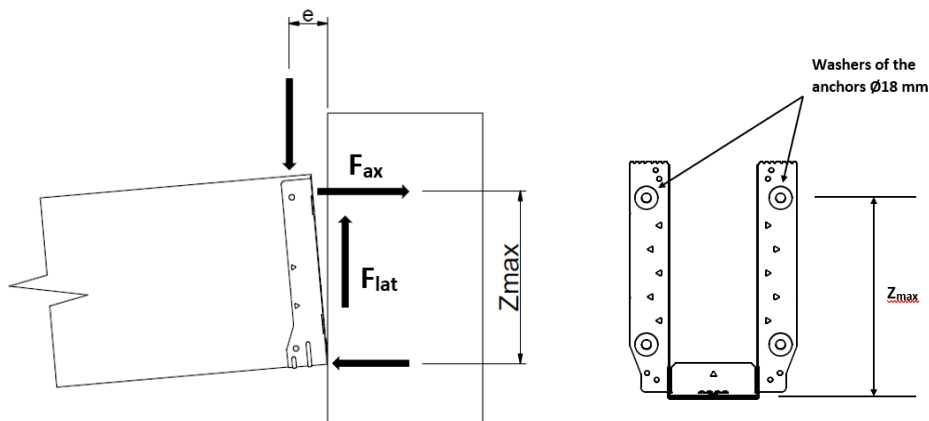
Where:

$e = 32.5 \text{ mm}$

$z_{max} = \text{Hanger height (B)} - 39.5 \text{ mm.}$

(the distance between the support and the nails)

(the distance from top of hanger seat to centre of upper bolt hole)



The upper two anchors are subjected to a combination of lateral and withdrawal forces. The lateral force is determined assuming an even distribution of the downward force F:

$$F_{lat,bolt} = \frac{F_1}{n_{bolt}}$$

Product capacities: Enhanced uplift

Item	Type	Fasteners					Characteristic Capacities [kN]		
							$R_{2,k}$		
		Face Nails (Flange B)		Top Nails (Flange E)	Joist Nails (Flange C)		Joist Type		
		ø5	Tri	ø5	ø5	Tri	I-Joist + Web Stiffener	Metal Web	LVL, Glulam, Solid Timber
						N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	N3.75x30 CNA4.0x35 CNA4.0x40 CSA5.0x40	
EWH	Top Fix	4	6, 8 or 10	4	4	4	8.0	8.0	8.0
	Face Fix	4	6, 8 or 10	-	4	4	8.0	8.0	8.0

Notes:

- Fill all round and triangular holes with the relevant fastener.
- If the incoming joist is an I-Joist then web stiffeners are required. (The web stiffener's size and installation requirements shall be in accordance to relevant I-Joist manufacturer's specification).
- Solid Sawn Timbers to be minimum C24 graded timber

EWH Special Installation Notes

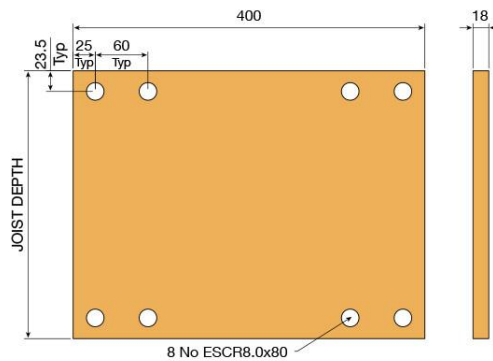
- Use all specified fasteners.
- For STANDARD installation all round holes to be filled.
- For ENHANCED installation, all round and triangular holes to be filled, (excluding triangular hole in the hanger's seat tab).

EWH Standard Installation Instructions – Applicable to I-Joist, Metal Web Joist & Solid Timber Headers

- Position EWH hanger onto the face of the supporting Joist, ensuring the seat tab is tight up against the underside of the supporting joist.
- Ensure hanger sides are vertical; fill all face round holes, starting from bottom upwards, with the specified fastener.
- **For top fix installations**, fold over the top flange, ensuring a tight fold line along the top edge of the supporting timber, and fill all top round holes with the specified fasteners (NOTE: Depending upon the joist depth, the fold line may be up to 6mm above the perforation lines).
- **For face fix installations**, snap off the top flange along the perforation line (NOTE: The top flange may be snapped off pre or post installation).
- Insert the incoming joist, ensuring it is tight against the back of the EWH (maximum allowable gap is 3mm between end of incoming joist and face of hanger) and fill all round holes in the side flanges.
- For instances where the supporting member is deeper than the hanger, bend the seat tab upwards so the hanger fits tight against the face of the supporting member.

EWH Enhanced Installation Instructions – Applicable to I-Joist, Metal Web Joist & Solid Timber Headers

- **Metal Web Headers Only:** Install an 18mm plywood gusset to the face of the metal web joist. The plywood gusset is to be at least 400mm long and full depth of the metal web joist. The plywood gusset is installed with 8 No ESCR8.0x80mm (or SWW8.0x80) screws. The screws are to be positioned in accordance to illustration below.



- **I-Joist Headers Only:** Install a backer block onto the front face of the I-Joist. The backer blocks size and installation requirements shall be in accordance to the relevant I-Joist manufacturer's specifications.
- Position EWH hanger onto the face of the supporting joist, ensuring the seat tab is tight up against the underside of the supporting joist's bottom chord.
- Ensure hanger sides are vertical and fill all face round holes then the triangular holes, starting from bottom upwards, with the specified fastener.
- **For top fix installations**, fold over the top flange, ensuring a tight fold line along the top edge of the supporting timber, and fill the round holes with the specified fasteners (NOTE: Depending upon joist depth, the fold line may be up to 6mm above the perforation lines).
- **For face fix installations**, snap off the top flange along the perforation line (NOTE: The top flange may be snapped off pre or post installation).
- Insert the incoming joist, ensuring it is tight against the back of the EWH (maximum allowable gap is 3mm between end of incoming joist and face of hanger) and fill all round holes in the side flanges.
- **For enhanced uplift installations**, if the incoming joist is an I-Joist then web stiffeners are required. (The web stiffener's size and installation requirements shall be in accordance to relevant I-Joist manufacturer's specification). Fill all round and triangular holes with the relevant fastener.

EWH Installation Instructions – SIP

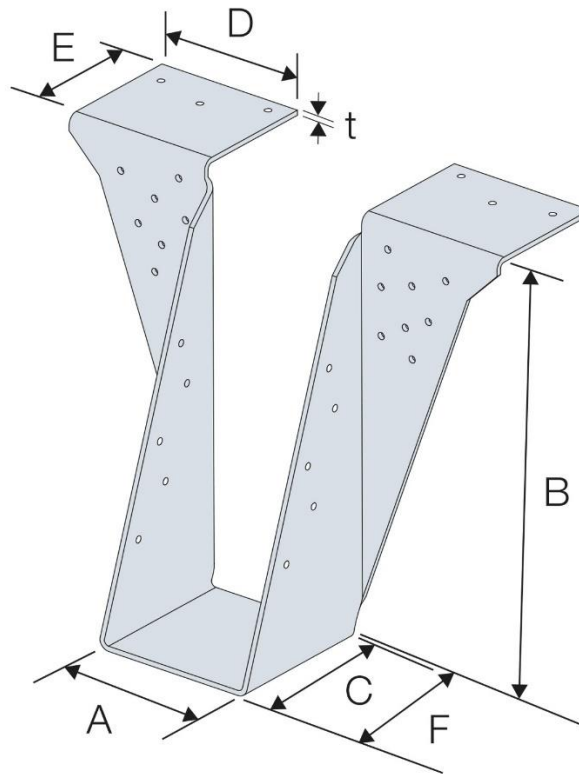
- It is recommended for SIP installation that the EWH is installed face fix only.
- Bend the seat tab upwards so the hanger fits tight against the face of the SIP.
- Position the EWH hanger onto the face of the SIP so that the top of the carried member will finish level with the top of the SIP.
- Install 4 No CSA 5.0x50mm screws through the upper 4 round holes on the face of the EWH.
- Tear off the hanger's top flange, along its perforation line.
- Sit the carried member into the hanger and install 4 No 3.75x30mm square twist nails (or CSA5.0x30mm screws) through the round holes into the side of the supported member.

D2 Connector type HB

Product Name	Material reference acc. to clause II-1	Alternative Names
HB	Steel ref 1 - Steel ref 2	-

Product dimensions

Item	Product dimensions [mm]								Header holes		Joist holes
	A		B		C	D	E	t	Top	Face	Ø4.3
	Min	Max	Min	Max	Min	Min			Ø4.3	Ø4.3	
HB	40	190	195	400	90	90	75	3	6	16	10



Product capacities

Item	Fasteners			Characteristic capacities [kN] - Timber C24							
	Header		Joist	R _{1,k}						R _{2,k}	
	Top	Face		3.75x30 ST	3.8x38 SR	3.75x75 SR	4.0x90 SR	CNA3.7x50	CNA4.0x50	3.75x30 ST	3.8x38 SR
HB	6	16	10	19.0	24.8	33.3	37.1	31.3	32.8	5.6	6.9

Notes:

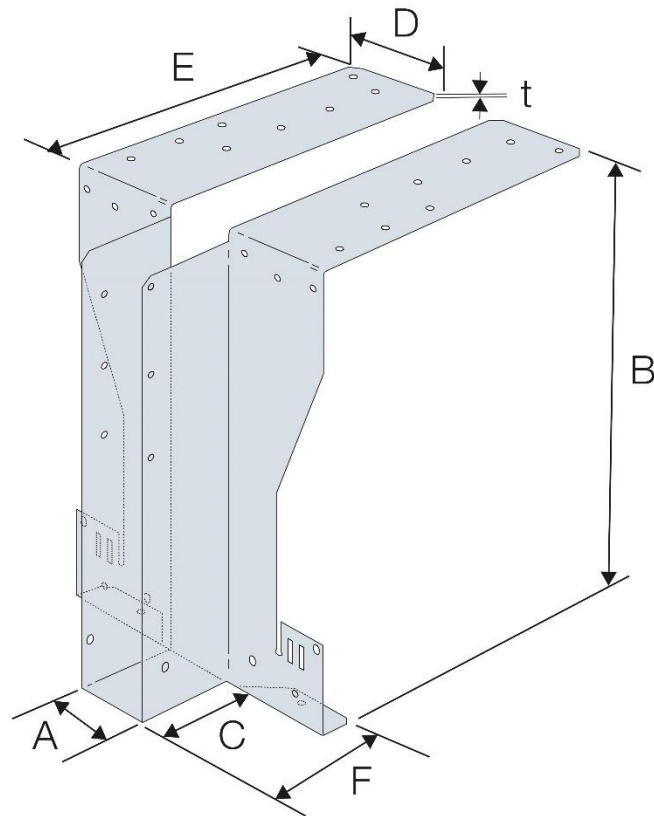
- Connectors can only be used on I-joist headers in conjunction with Type ST 3.75 x 30 and SR 3.8 x 38 nails.
- Web stiffeners are to be fitted in accordance with the I-Joist manufacturer's recommendations.
- When I-joists with solid timber flanges are used as headers, the capacity of the Connector is the same as the capacity when connected to a solid timber header of the same grade as the I-joist flanges.
- The values in the tables are Connector capacities and do not take account the joist (end grain member) capacity which shall be checked by the joist designer.

D3 Connector type HITB

Product Name	Material reference acc. to clause II-1	Alternative Names
HITB	Steel ref 1	-

Product dimensions

Item	Product dimensions [mm]									Header holes				Joist holes	
	A		B		C	D	E	F	t	Top	Bottom	Face		Ø6x4	Ø4
	Min	Max	Min	Max						Ø4.1	Ø4.1	Ø4.1	Ø6x4		
HITB	40	128	195	300	60	65	180	180	2	18	2	8	4	2	6



Product capacities – Standard installation

Item	Type	Fasteners								Characteristic capacities [kN]	
		Header						Joist		R _{1,k}	R _{2,k}
		Top	Type	Bottom	Type	Face	Type	Qty	Type		
HITB	< 35 mm LVL flange	8	3.75 x 30 ST	2	3.75 x 30 ST	12	3.75 x 30 ST	8	3.75 x 30 ST	15.6	11.4
	≥ 35 mm LVL flange	8	3.75 x 30 ST	2	3.75 x 30 ST	12	3.75 x 30 ST	8	3.75 x 30 ST	17.5	11.4
	≥ 45 mm C24 flange	8	3.75 x 30 ST	2	3.75 x 30 ST	12	3.75 x 30 ST	8	3.75 x 30 ST	19.1	11.1

Note:

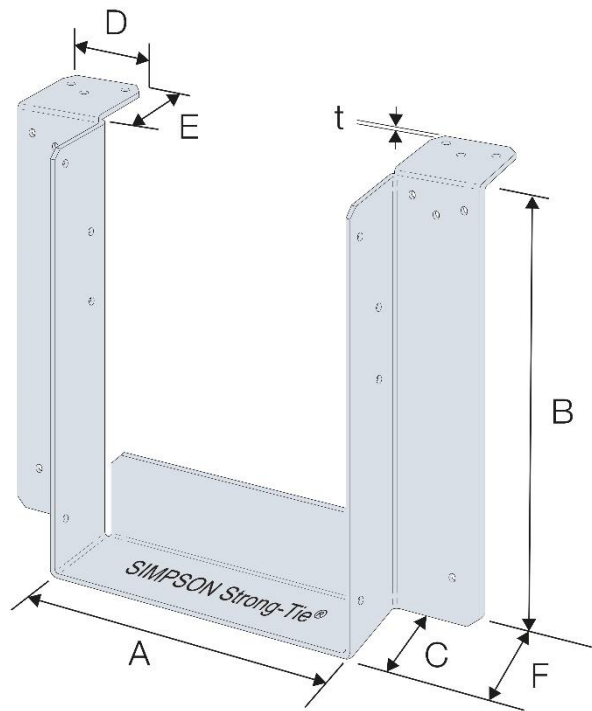
- Web stiffeners are to be fitted in accordance with the I-Joist manufacturer's recommendations.

D4 Connector type HIUB

Product Name	Material reference acc. to clause II-1	Alternative Names
HIUB	Steel ref 1	-

Product dimensions

Item	Product dimensions [mm]									Header holes		Joist holes	
	A		B		C	D	E	F	t	Top	Face	Ø4.1	Ø6x4
	Min	Max	Min	Max						Ø4.1	Ø4.1		
HIUB	40	300	195	421	63	64	64	66	2	6	10	6	2



Product capacities – Standard installation

Item	Fasteners						Characteristic capacities [kN]	
	Header				Joist		R _{1,k}	R _{2,k}
	Top	Type	Face	Type	Qty	Type		
HIUB	6	3.75x30 ST	10	3.75x30 ST	8	3.75x30 ST	19.2	7.0

Product capacities – Enhanced installation

Item	Fasteners						Characteristic capacities [kN]	
	Header				Joist		R _{1,k}	R _{2,k}
	Top	Type	Face	Type	Qty	Type		
HIUB	6	3.75x30 ST	10	3.75x30 ST	8	3.75x30 ST	23.4	7.0

Note:

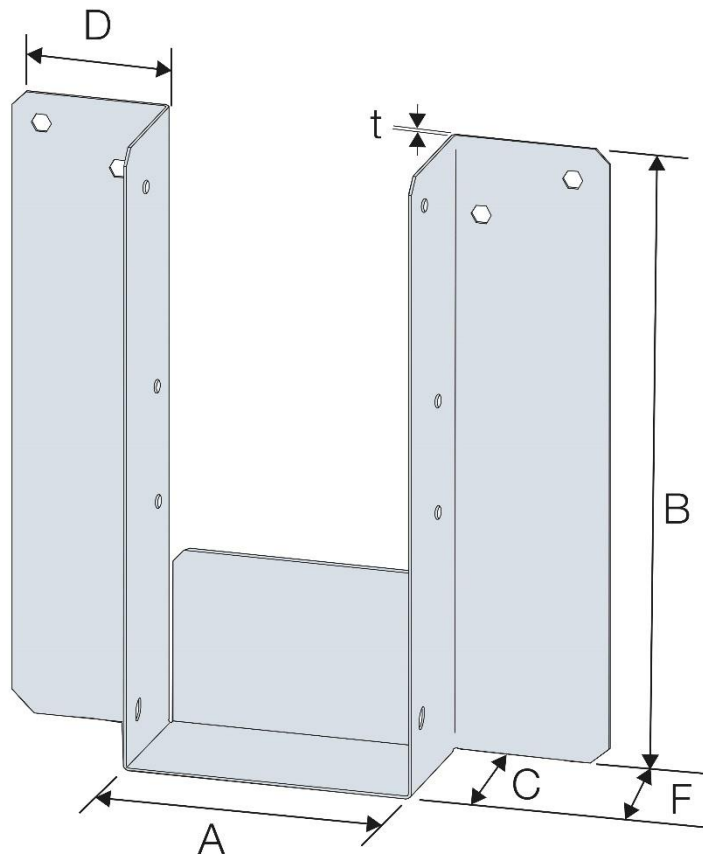
- For enhanced installation, a timber blocking piece is to be fixed between the top and bottom flanges of Metal Web Floor Trusses.
- Characteristic capacities based upon C27 / TR26 graded timbers.

D5 Connector type HIUQ

Product Name	Material reference acc. to clause II-1	Alternative Names
HIUQ	Steel ref 1	-

Product Dimensions

Item	Product dimensions [mm]								Header Holes	Joist holes	
	A		B		C	D	F	t	Ø6.2 Hex	Ø4.1	Ø6x4
	Min	Max	Min	Max							
HIUQ	40	300	190	421	63	64	66	2.0	4	6	2



Product capacities – Standard installation onto SIP's

Item	Fasteners				Characteristic capacities [kN]	
	Header		Joist		R _{1,k}	R _{2,k}
	Qty	Type	Qty	Type		
HIUQ	4	SSH6.0x60	8	3.75 x 30 ST	18.1	8.0

Note:

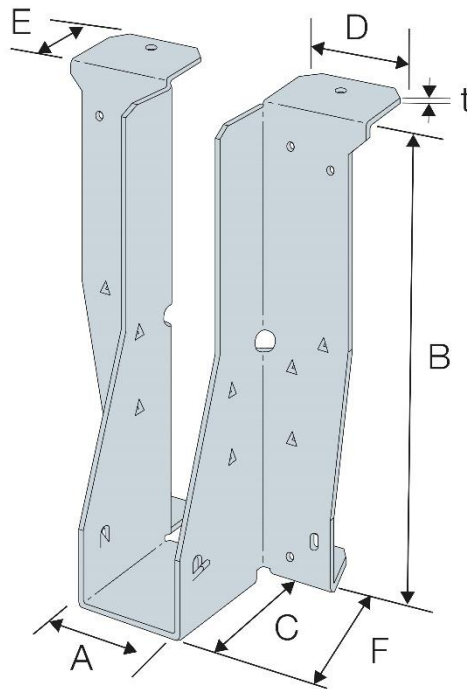
- Suitable for use on SIP panels with 11mm and 15mm OSB
- Top rail timber to be minimum C24 graded and deep.
- When used to support an I-Joist, web stiffeners are required. Web stiffeners specification and installation to be in accordance to I-Joist manufacturers recommendations

D6 Connector type ITB

Product Name	Material reference acc. to clause II-1	Alternative Names
ITB	Steel ref 1	-

Product dimensions

Item	Product dimensions [mm]								Header holes				Joist holes	
	A		B		C	D	E	t	Top & Bottom	Face			Ø6x4	Tri
	Min	Max	Min	Max					Ø4.1	Ø4.1	Ø6x4	Tri		
ITB	40	100	195	302	51	55	35	1.2	4	6	2	6	2	4



Product capacities – Standard installation

Item	Type	Fasteners						Characteristic capacities [kN]	
		Header			Joist			R _{1,k}	R _{2,k}
		Top & Bottom	Type	Face	Type	Qty	Type		
ITB	< 35 mm LVL flange	4	3,75x30 ST	8	3,75x30 ST	2	3,75x30 ST	10.8	1.1
	≥ 35 mm LVL flange	4	3,75x30 ST	8	3,75x30 ST	2	3,75x30 ST	9.2	1.2
	≥ 45 mm C24 flange	4	3,75x30 ST	8	3,75x30 ST	2	3,75x30 ST	6.7	1.1

Product capacities - Enhanced installation

Item	Type	Fasteners						Characteristic capacities [kN]	
		Header			Joist			R _{1,k}	R _{2,k}
		Top & Bottom	Type	Face	Type	Qty	Type		
ITB	< 35 mm LVL flange	4	3,75x30 ST	14	3,75x30 ST	6	3,75x30 ST	17.4	9.3
	≥ 35 mm LVL flange	4	3,75x30 ST	14	3,75x30 ST	6	3,75x30 ST	17.4	7.6
	≥ 45 mm C24 flange	4	3,75x30 ST	14	3,75x30 ST	6	3,75x30 ST	17.9	8.0

Note:

- Enhanced installation refers to I-joists headers with backer blocks.
- Web stiffeners are to be fitted in accordance with the I-Joist manufacturer's recommendations – for enhanced uplift installation only.

D7 Connector type ITBS

Product Name	Material reference acc. to clause II-1	Alternative Names
ITBS	Steel ref 1	-

Product dimensions

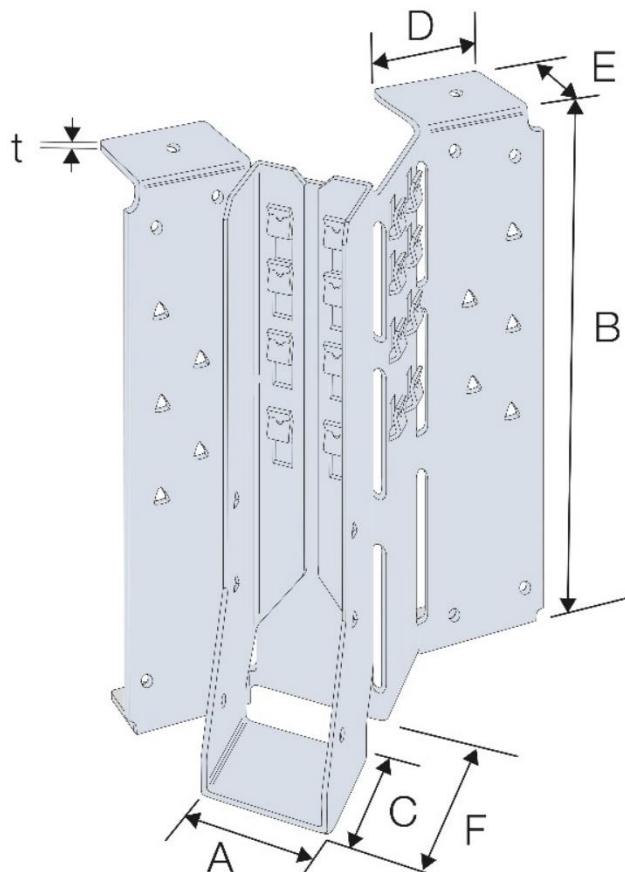
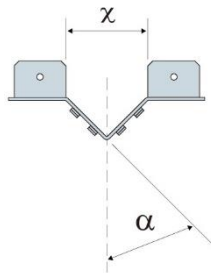
Item	Product dimensions [mm]									Header holes			Joist holes	
	A		B		C	D	E	F	t	Top & Bottom	Face		Ø6x4	Tri
	Min	Max	Min	Max						Ø4.1	Ø4.1	Tri		
ITBS	40	100	195	300	51	55	35	64	1.5	4	6	10	2	4

Note:

- Supplied at standard 45° skew, with site adjustable skew from 5° to 67.5°.

Skew Angle Guide Table

Skew Angle α [°]	Dimension x [mm]
5	206
15	200
22.5	190
30	180
37.5	166
45	149
52.5	130
60	109
67.5	86



Product capacities – Standard installation

Item	Type	Fasteners						Characteristic capacities [kN]	
		Header			Joist			R _{1,k}	R _{2,k}
		Top & Bottom	Type	Face	Type	Qty	Type		
ITBS	<35 mm LVL flange	4	3.75 x 30 ST	8	3.75 x 30 ST	1	3.75 x 30 ST	7.5	1.5
	≥35 mm LVL flange	4	3.75 x 30 ST	8	3.75 x 30 ST	1	3.75 x 30 ST	10.2	1.5
	≥45 mm C24 flange	4	3.75 x 30 ST	8	3.75 x 30 ST	1	3.75 x 30 ST	7.4	1.5

Product capacities - Enhanced installation

Item	Type	Fasteners						Characteristic capacities [kN]	
		Header			Joist			R _{1,k}	R _{2,k}
		Top & Bottom	Type	Face	Type	Qty	Type		
ITBS	<35 mm LVL flange	4	3.75 x 30 ST	18	3.75 x 30 ST	3	3.75 x 30 ST	13.5	1.5
	≥35 mm LVL flange	4	3.75 x 30 ST	18	3.75 x 30 ST	3	3.75 x 30 ST	15.0	1.5
	≥45 mm C24 flange	4	3.75 x 30 ST	18	3.75 x 30 ST	3	3.75 x 30 ST	12.8	1.5

Note:

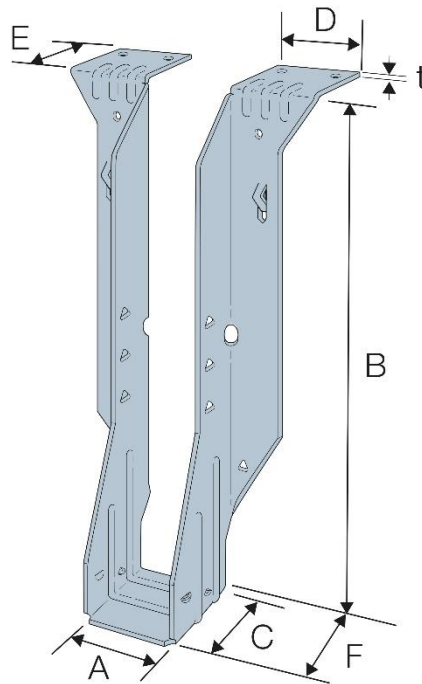
- Enhanced installation refers to I-joists headers with backer blocks.
- Web stiffeners are to be fitted in accordance with the I-Joist manufacturer's recommendations – for enhanced installation only.

D8 Connector type ITSE

Product Name	Material reference acc. to clause II-1	Alternative Names
ITSE	Steel ref. 1	-

Product dimensions

Item	Product dimensions [mm]									Header holes			Joist holes	
	A		B		C	D	E	F	t	Top	Face		Ø4x6	Tri
	Min	Max	Min	Max						Ø4	Ø4	Tri		
ITSE	40	100	140	600	51	51	34	58	1.2	4	2	2	2	6



Product capacities – standard installation

Item	Fasteners			Characteristic capacities [kN] – Timber C24						
	Header		Joist	R _{1,k}					R _{2,k}	
	Top	Face		3,75x30 ST	3,80x38 SR	CNA3,75x50	CNA4,00x40	CNA4,0x50	3,75x30 ST	3,80x38 SR
ITSE	4	2	2	6.6	8.8	12.8	8.7	10.2	1.8	2.3
	4	2	8	6.6	8.8	12.8	8.7	10.2	7.2	9.2

Product capacities – enhanced installation

Item	Fasteners			Characteristic capacities [kN] - Timber C24						
	Header		Joist	R _{1,k}					R _{2,k}	
	Top	Face		3,75x30 ST	3,80x38 SR	3,75x75 SR	CNA3,70x50	CNA4,0x50	3,75x30 ST	3,80x38 SR
ITSE	4	4 ⁽¹⁾	2	8.2	11.2	16.8	11.0	13.2	1.8	2.3
	4	4 ⁽¹⁾	8	8.2	11.2	16.8	11.0	13.2	7.2	9.2

⁽¹⁾ Additional face nails in triangular holes.

Notes on standard and enhanced installation:

- Web stiffeners are to be fitted in accordance with the I-Joist manufacturer's recommendations – for enhanced installation only.
- When I-joists with solid timber flanges are used as headers, the capacity of the Connector is the same as the capacity when connected to a solid timber header of the same grade as the I-joist flanges.
- Connectors can only be used on I-joist headers in conjunction with Type ST 3.75 x 30 and SR 3.8 x 38 nails.
- ITSE Connectors can be used without joist nails, but uplift loads cannot be applied.

D9 Connector type IUBS

Product Name	Material reference acc. to clause II-1	Alternative Names
IUBS	Steel ref 1	-

Product dimensions

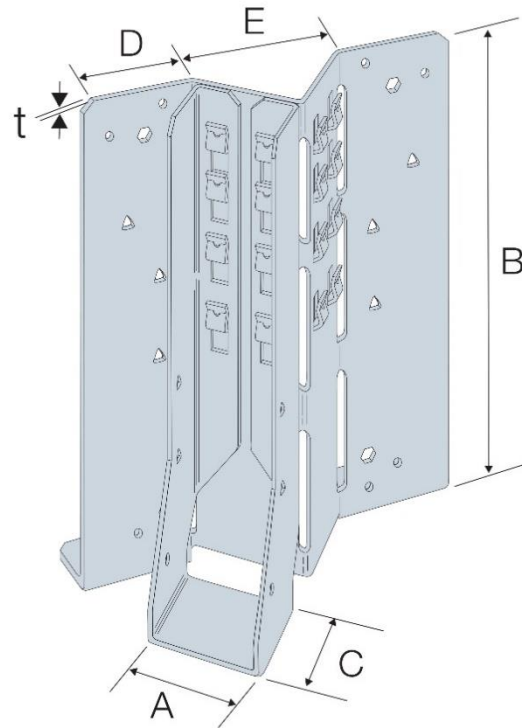
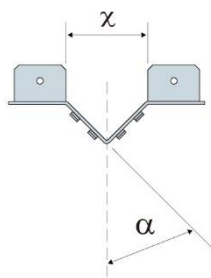
Item	Product dimensions [mm]							Header holes					Joist holes	
	A		B		C	D	t	Bottom	Face				Ø4	Tri
	Min	Max	Min	Max				Ø4.1	Ø4.1	Ø6x4	Ø6.2 Hex	Tri		
IUBS	75	100	195	299	64	56	1.5	2	4	2	4	6	2	4

Note:

- Supplied at standard 45° skew, with site adjustable skew from 5° to 67.5°.

Skew Angle Guide Table

Skew Angle α [°]	Dimension E (x) [mm]
5	206
15	200
22.5	190
30	180
37.5	166
45	149
52.5	130
60	109
67.5	86



Product capacities – Standard installation

Item	Fasteners						Characteristic capacities [kN]	
	Header				Joist		R _{1,k}	R _{2,k}
	Bottom	Type	Face	Type	Qty	Type		
IUBS	2	3.75x30 ST	8	3.75x30 ST	2	3.75x30 ST	12.7	1.3

Product capacities – Enhanced installation

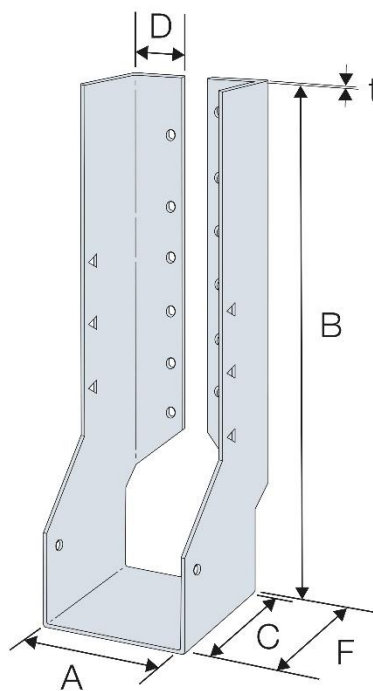
Item	Fasteners						Characteristic capacities [kN]	
	Header				Joist		R _{1,k}	R _{2,k}
	Bottom	Type	Face	Type	Qty	Type		
IUBS	-	-	4	SDS	2	3.75x30 ST	17.2	1.3

D10 Connector type IUC

Product Name	Material reference acc. to clause II-1	Alternative Names
IUC	Steel ref 1	-

Product dimensions

Item	Product dimensions [mm]								Header holes		Joist holes	
	A		B		C	D	F	t	Ø4		Ø6x4	Tri
	Min	Max	Min	Max					Min	Max		
IUC	40	100	140	300	51	19	57	1.2	6	14	2	6



Product capacities – Standard installation

Item	Size range [mm]		Fasteners				Characteristic capacities [kN]				
	A	B	Header		Joist		C16 / I-Joist		C24		LVL
			Qty	Type	Qty	Type	R _{1,k}	R _{2,k}	R _{1,k}	R _{2,k}	R _{1,k}
IUC	40-91	142	6	3.75 x 30 ST	2	3.75 x 30 ST	3.8	1.8	4.8	2.0	8.1
		192	10	3.75 x 30 ST	2	3.75 x 30 ST	7.5	1.8	9.5	2.0	13.5
		217	12	3.75 x 30 ST	2	3.75 x 30 ST	10.0	1.8	12.0	2.0	16.2
		280	14	3.75 x 30 ST	2	3.75 x 30 ST	12.6	1.8	14.0	2.0	-
IUC	92-100	142	6	3.75 x 30 ST	2	3.75 x 30 ST	3.5	1.8	4.4	2.0	8.1
		192	10	3.75 x 30 ST	2	3.75 x 30 ST	6.9	1.8	8.8	2.0	13.5
		217	12	3.75 x 30 ST	2	3.75 x 30 ST	9.2	1.8	11.0	2.0	16.2
		280	14	3.75 x 30 ST	2	3.75 x 30 ST	11.6	1.8	12.9	2.0	-

Product capacities – Enhanced installation

Item	Size range [mm]		Fasteners				Characteristic capacities [kN]				
	A	B	Header		Joist		C16 / I-Joist		C24		LVL
			Qty	Type	Qty	Type	R _{1,k}	R _{2,k}	R _{1,k}	R _{2,k}	R _{1,k}
IUC	40-91	142	6	3.75 x 75 SS	2	3.75 x 30 ST	7.9	1.8	10.9	2.0	10.7
		192	10	3.75 x 75 SS	2	3.75 x 30 ST	13.1	1.8	17.8	2.0	17.8
		217	12	3.75 x 75 SS	2	3.75 x 30 ST	15.7	1.8	20.4	2.0	21.4

Notes:

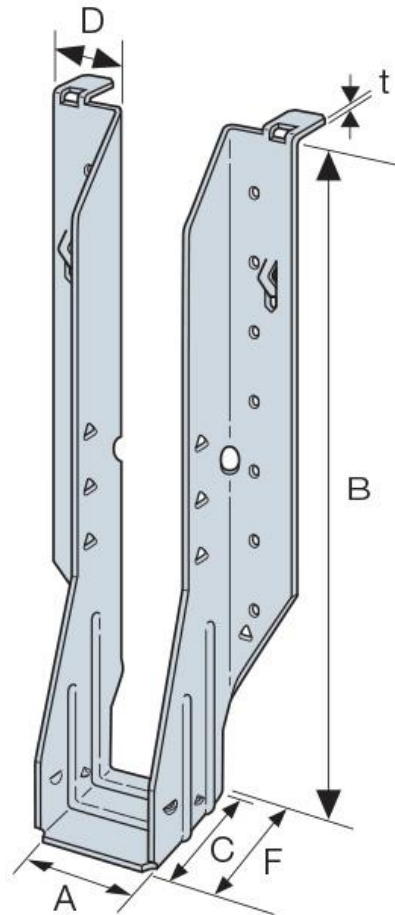
- Web stiffeners are to be fitted in accordance with the I-Joist manufacturer's recommendations – for enhanced installation only.
- When I-joists with solid timber flanges are used as headers. The capacity of the Connector is the same as the capacity when connected to a solid timber header of the same grade as the I-joist flanges.
- Connectors can only be used on I-joist headers in conjunction with Type ST 3.75 x 30 nails
- The values in the tables are Connector capacities and do not take account of the joist (end grain member) capacity which shall be checked by the joist designer.

D11 Connector type IUSE

Product Name	Material reference acc. to clause II-1	Alternative Names
IUSE	Steel ref 1 - Steel ref 3	-

Product dimensions

Item	Product dimensions [mm]									Header holes		Joist holes		
	A		B		C	D	E	F	t	Face		Ø4		Ø4x6
	Min	Max	Min	Max						Ø4.3				
	Min	Max	Min	Max	Min	Max	Min	Max						
IUSE	41	100	194	449	51	29.5	15	59	1.2	6	22	2	8	2



Product capacities

Hanger Size [mm]			Item	Lever arm a [mm]	Ecc e [mm]	No of Header nail [n _h]	No of Joist nail [n _j]	Side Flange S [mm]	Steel Thickness t [mm]	Steel Strength f _u [MPa]	Width factor k _w
A	B	C									
40 to 91	144	51	IUSE144/(A)	110	31.5	6	2 or 8	49	1.2	330	1
40 to 91	179	51	IUSE179/(A)	120	31.5	8	2 or 8	49	1.2	330	1
40 to 91	194	51	IUSE194/(A)	130	31.5	10	2 or 8	49	1.2	330	1
40 to 91	199	51	IUSE199/(A)	130	31.5	10	2 or 8	49	1.2	330	1
40 to 91	219	51	IUSE219/(A)	143	31.5	12	2 or 8	49	1.2	330	1
40 to 91	224	51	IUSE224/(A)	143	31.5	12	2 or 8	49	1.2	330	1
40 to 91	234	51	IUSE234/(A)	143	31.5	12	2 or 8	49	1.2	330	1
40 to 91	237	51	IUSE237/(A)	143	31.5	12	2 or 8	49	1.2	330	1
40 to 91	239	51	IUSE239/(A)	156	31.5	14	2 or 8	49	1.2	330	1
40 to 91	244	51	IUSE244/(A)	156	31.5	14	2 or 8	49	1.2	330	1
40 to 91	249	51	IUSE249/(A)	156	31.5	14	2 or 8	49	1.2	330	1
40 to 91	254	51	IUSE254/(A)	156	31.5	14	2 or 8	49	1.2	330	1
40 to 91	269	51	IUSE269/(A)	156	31.5	14	2 or 8	49	1.2	330	1
40 to 91	284	51	IUSE284/(A)	170	31.5	16	2 or 8	49	1.2	330	1
40 to 91	289	51	IUSE289/(A)	170	31.5	16	2 or 8	49	1.2	330	1
40 to 91	294	51	IUSE294/(A)	170	31.5	16	2 or 8	49	1.2	330	1
40 to 91	299	51	IUSE299/(A)	170	31.5	16	2 or 8	49	1.2	330	1
40 to 91	319	51	IUSE319/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	324	51	IUSE324/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	329	51	IUSE329/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	349	51	IUSE349/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	355	51	IUSE355/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	359	51	IUSE359/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	379	51	IUSE379/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	389	51	IUSE389/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	399	51	IUSE399/(A)	186	31.5	18	2 or 8	49	1.2	330	1
40 to 91	405	51	IUSE405/(A)	186	31.5	18	2 or 8	49	1.2	330	1
92 to 100	144	51	IUSE144/(A)	110	31.5	6	2 or 8	49	1.2	330	0.7
92 to 100	179	51	IUSE179/(A)	120	31.5	8	2 or 8	49	1.2	330	0.7
92 to 100	194	51	IUSE194/(A)	130	31.5	10	2 or 8	49	1.2	330	0.7

Hanger Size [mm]			Item	Lever arm a [mm]	Ecc e [mm]	No of Header nail [n _h]	No of Joist nail [n _j]	Side Flange S [mm]	Steel Thickness t [mm]	Steel Strength f _u [MPa]	Width factor k _w
A	B	C									
92 to 100	199	51	IUSE199/(A)	130	31.5	10	2 or 8	49	1.2	330	0.7
92 to 100	219	51	IUSE219/(A)	143	31.5	12	2 or 8	49	1.2	330	0.7
92 to 100	224	51	IUSE224/(A)	143	31.5	12	2 or 8	49	1.2	330	0.7
92 to 100	234	51	IUSE234/(A)	143	31.5	12	2 or 8	49	1.2	330	0.7
92 to 100	237	51	IUSE237/(A)	143	31.5	12	2 or 8	49	1.2	330	0.7
92 to 100	239	51	IUSE239/(A)	156	31.5	14	2 or 8	49	1.2	330	0.7
92 to 100	244	51	IUSE244/(A)	156	31.5	14	2 or 8	49	1.2	330	0.7
92 to 100	249	51	IUSE249/(A)	156	31.5	14	2 or 8	49	1.2	330	0.7
92 to 100	254	51	IUSE254/(A)	156	31.5	14	2 or 8	49	1.2	330	0.7
92 to 100	269	51	IUSE269/(A)	156	31.5	14	2 or 8	49	1.2	330	0.7
92 to 100	284	51	IUSE284/(A)	170	31.5	16	2 or 8	49	1.2	330	0.7
92 to 100	289	51	IUSE289/(A)	170	31.5	16	2 or 8	49	1.2	330	0.7
92 to 100	294	51	IUSE294/(A)	170	31.5	16	2 or 8	49	1.2	330	0.7
92 to 100	299	51	IUSE299/(A)	170	31.5	16	2 or 8	49	1.2	330	0.7
92 to 100	319	51	IUSE319/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	324	51	IUSE324/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	329	51	IUSE329/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	349	51	IUSE349/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	355	51	IUSE355/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	359	51	IUSE359/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	379	51	IUSE379/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	389	51	IUSE389/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	399	51	IUSE399/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7
92 to 100	405	51	IUSE405/(A)	186	31.5	18	2 or 8	49	1.2	330	0.7

Notes:

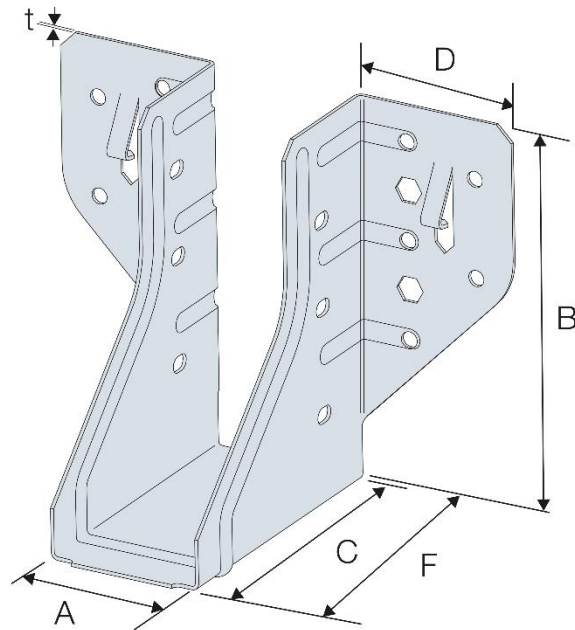
- Web stiffeners are to be fitted in accordance with the I-Joist manufacturer's recommendations – for enhanced installation only.
- For nail capacities refer to [Annex C3](#).

D12 Connector type THM

Product Name	Material reference acc. to clause II-1	Alternative Names
THM	Steel ref 1	-

Product dimensions

Item	Product dimensions [mm]								Header holes		Joist holes
	A		B		C	D	F	t	Ø4.1	Hex Ø6.2	Ø6x4
	Min	Max	Min	Max							
THM	38	50	90	96	75	42	77	0.9	10	4	6



Product capacities – Standard installation

Item	Fasteners				Characteristic capacities [kN]
	Header		Joist		
	Qty	Type	Qty	Type	$R_{1,k}$
THM	10	3.75x30 ST	6	3.75x30 ST	7.3

Product capacities – Double Shear installation

Item	Fasteners				Characteristic capacities [kN]
	Header		Joist		
	Qty	Type	Qty	Type	$R_{1,k}$
THM	10	3.75x30 ST	6	3.75x75 SS	9.8

Product capacities – Enhanced installation

Item	Fasteners				Characteristic capacities [kN]
	Header		Joist		
	Qty	Type	Qty	Type	$R_{1,k}$
THM	4	SSH	6	3.75x30 ST	7.4

Notes:

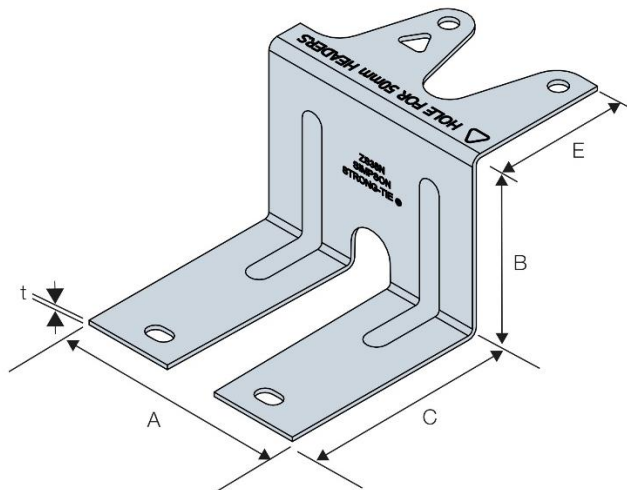
- When I-joists with solid timber flanges are used as headers, the capacity of the Connector is the same as the capacity when connected to a solid timber header of the same grade as the I-joist flanges.
- Connectors can only be used on I-joist headers in conjunction with Type ST 3.75 x 30 nails.
- For double shear connection installation, 3.75 x 75mm smooth shank nails are to be used.
- The values in the tables are Connector capacities and do not take account of the joist (end grain member) capacity which shall be checked by the joist designer.
- Characteristic capacities based upon C24 graded timber

D13 Connector type ZS

Product Name	Material reference acc. to clause II-1	Alternative Names
ZS	Steel ref 1	-

Product Dimensions

Item	Product dimensions [mm]						Header holes		Joist holes	
	A	B		C		E	t	Top		Ø6x4
		Min	Max	Min	Max			Ø4	Tri	
ZS	52	30	47	37	54	31	0.9	2	1	2



Product capacities – Standard installation

Item	Fasteners				Characteristic capacities [kN]	
	Header		Joist		Timber C24 - R _{1,k}	I-Joists - R _{1,k}
	Qty	Type	Qty	Type		
ZS	2	3.75 x 30 ST	2	3.75 x 30 ST	3.6	3.8

Notes:

- Loads given are per noggin – not per Z – Clip.
- When I-joists with solid timber flanges are used as headers, the capacity of the Connector is the same as the capacity when connected to a solid timber header of the same grade as the I-joist flanges.
- Connectors can only be used on I-joist headers in conjunction with Type ST 3.75 x 30 nails.
- The values in the tables are Connector capacities and do not take account of the joist (end grain member) capacity which shall be checked by the joist designer.