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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-13/0630 of 2024/03/14

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:	AV Purlin ties right/left 170, 210 and 250 and universal 170 and 210
Product family to which the above construction product belongs:	Three-dimensional nailing plate (timber-to-timber purlin tie)
Manufacturer:	August Vormann GmbH & Co. KG Postfach 1552 Heilenbecker Strasse 191 - 205 DE-58256 Ennepetal Tel. +49 02333 / 978 - 0 Internet www.vormann.com
Manufacturing plant:	August Vormann GmbH & Co. KG Berliner Strasse 50 DE-04910 Elsterwerda
This European Technical Assessment contains:	12 pages including 2 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, Three Dimensional Nailing Plates
This version replaces:	The ETA with the same number issued on 2018-08-07

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

AV Purlin ties right/left 170, 210 and 250 and universal 170 and 210 are one-piece non-welded, face-fixed purlin ties to be used in timber to timber connections. They are connected to the timber elements by a range of profiled nails.

The purlin ties are made from pre-galvanized steel S 250 GD + Z 275 according to EN 10346:2009 or from stainless steel according to EN 10088-2:2014 with $R_{p0,2} \geq 240$ N/mm² and Rm ≥ 500 N/mm². Dimensions, hole positions and typical installations are shown in Annex A. Purlin ties are made from steel with tolerances according to EN 10143.

2 Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

The purlin ties are intended for use in making connections in load bearing timber structures, as a connection between a beam and a purlin, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Work Requirements 1 and 4 of the Regulation 305/2011 (EU) shall be fulfilled.

The connection always contains two purlin ties (see Annex A).

The static and kinematic behaviour of the timber members or the supports shall be as described in Annex B.

The wood members may be of solid timber, glued laminated timber and similar glued members, or wood-based structural members with a characteristic density from 290 kg/m^3 to 420 kg/m^3. This requirement to the material of the wood members can be fulfilled by using the following materials:

- Structural solid timber according to EN 14081,
- Glulam according to EN 14080,
- LVL according to EN 14374,
- Parallam PSL,
- Intrallam LSL,
- Glued solid timber according to EN 14080,
- Cross laminated timber according to EN 16351 or ETA,
- Plywood according to EN 636

Annex B states the load-carrying capacities of the purlin tie connections for a characteristic density of 350 kg/m^3. For timber or wood based material with a different characteristic density than 350 kg/m^3 the load-carrying capacities of the nailed connection shall be modified by the k_{dens} factor:

$$k_{dens} = \sqrt{\frac{\rho_k}{350}}$$

Where ρ_k is he characteristic density of the timber in kg/m^3.

The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code. The wood members shall have a thickness which is larger than the penetration depth of the nails into the members.

The purlin ties made of pre-galvanized steel are primarily for use in timber structures subject to the dry, internal conditions defined by service class 1 and 2 of Eurocode 5 and for connections subject to static or quasi-static loading.

The purlin ties can also be used in outdoor timber structures, service class 3, when a corrosion protection in accordance with Euro Code 5 is applied, or when stainless steel is employed.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the purlin ties of 50 years, provided they are subject to appropriate use and maintenance.

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 choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Joint Strength - Characteristic load-carrying capacity	See Annex B
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 purlin ties are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
Resistance to fire	No performance assessed
3.3 General aspects related to the performance of the product	The Purlin Ties have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service class 1 and 2

*) See additional information in section 3.4 – 3.7.

3.4 Safety principles and partial factors

The characteristic load-carrying capacities are based on the characteristic values of the nail connections, the timber components and the steel plates. To obtain design values the capacities must be divided by different partial factors for the material properties, the nail connection and the timber components 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 can be assessed by reducing the characteristic values of the load-carrying capacity with different partial factors.

Thus, the characteristic values of the load–carrying capacity are assessed also for timber failure $F_{Rk,N}$ (reaching the embedment strength of nails subjected to shear), $F_{90,Rk}$ (reaching the transverse tensile strength of the timber components) as well as for steel plate failure $F_{Rk,S}$. The design value of the load–carrying capacity is the smaller value of both load–carrying capacities.

$$F_{Rd} = \min\left\{\frac{k_{mod} \cdot F_{Rk,N}}{\gamma_{M,H}}; \frac{F_{Rk,S}}{\gamma_{M,S}}; \frac{k_{mod} \cdot F_{90,Rk}}{\gamma_{M,H}}\right\}$$

Therefore, for timber failure and the nails connection the load duration class and the service class are included. The different partial factors γ_M for steel or timber, respectively, are also correctly considered.

3.5 Mechanical resistance and stability

See annex B for the characteristic load-carrying capacity in the direction F_1.
The characteristic capacities of the purlin ties are assessed by calculation assisted by testing as described in EAD 130186-00-0603 clause 2.2.1. 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 on page 9 in Annex A

No performance has been assessed 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.

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

3.10 Related aspects of serviceability

3.10.1 Corrosion protection in service class 1 and 2.
In accordance with EAD 130186-00-0603 the purlin ties are made from pre-galvanized steel S 250 GD / Z 275 according to EN 10346:2009 with $R_e \geq 250$ N/mm², $R_m \geq 330$ N/mm² or from stainless steel according to EN 10088-2:2014 with $R_{p0,2} \geq 240$ N/mm² and $Rm \geq 500$ N/mm².

3.10.2 Corrosion protection in service class 3
In accordance with EAD 130186-00-0603 the purlin ties are made from stainless steel according to EN 10088-2:2014 with $R_{p0,2} \geq 240$ N/mm² and $Rm \geq 500$ N/mm².

3.11 Methods of verification

The characteristic values of the Purlin Ties are based on the EOTA Guideline EAD 130186-00-0603.

3.12 General aspects related to the fitness for use of the product

The European Technical Assessment is issued for the product based on agreed data/information, deposited with ETA-Danmark, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to ETA-Danmark before the changes are introduced. ETA-Danmark will decide if such changes affect the ETA and consequently the validity of the CE marking based on the ETA and if so whether further assessment or alterations to the ETA, shall be necessary.

AV Purlin Ties 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 purlin tie connection is assessed for its intended use provided:

- The structural members to which the purlin ties are fixed shall be:
  - Restrained against rotation.
  - Solid timber according to EN 338 or better, see section 3 of this evaluation report
  - Free from wane under the purlin tie.

- The tensile perpendicular to the grain capacity of the timber member to be used in conjunction with the purlin tie is to be checked by the designer of the structure to ensure it is not less than the purlin tie capacity and, if necessary, the purlin tie

capacity reduced accordingly.

- The gap between the timber members does not exceed 3 mm.

- There are no specific requirements relating to preparation of the timber members. There are no specific requirements relating to preparation of the timber members.

4 Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

4.1 AVCP system

According to the decision 97/808/EC of the European Commission, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 4.

5 Technical details necessary for the implementation of the AVCP system, as provided for 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 2024-03-14 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A
Product details

Product details definitions

Table A.1 Materials specification

Purlin Ties Type	Thickness (mm)	Steel specification	Coating specification
right/left (170-250)	2,0	S 250 GD + Z 275	Z 275
right/left (170-210)	2,0	Stainless steel with $R_{p0,2} \geq 240$ N/mm² and $R_m \geq 500$ N/mm².	Stainless steel according to EN 10088-2:2014
universal (170-210)	2,0	S 250 GD + Z 275	Z 275

Table A.2 Dimensions

Purlin Ties Type	Length (mm)		Width (mm)	
	min	**max**	**min**	**max**
right/left 170	169	172	33,7	34,3
right/left 210	209	212	33,7	34,3
right/left 250	249	252	33,7	34,3
universal 170	169	172	35,7	36,3
universal 210	209	212	35,7	36,3

Table A.3 Fastener specification

Nail type	Nail size (mm)		Finish
According to EN 14592 or an ETA	Diameter	Length	
Threaded nail	4,0	40	Electroplated zinc or stainless steel
The shape of the nail directly under the head shall be in the form of a truncated cone with a diameter under the nail head which exceeds the hole diameter.			

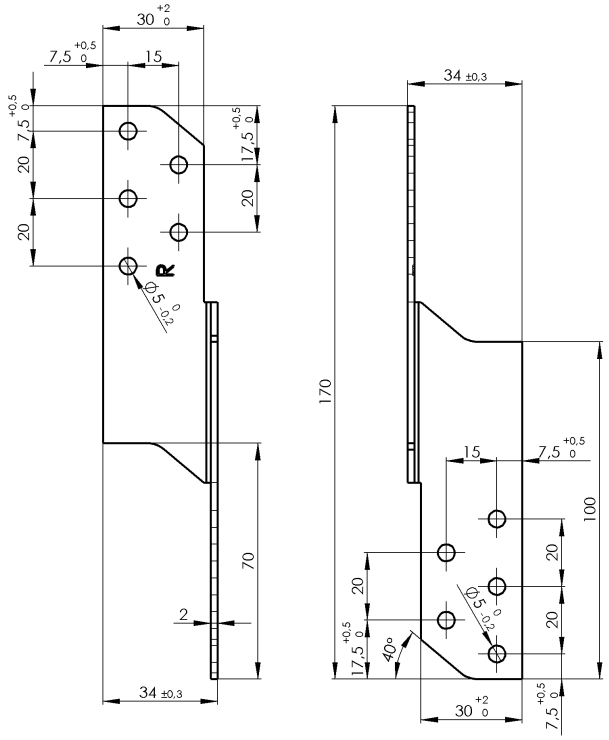

Figure A.1 Dimensions of Purlin Ties
right 170

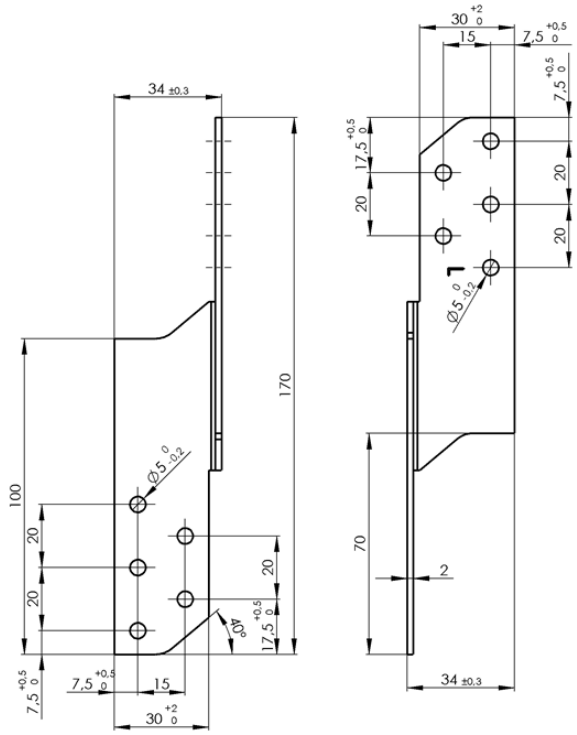

Figure A.2 Dimensions of Purlin Ties
left 170

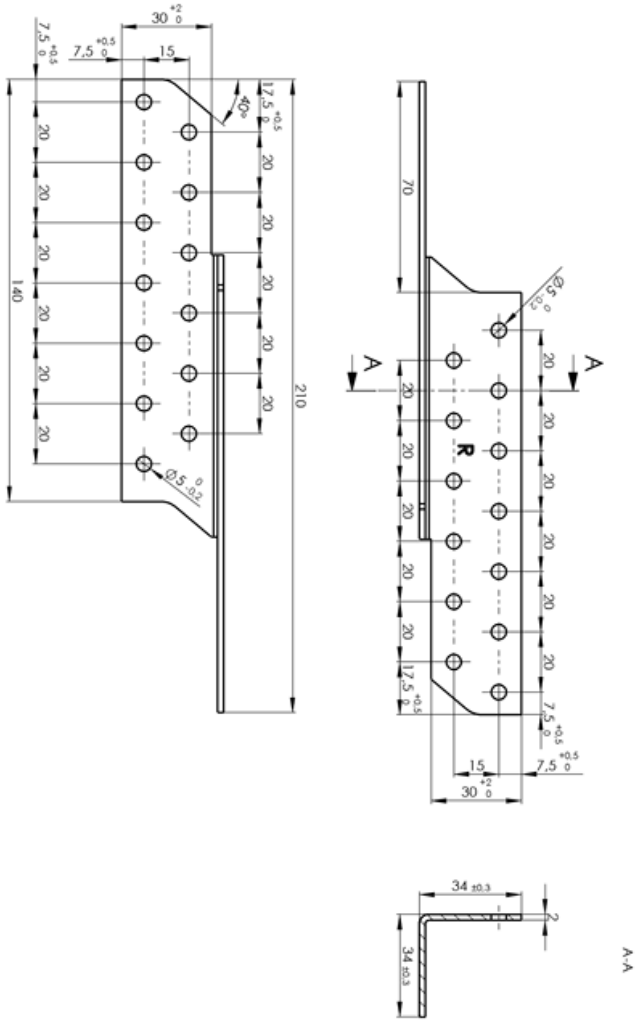

Figure A.3 Dimensions of Purlin Ties
right 210

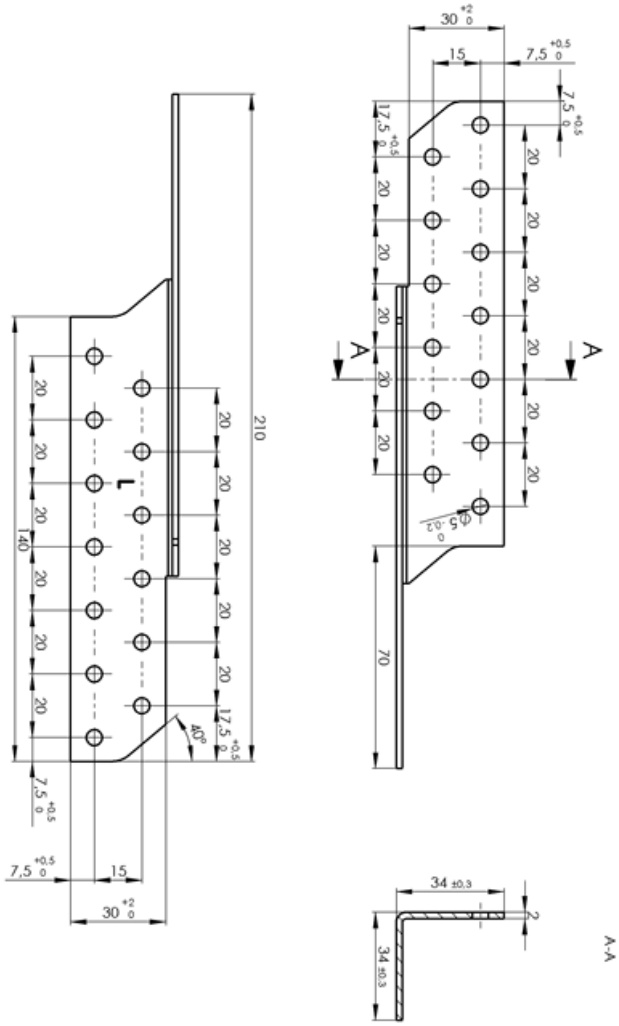

Figure A.4 Dimensions of Purlin Ties
left 210

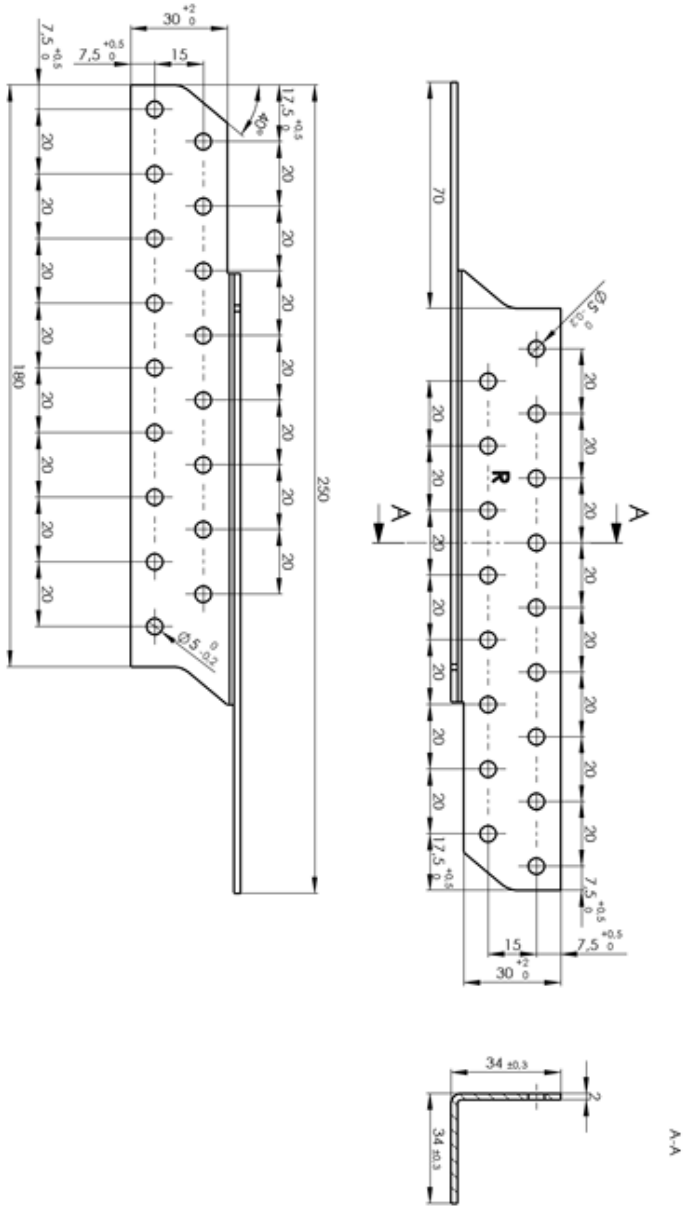

Figure A.5 Dimensions of Purlin Ties
right 250

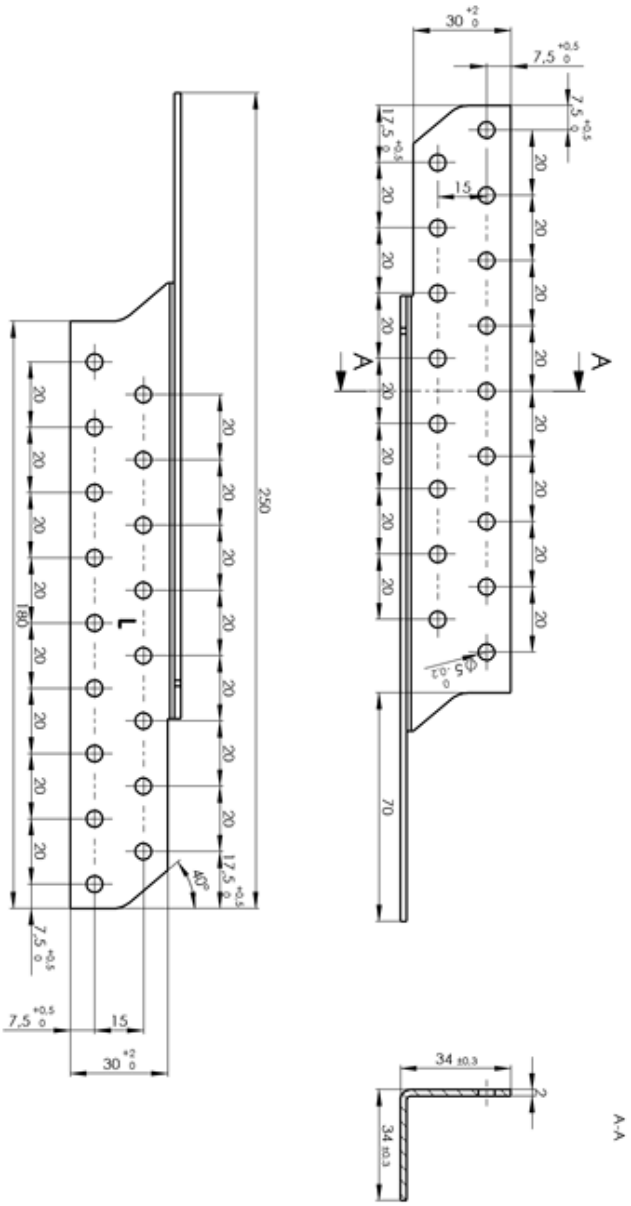

Figure A.6 Dimensions of Purlin Ties
left 250

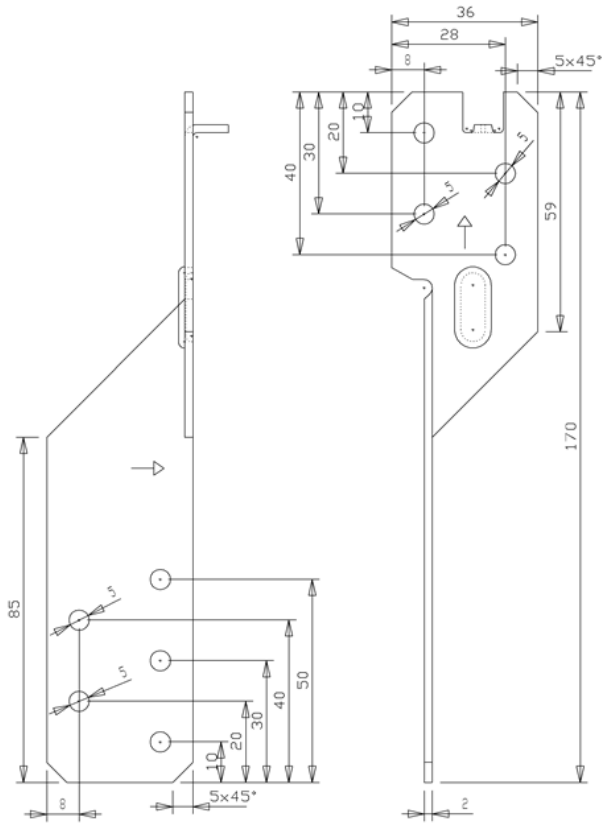

Figure A.7 Dimensions of Purlin Ties universal 170

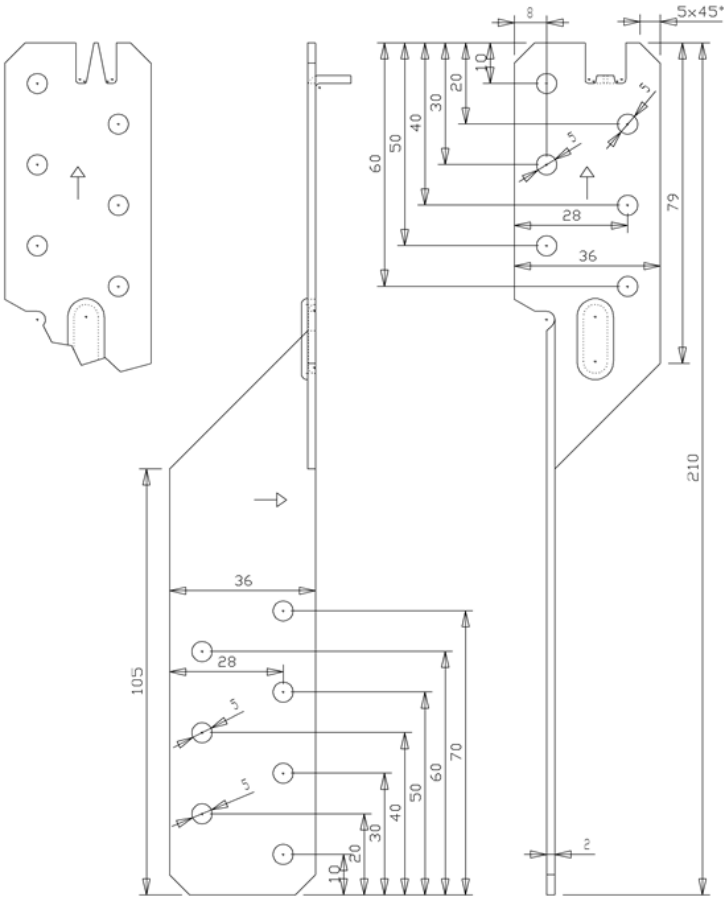

Figure A.8 Dimensions of Purlin Ties universal 210

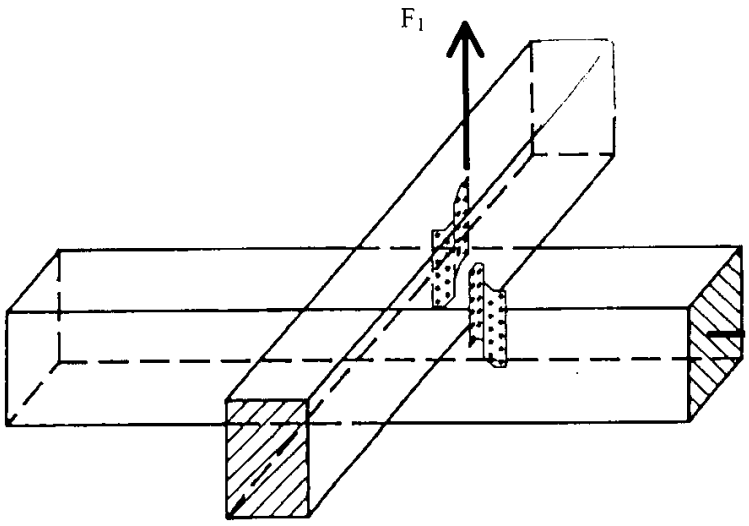

Figure A.9 Typical installation

Annex B
Characteristic load-carrying capacities

Support conditions
The distance between the timber elements in the area of the connection must not exceed 3 mm. The timber members are prevented from rotation.

Fastener specification
The holes have to be nailed as given in Annex A, beginning at the end of the purlin tie.

Wane
Wane is not allowed, the timber has to be sharp-edged in the area of the purlin ties.

Characteristic load-carrying capacities 2 purlin ties

Table B.1: Characteristic load-carrying capacities Load F_1 – 2 Purlin Ties / connection (the values are valid for threaded nails 4,0 x 40 mm with $F_{ax,Rk}$ = 686 N and $M_{y,Rk}$ = 6617 Nmm)

Purlin Ties	Number of nails per Purlin Tie	Nailed connection $F_{Rk,N}$	Steel $F_{Rk,S}$	Transverse tensile failure
right/left 170 ÷ 250 (zinc coated steel plate & nails)	2 x 2	2,02 kN	7,64 kN	Design according to equation (B.1)
	2 x 3	3,23 kN	7,64 kN	
	2 x 4	5,08 kN	7,64 kN	
	2 x 5	8,09 kN	7,64 kN	
	2 x 6	9,29 kN	7,64 kN	
	2 x 7	13,2 kN	7,64 kN	
	2 x 8	14,5 kN	7,64 kN	
	2 x 9	18,9 kN	7,64 kN	
right/left 170 ÷ 250 (stainless steel plate & nails)	2 x 2	2,00 kN	6,72 kN	
	2 x 3	3,19 kN	6,72 kN	
	2 x 4	5,02 kN	6,72 kN	
	2 x 5	7,99 kN	6,72 kN	
	2 x 6	9,18 kN	6,72 kN	
	2 x 7	13,1 kN	6,72 kN	
	2 x 8	14,3 kN	6,72 kN	
	2 x 9	18,7 kN	6,72 kN	
universal 170	4 + 5	8,15 kN	9,70 kN	
universal 210	4 + 6	8,15 kN	9,70 kN	
	6 + 7	13,8 kN	9,70 kN	

Splitting
For a lifting force F_1 splitting has to be proved, when necessary, for both timber elements. The capacity of a connection with two purlin ties on both sides of the timber element is calculated according to the general splitting design for connections with mechanical fasteners in EN 1995:2004.

$$F_{90,Rk} = 14 \cdot b \sqrt{\frac{h_e}{\left(1 - \frac{h_e}{h}\right)}} \qquad \text{(B.1)}$$

Where:

$F_{90,Rk}$ the characteristic splitting capacity in N
b the member thickness, in mm
h_e is the loaded edge distance to the centre of the most distant fastener in mm
h the timber member height in mm

The design value of the force component perpendicular to the structural member's axis has to be lower than the design capacity $F_{90,Rd}$.