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## European Technical Assessment

**ETA 24/0009  
of 24/03/2024**

General part

**Technical Assessment Body issuing the ETA:**

**Technical and Test Institution for  
Construction Prague**

**Trade name of the construction product**

**ADVECO Hold-downs, types:**

Hold-downs, types:

ADV SQHT 340, ADV SQHT 440,  
ADV SQHT 540, ADV SQHT 620,  
ADV SQHT 765,  
ADV SQHT 7651W, ADV SQHT 7652W

Washer-plates, types:

ADV RPSQHT 10,  
ADV RPSQHT 20

**Product family to which the construction  
product belongs**

Three-dimensional nailing plates

**Manufacturer**

**ADVECO s.r.l.**

Via Monte Guglielmo, 61  
I-25060 Cogozzo di Villa Carcina (Bs)  
The Republic of Italy

**Manufacturing plant**

Via Monte Guglielmo, 61  
I-25060 Cogozzo di Villa Carcina (Bs)  
The Republic of Italy

**This Evaluation Report contains**

25 pages incl. Annexes A and B which form  
an integral part of this assessment.

Annex C contains the Control Plan which is  
not included here.

**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 (ed. July 2018)

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Product details and specifications

**Annex B**  
Load-bearing capacities of ADVECO hold-downs with and without washer plates

## 1 Introduction

The ADVECO Hold-downs are intended for timber-to-concrete or timber-to-steel posts connections in building construction.

The ADVECO hold-downs are manufactured in various product types, i.e. ADV SQHT 340, ADV SQHT 440, ADV SQHT 540, ADV SQHT 540.22, ADV SQHT 620, ADV SQHT 620.26 and ADV SQHT 765, ADV SQHT 7651W and ADV SQHT 7652W with basic dimensions 340x60x62x3mm, 440x60x62x3mm, 540x60x62x3mm, 620x80x82x3mm and 765x140x82x3mm. They are face-fixed with nailing and bolting, three-piece welded, zinc coated steel angle brackets. They may be completed with massive rectangular washer plates ADV RPSQHT 10 of dimensions 50x60x10mm with hole diameter 17mm or 22mm, ADV RPSQHT 20 of dimensions 70x80x20mm with the hole diameter 24mm or 26mm and ADV RPSQHT 20 of dimensions 130x76x20mm with hole diameter 30mm.

The ADVECO hold-downs are made of steel that complies with grade S355 according to EN 10025-2:2004 with  $R_{eH} \geq 355$  MPa,  $R_m$  between 470 and 630 MPa and  $A \geq 22\%$ . The washer plates are made of steel grade S275 with  $R_{eH} \geq 275$  MPa. The source materials are flat hot-rolled products with tolerances that correspond to the requirements of EN 10025-1:2004. Both the hold-downs and the washer plates are either hot dip galvanized according to EN ISO 1461:2009 with a minimum zinc coating mass of Z275 or with equivalent electroplated zinc coating Fe/Zn 12c according to EN ISO 2081:2008.

Dimensions of the products are given in Annex A.

This report contains a summary of the tests and assessment against the requirements of EOTA Guideline for European Technical Approvals, EAD 130186-00-0603 *Three-dimensional Nailing Plates*, Edition July 2018.

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

The Adveco Hold-downs are intended for timber-to-concrete or timber-to-steel connections fastened by a range of nails, bolts or metal anchors.

The hold-downs are used for connecting load bearing elements, as for instance in connections of timber post to concrete base, where requirements for mechanical resistance and stability and safety in use in the sense of the Basic Requirements for Construction Works 1 and 4 of Annex I in Regulation (EU) No. 305/2011 (CPR), as amended, shall be fulfilled.

The connection may be with a single hold-down or with a hold-down on each side of the fastened timber member.

The wood members can be of solid timber, glued laminated timber and similar glued members, or wood-based structural products with a characteristic density between 290 and 420 kg/m<sup>3</sup>.

This requirement to the material of the wood members can be fulfilled by using the following materials:

- Solid timber classified to C14-C40 according to EN 338 / EN 14081
- Glued members of timber classified to C14-C40 according to EN 338 / EN 14081 when structural adhesives are used
- Glued laminated timber classified to GL24c or better according to EN 14080
- Solid Wood Panels, SWP according to EN 13353
- Laminated Veneer Lumber LVL according to EN 14374
- Plywood according to EN 636

## 2.1 Specifications for structural design

In Annex B there are stated characteristic load-bearing capacities of the connections with the hold-downs in question and resisting uplift force  $F_{hd}$ . For all the types the load bearing capacities are given for hold-downs with and without the corresponding washer plate.

The stated characteristic load-bearing capacities are moreover conditioned by the use of the fasteners, support conditions of the connected members and the other conditions as summarized in Annexes A and B.

Namely, it is presumed that no rotation of the connected wood member occurs. The rotation shall be hindered by other structural links.

The design of the connections shall be in accordance with Eurocode 5 or a similar national Timber Code in part related to the assessment of the failure modes governed by wood including nails. The connection to concrete with a metal anchor or a bolt perchance connection to a steel member shall be assessed in line with CEN/TS 1992-4-1 *Design of fastenings for use in concrete* perchance in line with EN 1993-1-8. The reliability management of design and execution of the timber structure shall comply with the requirements stipulated in Cl. 2.2 of EN 1990.

The minimum thickness of the wood members shall be larger than the penetration depth of the fasteners. Where overlapping of fasteners occurs the respective rule stipulated in Cl. 8.3.1.1 of EN 1995-1-1:2004/A1+A2 applies.

Where relevant, possible splitting of the wood member by the tensile force component perpendicular to grain and block shear or plug shear failure shall be assessed.

The intended use of the hold-downs is for connections subjected to static or quasi-static loading.

Their inherent corrosion resistance conforms to the use in timber structures subjected to the dry, internal conditions defined by service class 1 and 2 of Eurocode 5.

The hold-downs can also be used in the connections of outdoor timber structures, service class 3, provided these are adequately protected against corrosion as stipulated in Eurocode 5.

## 2.2 Specifications for installation the products into construction

The following provisions concerning installation apply:

- *Fasteners*

The minimum number of fasteners used are specified in Annex B. The fasteners shall comply with the specification in Annex A of this ETA. The minimum spacing and edge and end distances shall comply with the requirements of the respective Timber Code.

- *Support conditions*

The members connected by the hold-downs shall be prevented from rotation.

- *Wood members*

Strength class C14 as a minimum, see above. There is no wane in the region of the connection and splits, knots or other defects are limited such that the load-bearing capacity of the connection is not affected. If single hold-down per connection is used the members shall have thickness greater than the penetration depth of the nails. In case double hold-down connection is used overlapping of the nails shall comply with 8.3.1.1 (7) in EN 1995-1-1:2004/A1+A2.

- *Gap size between members*

It is supposed the hold-downs are face fixed in full contact with surfaces of the connected members. The gap between connected members does not exceed 3 mm.

- *Contact with preservative-treated timbers*

If preservative treated timber is used it shall comply with EN 15228. The preservative used shall be compatible with the corrosion protection coating of the connector and fasteners. Note: Protection by zinc coating Z275 or the equivalent Fe/Zn 12c is normally considered as sufficient when copper salts or organic substances are used as treatment in service classes 1 and 2.

- *Additional conditions*

The execution of the connection shall comply with the ETA holder's technical instructions.

## 2.3 Expected service life

The expected service life in the intended use, such as the estimated time during which the product installed in the construction will perform its functions so that the construction will meet the basic requirements of the CPR under foreseeable actions and normal maintenance is 50 years.

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

#### Essential characteristics of the products and methods used to assess:

EAD 130186-00-0603 Three-dimensional nailing plates (ed. July 2018):

No	Essential characteristics	Assessment method	Type of expression of product performance (level, class, description)
<b>BWR 1 - Basic Works Requirement 1: MECHANICAL RESISTANCE AND STABILITY</b>			
1	Joint strength	2.2.1	For details on the assessment procedure, see Article 2.2.1 of this ETA. See also Annex B to this ETA
2	Joint stiffness	2.2.1	<i>no performance assessed</i>
3	Joint ductility	2.2.1	<i>no performance assessed</i>
4	Resistance to seismic actions	2.2.2	<i>no performance assessed</i>
5	Resistance to corrosion and deterioration	2.2.3	See Article 2.2.3 of this ETA
<b>BWR 2 - Basic Work Requirement 2: SAFETY IN CASE OF FIRE</b>			
6	Reaction to fire	2.2.4	The hold-downs are made of steel classified as <b>Euroclass A1</b> in accordance with EN 13501-1+A1 and EC Decision 96/603/EC, as amended
7	Resistance to fire	2.2.5	<i>no performance assessed</i> Fire resistance is determined for the complete structural element, including the final surfaces, not for the insulated anchoring element. Therefore, no performance assessed.

#### 3.1 Assessment methods

##### 3.1.1 Mechanical resistance and stability

The load-bearing capacity values of hold-downs were determined by the calculation method with verification by tests according to EAD 130186-00-0603 article 2.2.1.2.

Numerical values of the characteristic load-bearing capacities as given in Annex B were calculated using the verified calculation model considering characteristic yield strength of steel stated above and the characteristic pull-out and lateral load-bearing capacities (thin steel plate assumed) of the fasteners determined according to Eurocode 5 in conjunction with EN 14592, as amended.

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.

No performance has been determined in relation to the stiffness properties of the connections.

### 3.1.2 Durability, corrosion and damage resistance

As a minimum, the respective characteristics of the materials employed are that of S355JR (hold down) and S275JR (washer plate) with corrosion protection Z275 or Fe/Zn 12c.

The corrosion protection of the hold-downs complies with requirements for service classes 1 and 2.

The thickness of steel is less than or equal to 3 mm. This complies with the requirements of EAD 130186-00-0603 for the minimum weight of the zinc surface layer in serviceability class 2, which is Z275. The corrosion protection of the angles is suitable for serviceability class 1 and 2.

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

According to the Decision 1997/0176/EC, of the European Commission the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011 and Commission delegated Regulation (EU) No 568/2014) given in the following table applies:

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Adveco Hold-downs (connected by nails, bolts or metal anchors)	For wooden construction products	Fire reaction class and fire resistance classes according to EN 13501-2	2+

## **5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD**

### **5.1 Tasks for manufacturers**

The manufacturer may only use initial and constituent materials stated in the technical documentation of this European Technical Assessment.

The European Technical Assessment is issued for the product on the basis of agreed data, deposited with TZÚS Praha, s. p., which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data being incorrect, shall be notified to TZÚS Praha, s. p., before the changes are introduced. TZÚS Praha, s. p., will decide whether or not such changes affect the assessment.

Welds connecting parts of the hold-downs have been identified as structural link significant for the structural behaviour of the connectors thus affecting the load-bearing capacity of the connection. Hence, welding shall be considered as critical process during manufacturing the connectors and shall be in line with the requirements of EN ISO 3834-3.

The process of cold-forming parts of above stated structural steel is critical to reliable ductile behaviour of structural elements in question. The process shall meet the requirements of EN 1090-2 Cl. 6.5.4 in line with EN 10025-2 Cl. 7.4.2.2.

Similarly, the process of zinc coating shall meet the requirements of EN ISO 14713, and EN ISO 1461 or EN ISO 2081

Apart from marking and performance information of the products as required in EAD, the manufacturer shall provide technical instructions on design and installation of the products in works complying with the conditions stipulated in this ETA. These shall be made available, e. g. in accompanying documents to the products.

### **5.2 Factory production control**

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall ensure that the product is in conformity with this European Technical Assessment.

The factory production control shall be in accordance with the "Control plan to ETA 24/0009, ADVECO hold-downs ADV SQHT with washer plates ADV RPSQHT", version 3 that is a part of the technical documentation of this European Technical Assessment. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with TZÚS Praha, s.p.<sup>1</sup>

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<sup>1</sup> The control plan is a confidential part of the European Technical Assessment and is only handed over to the notified body or bodies involved in the procedure of Assessment and Verification of Constancy of Performance of the products.



Issued in Prague, Czech Republic  
on 24.03.2024

By

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## Annex A

### Product details and specifications

Table A.1 Dimensions and parent material specifications

Hold-down /washer plate Code No.	Type dimensions (mm)	Thickness (mm)	Steel specification	Coating specification
ADV SQHT 340	340x60x62	3.0	S355	Z275 or Fe/Zn 12c
ADV SQHT 440	440x60x62	3.0	S355	Z275 or Fe/Zn 12c
ADV SQHT 540	540x60x62	3.0	S355	Z275 or Fe/Zn 12c
ADV SQHT 540.22	540x60x62	3.0	S355	Z275 or Fe/Zn 12c
ADV SQHT 620	620x80x82	3.0	S355	Z275 or Fe/Zn 12c
ADV SQHT 620.26	620x80x82	3.0	S355	Z275 or Fe/Zn 12c
ADV SQHT 765	765x140x82	3.0	S355	Z275 or Fe/Zn 12c
ADV RPSQHT 10	50x60x10	10.0	S275	Z275 or Fe/Zn 12c
ADV RPSQHT 10.22	50x60x10	10.0	S275	Z275 or Fe/Zn 12c
ADV RPSQHT 20	70x80x20	20.0	S275	Z275 or Fe/Zn 12c
ADV RPSQHT 20.26	70x80x20	20.0	S275	Z275 or Fe/Zn 12c
ADV RPSQHT 20.30	130x76x20	20.0	S275	Z275 or Fe/Zn 12c

Table A.2 Tolerances

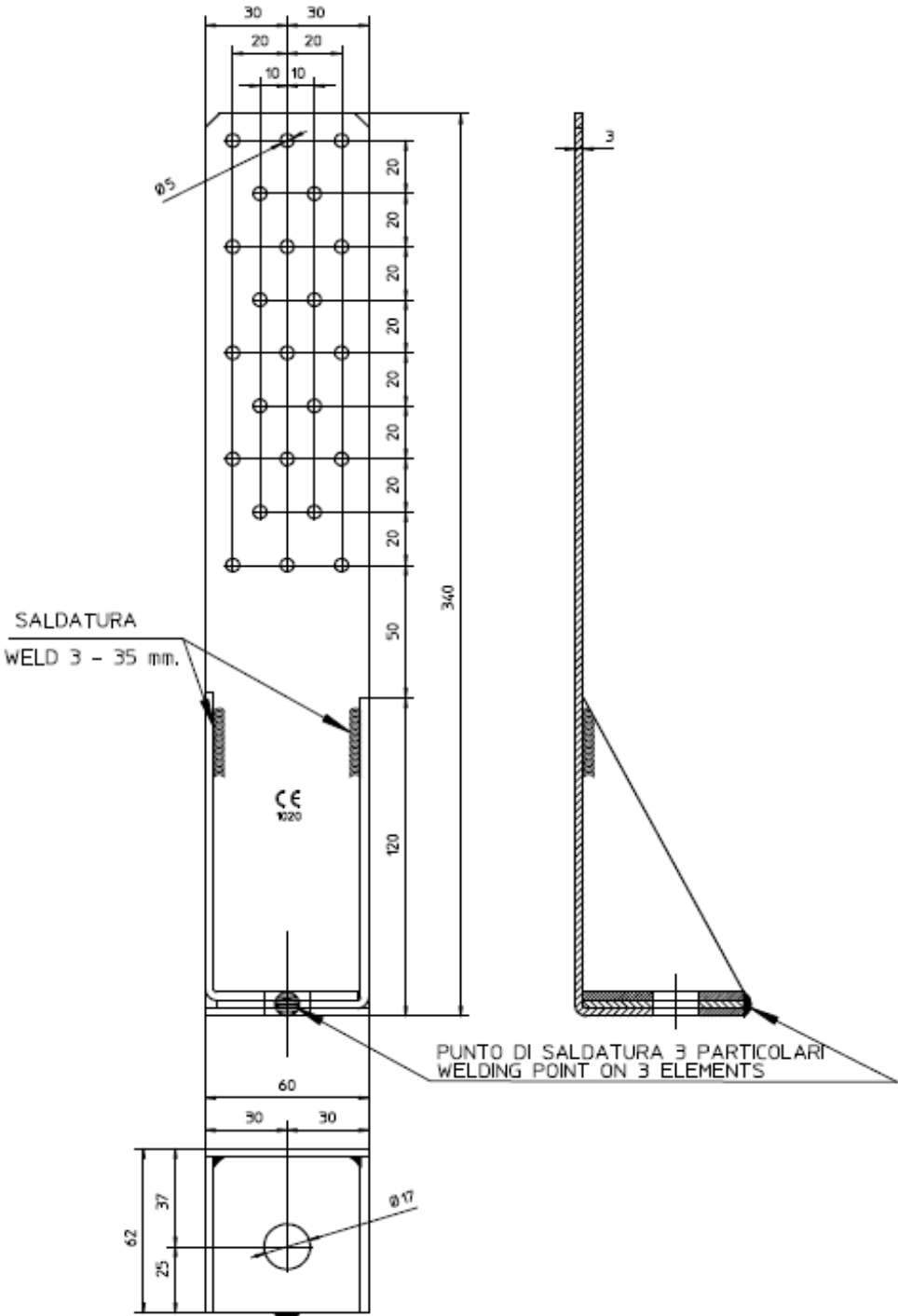
Connector	Lengths (mm)	Hole position and spacing (mm)	Hole diameter (mm)
All types	±1	±1	±0.2

Table A.3 Fastener specification

Nail type	Nail size (mm)		Finish
	Diameter	Length	
According to EN 14592 Threaded nail with truncated cone under the head	4.0	60	Zinc-coated
<p>The capacities for threaded (ring shank) nails calculated from the formulas of Eurocode 5, are used assuming a thick steel plate when calculating the nail lateral load-bearing capacity. The characteristic withdrawal capacity of the nails was determined by calculation according to the respective formula from paragraph 8.3.2 of EN 1995-1-1:2004/A1+A2:</p> $F_{ax,Rk} = f_{ax,k} \cdot d \cdot t_{pen}$ <p><math>f_{ax,k}</math> is the characteristic withdrawal strength, in N/mm<sup>2</sup>  <math>d</math> nail diameter, in mm  <math>t_{pen}</math> penetration length of the threaded part of shank, in mm</p> <p>The characteristic withdrawal strength is calculated as:</p> $f_{ax,k} = 50 \cdot 10^{-6} \cdot \rho_k^2$			

Bolt or Metal anchor diameter (mm)	Corresponding nut dimension (mm)	Type
16	24	According to the specification of the manufacturer
20	30	According to the specification of the manufacturer
24	36	According to the specification of the manufacturer
27	42	According to the specification of the manufacturer

TECHNICAL DRAWINGS OF THE PRODUCTS:



**Fig. A.1 ADV SQHT 340**

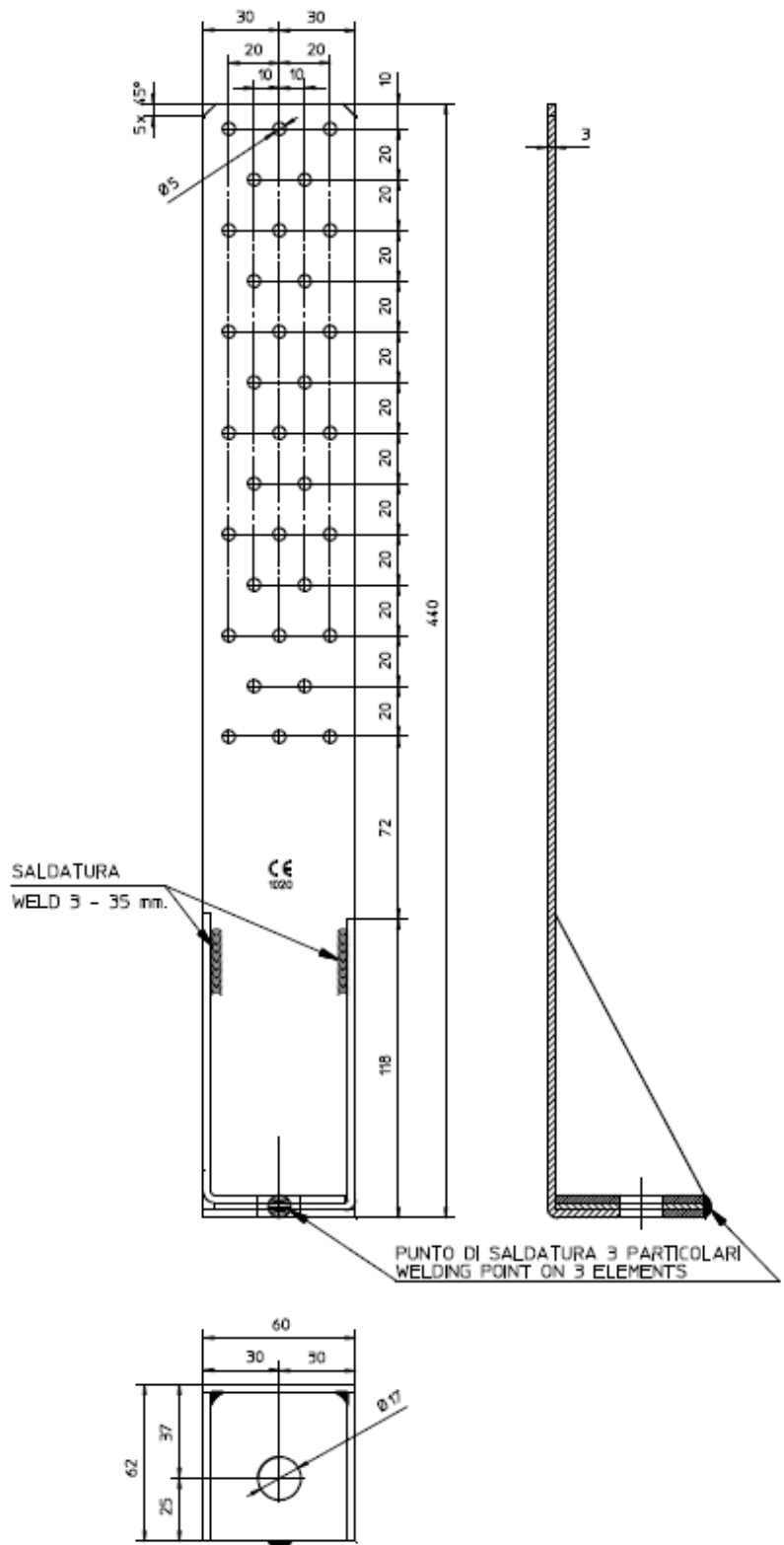


Fig. A.2 ADV SQHT 440

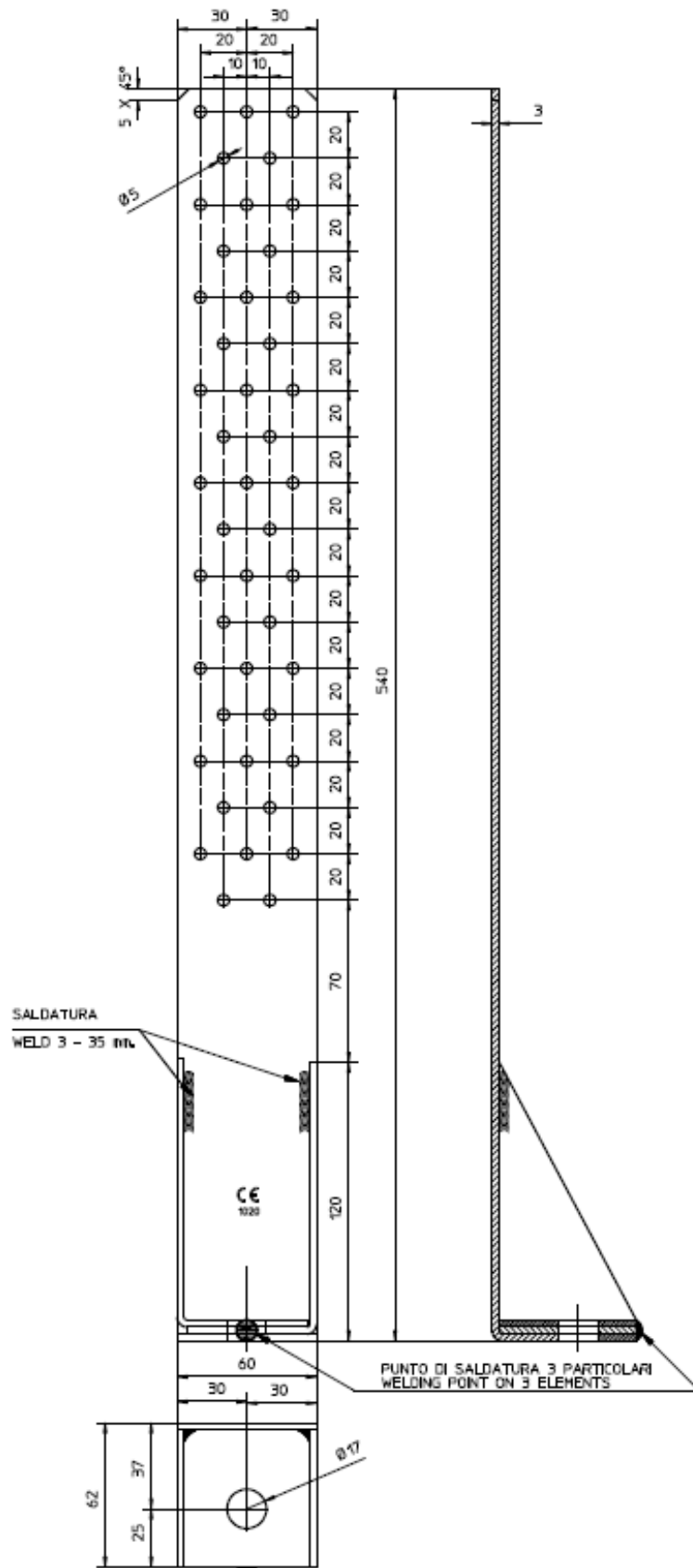


Fig. A.3 ADV SQHT 540

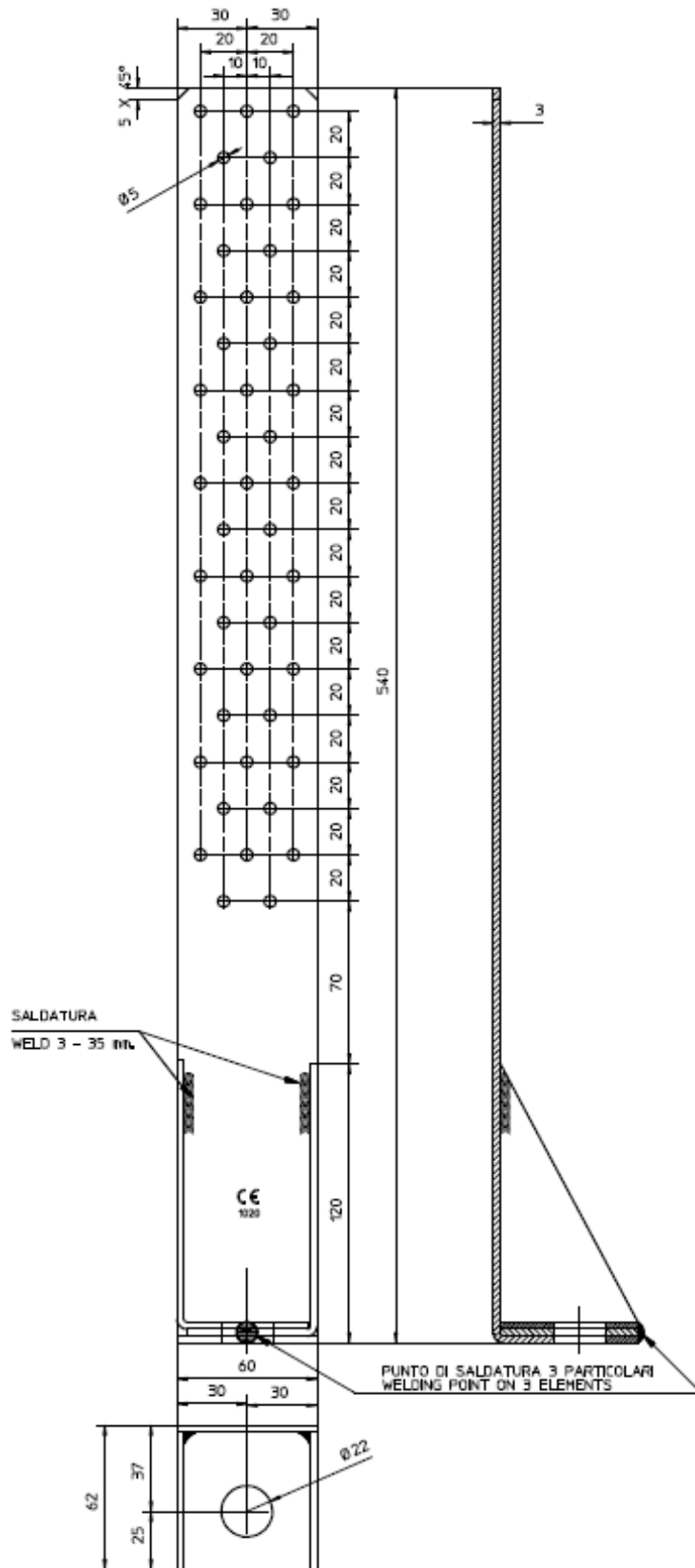
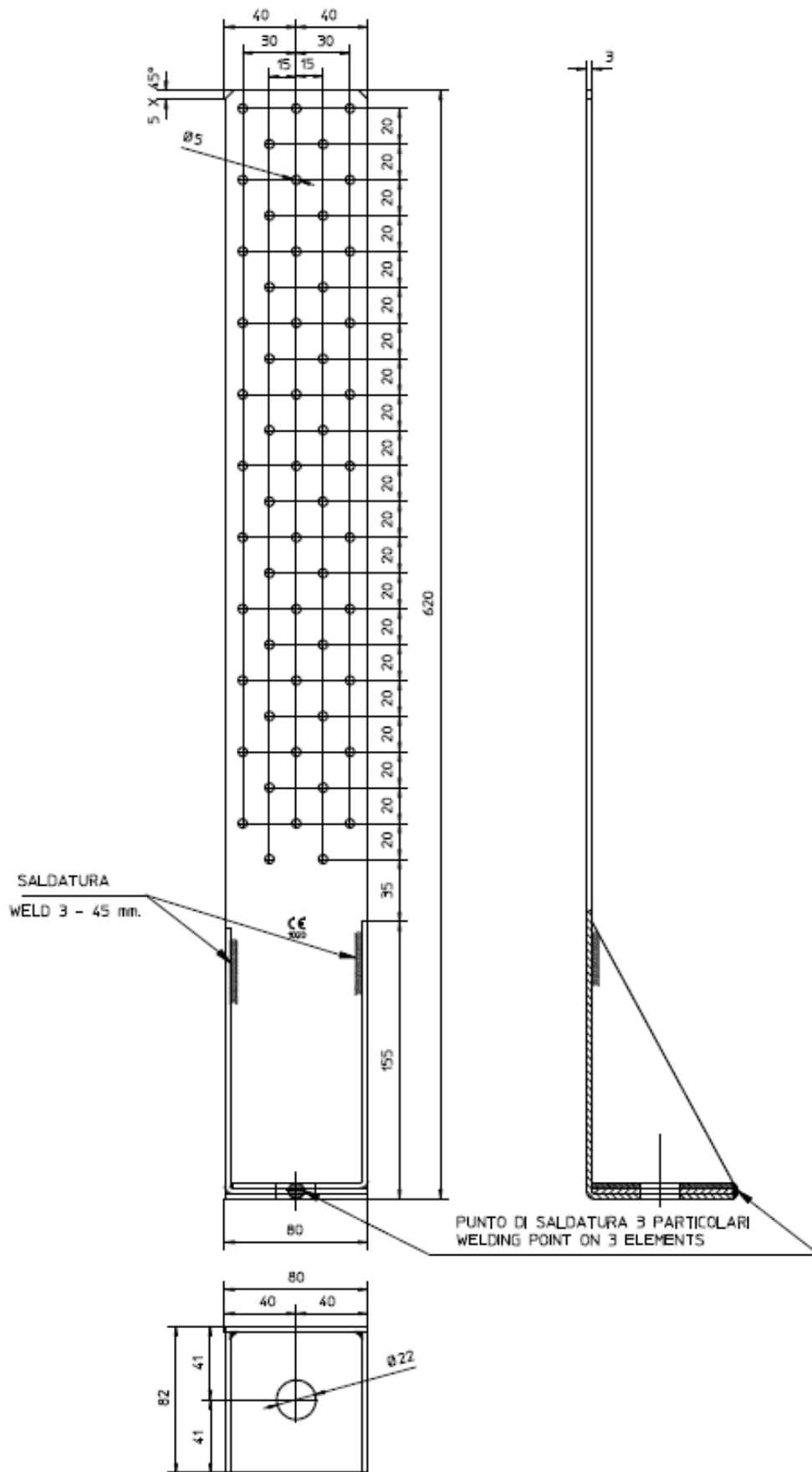
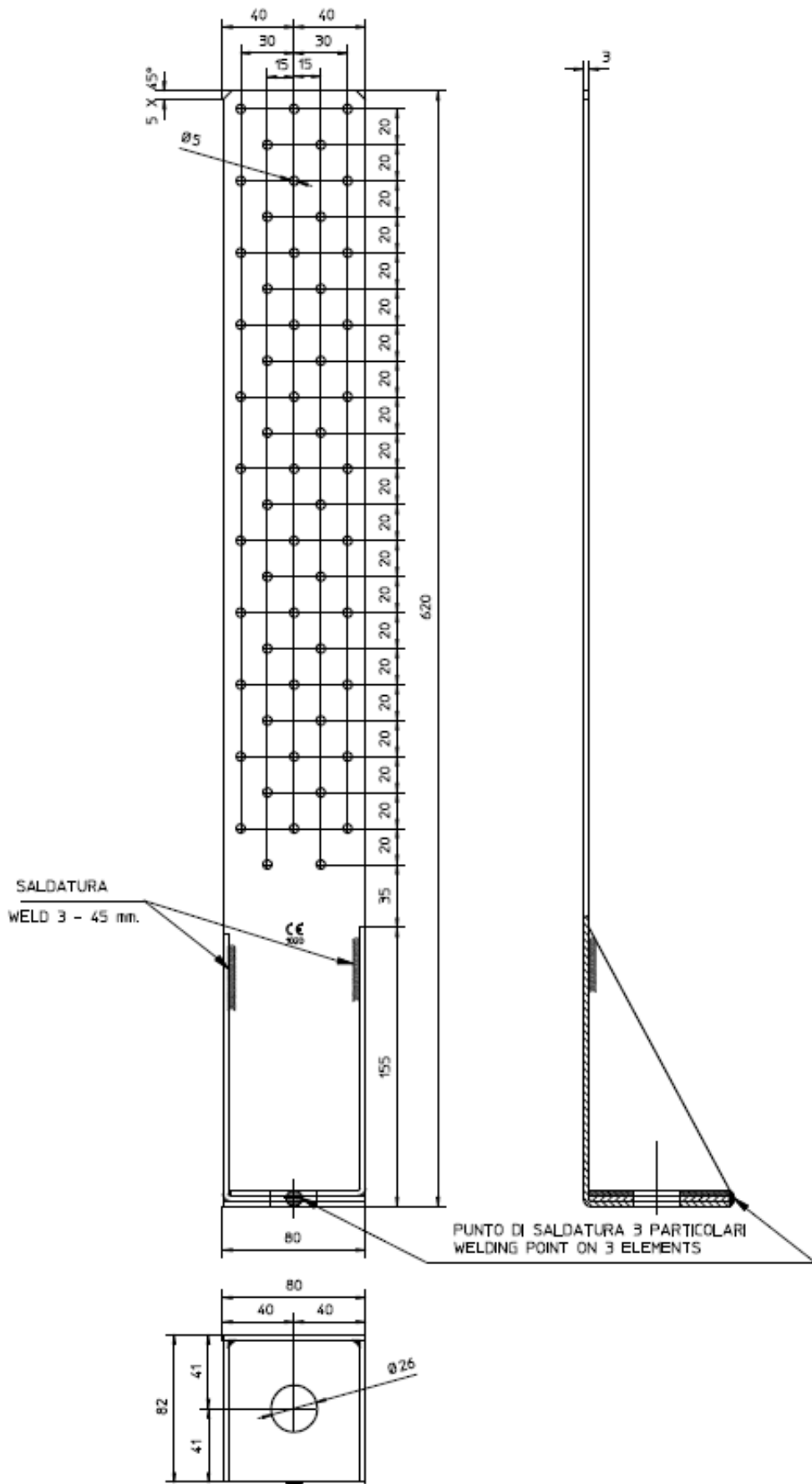


Fig. A.4 ADV SQHT 540.22

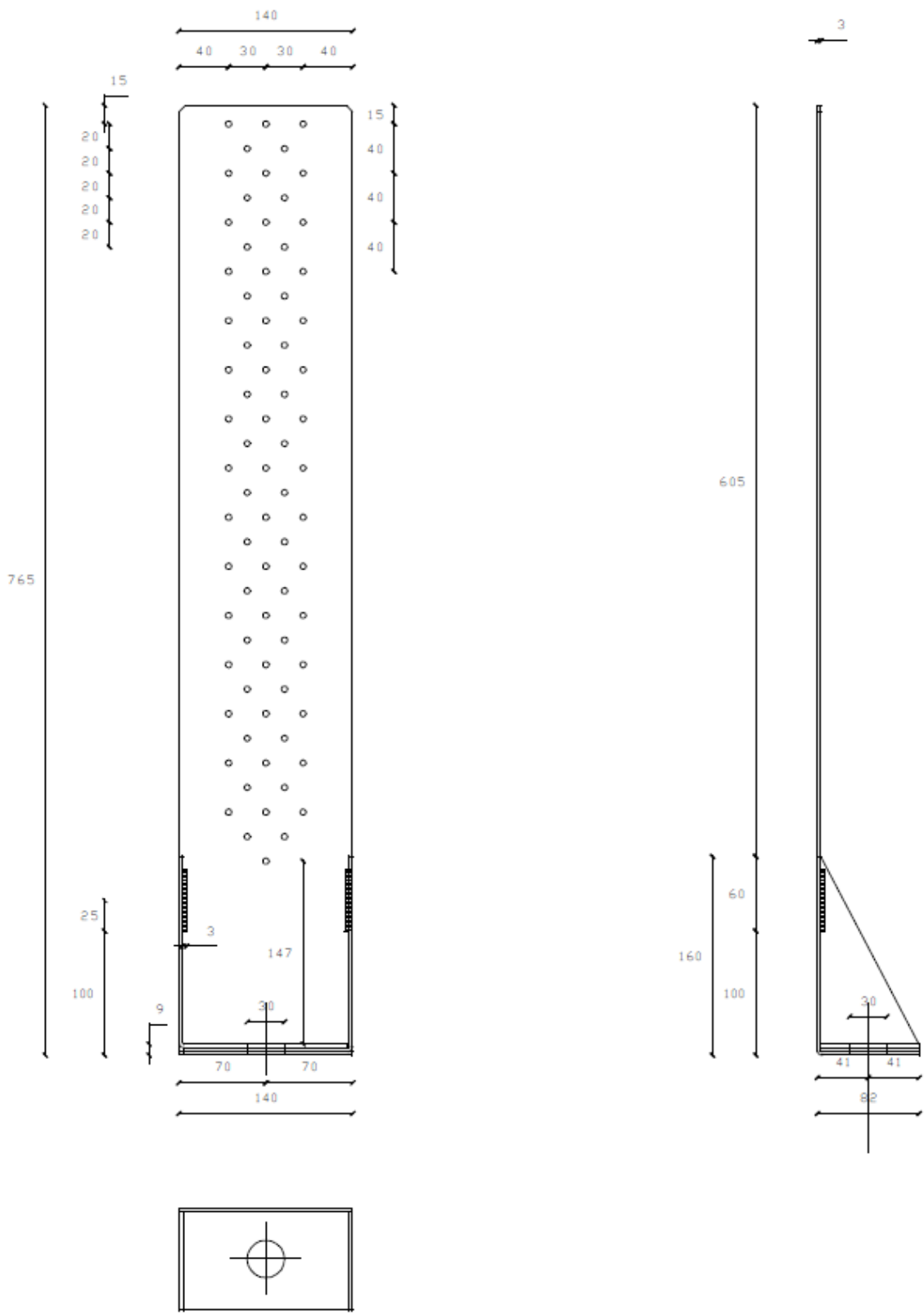


**Fig. A.5 ADV SQHT 620**

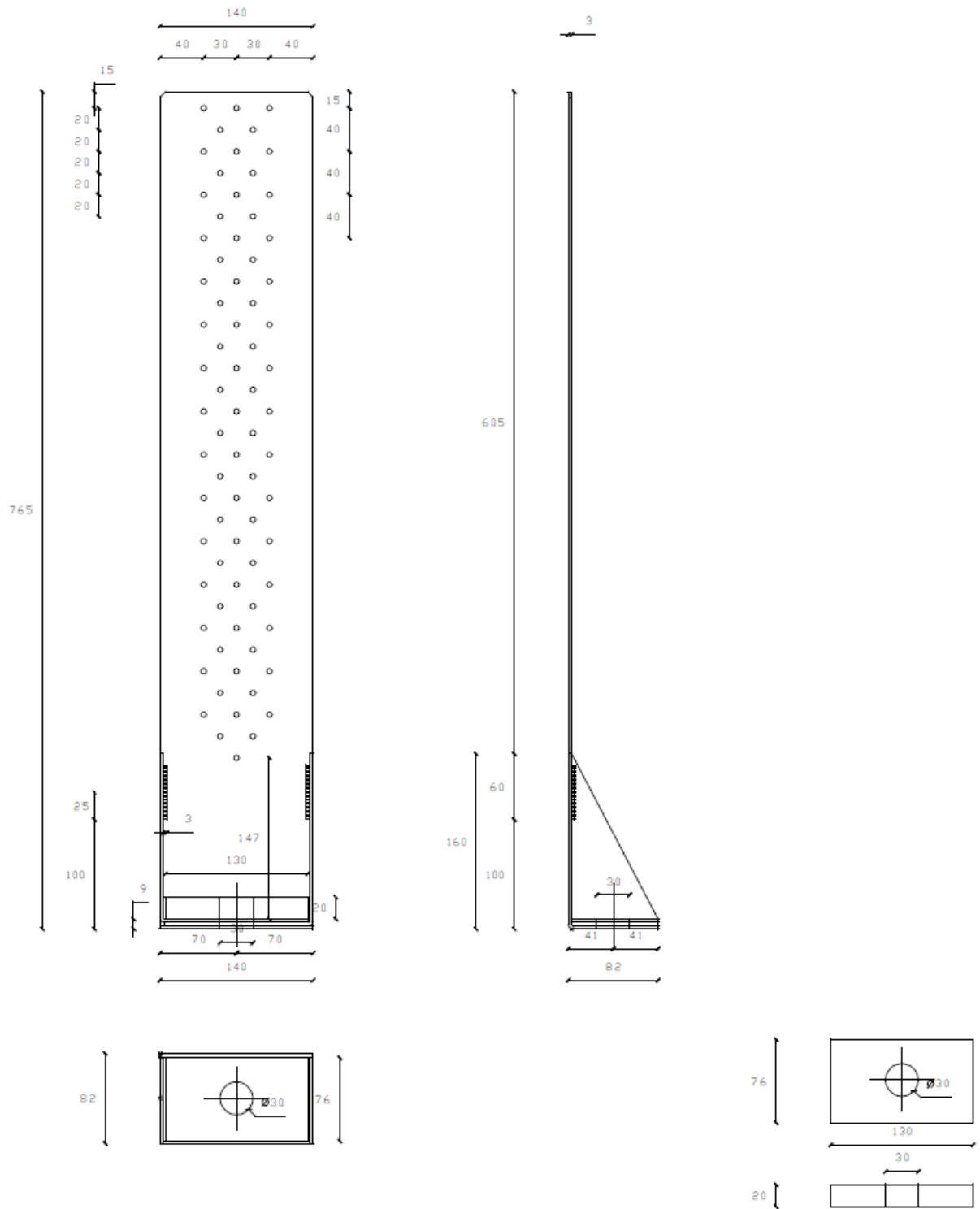


**Fig. A.6 ADV SQHT 620.26**

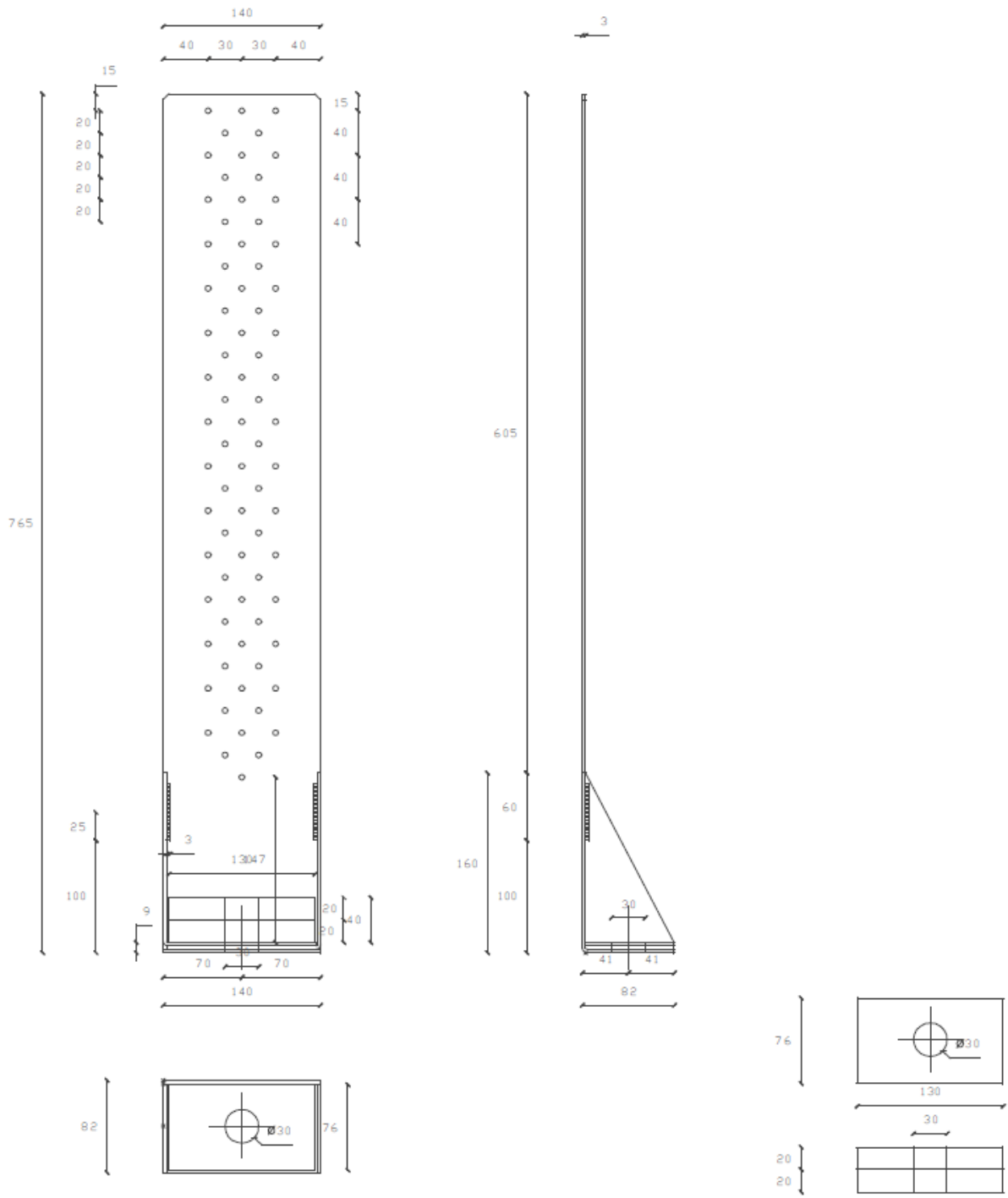




**Fig. A.7 ADV SQHT 765**



**Fig. A.8 ADV SQHT 7651W**



**Fig. A.9 ADV SQHT 7652W**

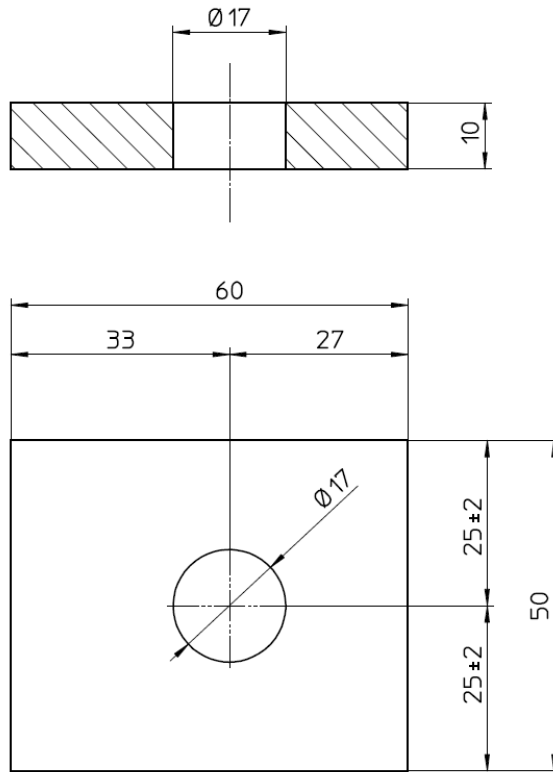


Fig. A.10 ADV RPSQHT 10

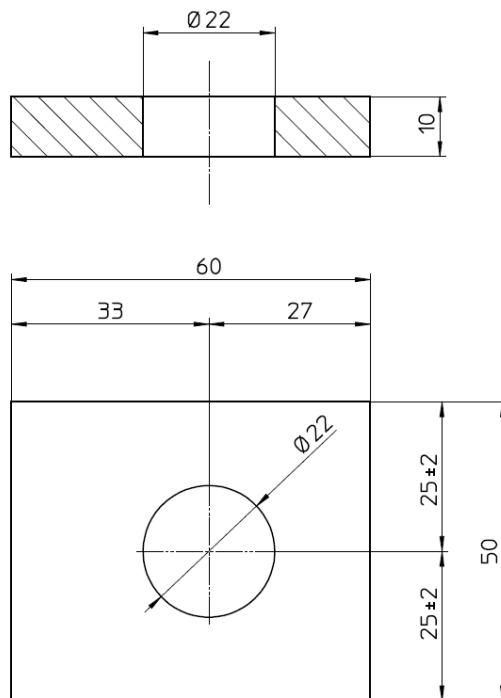
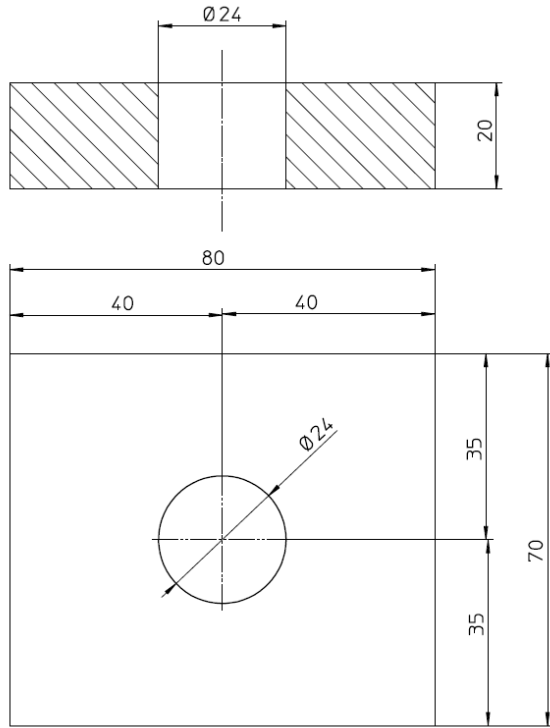
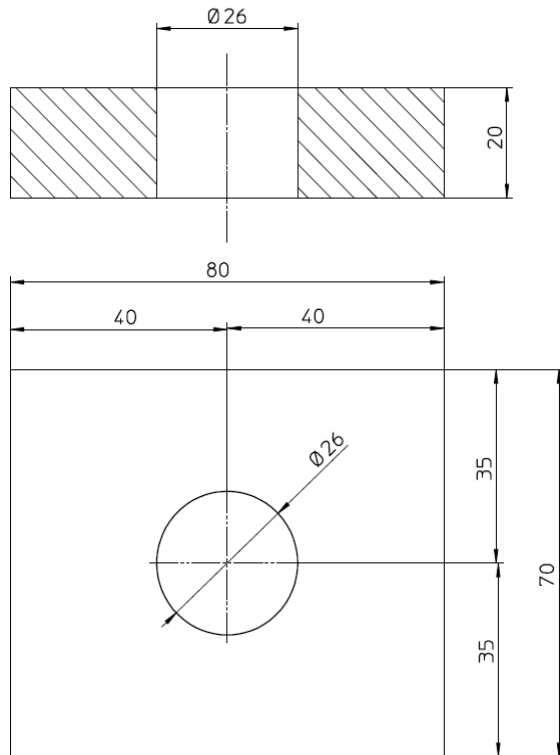


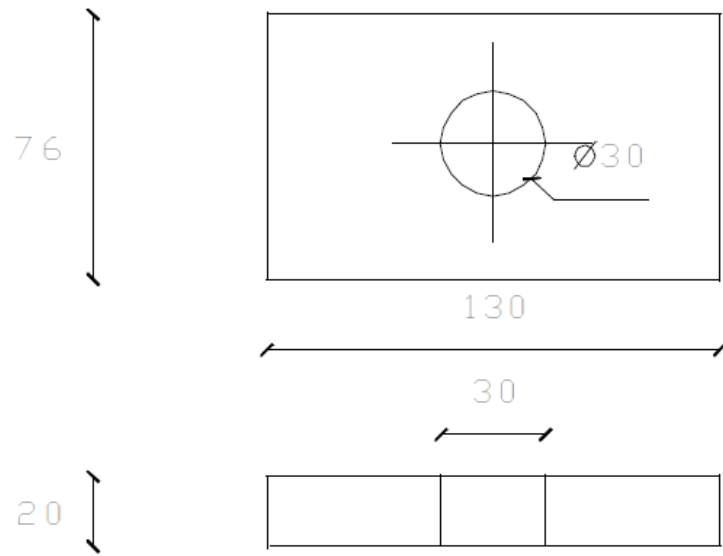
Fig. A.11 ADV RPSQHT 10.22



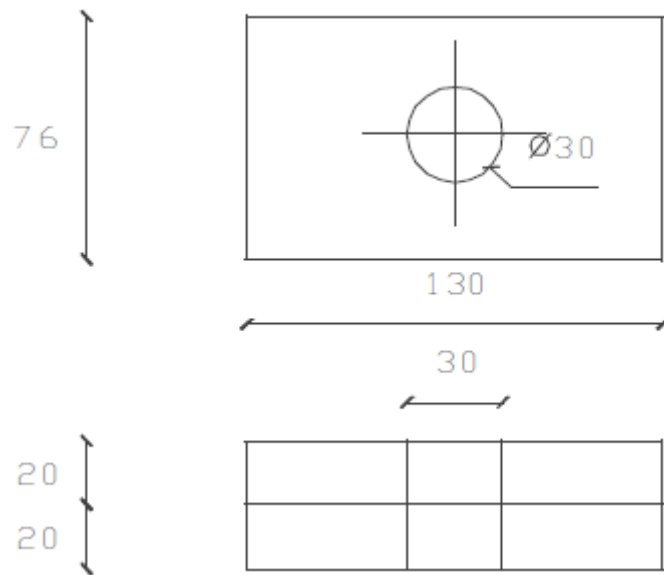
**Fig. A.12 ADV RPSQHT 20**



**Fig. A.13 ADV RPSQHT 20.26**



**Fig. A.14 ADV RPSQHT 20.30**



**Fig. A.15 2x ADV RPSQHT 20.30**

## Annex B

### Load-bearing capacities of ADVECO hold-downs type ADV SQHT with and without washer plates type ADV RPSQHT

Values of maximum characteristic load-bearing capacities for uplift stated in Table B.1 are given for one hold-down and are valid on condition that:

- it shall be distinguished whether the hold-down is or is not equipped with the respective type of washer plate. It is to be noted that the load-bearing capacities of hold-downs without washer plates are considerably lower as compared with those completed with the washer plates
- the hold-downs are affixed by fastener types as specified in Annex A with minimum number as determined below
- there is no wane in the region of the connection and splits, knots or other defects are limited so that the capacity is not reduced
- the connected wood member is prevented from rotation by other structural links
- the possibility of splitting the wood member and block or plug shear shall be checked, see 8.1.4 and Annex A in EN 1995-1-1
- the possibility of dimensional instability of the wood member shall be taken into account where relevant, refer to clause 3.1.4 of this ETA
- connection to concrete or other base material with a metal anchor or a bolt shall be assessed in line with CEN/TS 1992-4-1 *Design of fastenings for use in concrete* per chance in line with EN 1993-1-8. Namely, the effect of prying force in base connection shall be accounted for taking into account the stiffness and strength of the base material and the anchor/bolt. It shall be noted that the capacities given in Table B.1 may only develop if no substantial rotation in fixing to the base occurs which means that neither the base material nor the anchor/bolt fails or undergoes excessive plastic deformations before the load-bearing capacity of either the nails or of the steel hold-down is attained.

Table B.1 ADVECO hold-downs, characteristic capacities for the uplift force

Hold-down Code No.	Washer plate Code No.	Anchor (bolt) diameter (mm)	Capacity of the nails (connection to timber) $F_{hd,Rk}$	Capacity of the hold-down (steel) $F_{hd,Rk}$ (kN)
ADV SQHT 340	none	16	$n_{ef} \cdot F_{V,Rk}^{1,2)}$	13.5
ADV SQHT 440	none	16		13.5
ADV SQHT 540	none	16		13.5
ADV SQHT 540.22	none	20		15.7
ADV SQHT 620	none	20		15.1
ADV SQHT 620.26	none	24		16.7
ADV SQHT 765	none	27		17.5
ADV SQHT 340	ADV RPSQHT 10	16		45.7
ADV SQHT 440	ADV RPSQHT 10	16		45.7
ADV SQHT 540	ADV RPSQHT 10	16		45.7
ADV SQHT 540.22	ADV RPSQHT 10.22	20		45.7
ADV SQHT 620	ADV RPSQHT 20	20		66.0
ADV SQHT 620.26	ADV RPSQHT 20.26	24		66.0
ADV SQHT 7651W	ADV RPSQHT 20.30	27		99.2
ADV SQHT 7652W	2x ADV RPSQHT 20.30	27		126.9

- Note 1: <sup>1)</sup>  $F_{V,Rk}$  characteristic load-bearing capacity of one laterally loaded nail, thick plate considered
- <sup>2)</sup>  $n_{ef}$  effective (reduced) number of nails in solid timber when the fastener alignment goes parallel to grain, refer to 8.1.2 in EN 1995-1-1

Note 2: The minimum number  $n$  of nails to be used is 10. The maximum nail number corresponds to full nailing pertaining to the respective type.

Definitions of forces, eccentricities, and critical sections to be considered:

$F_{hd}$  uplift, lifting force acting parallel to vertical

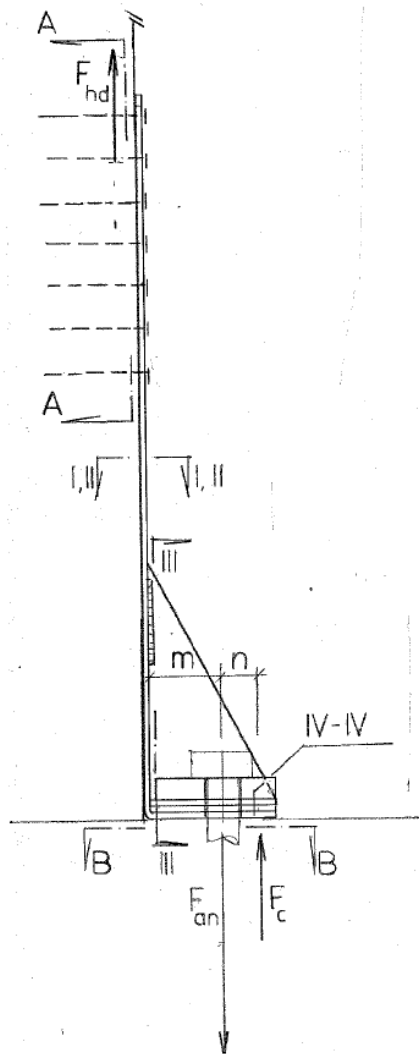
leg of the hold-down

$F_{an}$  force induced in anchor/bolt

$F_c$  prying force

$m$  distance of the anchor axis to vertical leg

$n$  distance of the anchor axis to centre of prying



Critical sections:

A-A capacity in this section is given by the capacity of the laterally loaded nails, this capacity is to be determined as shown in Table B.1

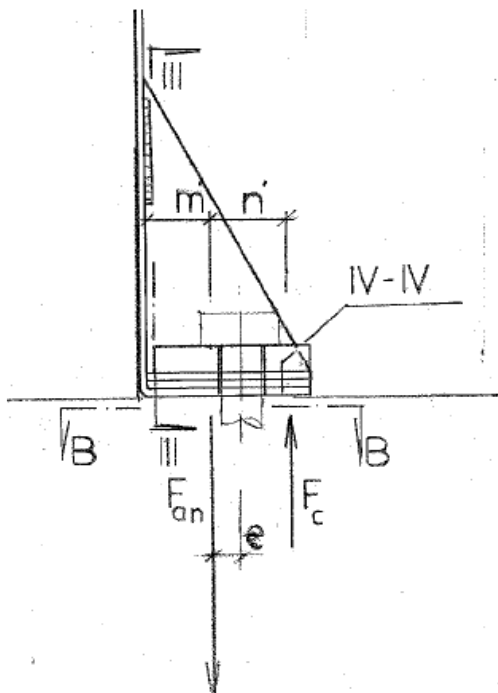
I-I, II-II, III-III, IV-IV critical sections and parts of the hold-down itself, the minimum characteristic capacity of these parts and sections is stated in Table B.1

B-B capacity in this section shall be assessed in line with CEN/TS 1992-4-1, 2, 3, 4, 5 or possibly in line with EN 1993-1-8

Fig. B.1 Definition of forces and critical sections

In cases the base material is of lower class/strength (e. g. C20/25 and less) the static scheme should be rather considered as depicted in Fig. B.2 – that means due to rotation of the washer plate anchor/bolt head is loaded eccentricly thus inducing bending in the anchor/bolt. Tensile capacity of the anchor/bolt shall be reduced accordingly.





e eccentricity of the force  $F_{an}$

Fig. B.2 Alternative static scheme of loading the anchor/bolt to be considered

Design value of the load bearing capacity of the connection:

To obtain design values the characteristic capacities have to be divided by the respective partial factors for the material properties. Moreover, where the load bearing capacity is governed by wood failure as is normally the case of nails, the coefficient  $k_{mod}$  depending on the load duration class and service class shall apply.

$$F_{hd,Rd} = k_{mod} \cdot F_{hd,Rk} / \gamma_M \quad (B.1)$$

- For design value pertain to steel (hold-down) the relation (B.1) applies with values  $\gamma_M = \gamma_{M0} = 1.0$ . According to EN 1993-1-1  $\gamma_{M0} = 1.0$ . (Note: reduction coefficient 0.9 and partial factor  $\gamma_{M2}$  for net cross-section at holes is already accounted for in the characteristic value of  $F_{hd,Rk}$ ).  $k_{mod} = 1.0$  applies.
- For design value pertain to nails (timber) the relation (B.1) applies with values  $\gamma_M = 1.3$  and  $k_{mod}$  depending on the load duration and moisture content, refer to EN 1995-1-1.
- For failure governed by the base connection – anchor/bolt and the base material – partial factors  $\gamma_{MS} \geq 1.4$ , and  $\gamma_{MC} \geq 1.5$  as specified in CEN/TS 1992-4-1, or  $\gamma_{M2}$  and  $\gamma_C$  according to EN 1993-1-1 and EN 1992-1-1, apply.  $k_{mod} = 1.0$ .

The lowest design value of the three so determined decides.